Research on the Performance Evaluation Index System of Logistics Enterprises Based on Improved BSC

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Abstract: The performance evaluation index system and empirical research of logistics enterprises based on improved BSC: Logistics enterprises are facing increasingly fierce global competition, and comprehensive, accurate, and timely evaluation of their comprehensive performance is the key to ensuring the efficient operation of logistics enterprises. This article focuses on the performance evaluation of logistics enterprises and redesigns an evaluation index system based on BSC, which includes five dimensions: finance, customers, internal processes, learning and growth, and policies. Subsequently, by combining the Analytic Hierarchy Process (AHP) to determine the weights of indicators and using the fuzzy comprehensive evaluation method as the basic model, a practical and feasible performance evaluation model for logistics enterprises is obtained. Finally, using data for case analysis, the rationality of the model was verified, providing a theoretical basis for further research on performance evaluation of logistics enterprises in the future.

Keywords: performance evaluation of logistics enterprises; fuzzy comprehensive evaluation; analytic hierarchy process; balanced scorecard

1. Introduction

With the rapid development of globalization and e-commerce, the logistics industry is facing unprecedented challenges and opportunities. Logistics enterprises not only need to handle the increasing volume of goods and orders, but also need to continuously improve service quality and efficiency to meet the increasingly diverse needs of customers. Therefore, performance evaluation of logistics enterprises is crucial.

2. Construction of Performance Evaluation Index System for Logistics Enterprises

Considering that the development of logistics enterprises also largely relies on policy support, combined with the existing research results of domestic and foreign scholars and referring to the suggestions of relevant experts in the logistics industry, this article improves the original four dimensions of BSC, adds a policy dimension, and designs a logistics enterprise performance evaluation index system that includes 5 primary indicators, 7 secondary indicators, and 15 tertiary indicators (as shown in Table 1).

Table 1. Performance evaluation indicators and weights for logistics enterprises

First indicators	Weights	Second indicators	Weights	Third indicators	Weights
Finance	0.1239	Enterprise Operations aspect	1	Net profit margin of total assets	0.40
				Total asset turnover rate	0.40
				Asset liability ratio	0.20
Customer	0.1239	Customer aspect	1	Consumer satisfaction	0.50
				Customer service level	0.50
Internal Processes	0.3938	competitive power	0.5	Market share	0.50
				Logistics technology innovation capability	0.50
		Operational quality	0.5	Logistics service quality	0.50
				Risk control capability	0.50
Learning and Growth	0.2345	Technical aspect	0.67	Enterprise informatization level	0.50
				R&D input-output ratio	0.50
		Employee aspect	0.33	Overall level of logistics technology personnel in enterprises	0.75
				Employee incentive measures	0.25
Policy	0.1239	Policy environment	1	Completeness of laws and regulations	0.50
				Degree of policy support	0.50

3. Performance Evaluation of SF Express Enterprise Based on AHP-Fuzzy Comprehensive Evaluation Method

3.1 Model selection

For logistics enterprises to conduct performance evaluation, considering that there are many influencing factors in the evaluation indicators, it is crucial to conduct accurate, reasonable, and effective evaluation. Therefore, this article adopts an evaluation model that combines Analytic Hierarchy Process and Fuzzy Comprehensive Evaluation.

3.2 Data Collection

This article selects SF Express Company as the evaluation object. The financial indicator data is sourced from the financial indicator analysis database in the CSMAR company research series; For other dimensions of data, this article obtains them through questionnaire surveys and expert interviews.

3.3 Weight determination of evaluation indicators

This article uses the Analytic Hierarchy Process to determine the weights of each indicator. Specific weights are shown in Table 1.

3.4 Fuzzy comprehensive evaluation

Based on the established evaluation index system, a five level scale is used to evaluate each indicator in five levels: "very good", "good", "average", "poor", and "extremely poor". Based on the obtained data, this article uses fuzzy statistical methods to calculate the membership degrees of all indicators, and the results are:

$$R_{11} = \begin{bmatrix} 0.08 & 0.89 & 0.03 & 0 & 0 \\ 0.07 & 0.90 & 0.03 & 0 & 0 \\ 0.09 & 0.20 & 0.71 & 0 & 0 \end{bmatrix} \quad R_{21} = \begin{bmatrix} 0.90 & 0.10 & 0 & 0 & 0 \\ 0.20 & 0.70 & 0.10 & 0 & 0 \end{bmatrix} \quad R_{31} = \begin{bmatrix} 0 & 0.65 & 0.35 & 0 & 0 \\ 0 & 0.29 & 0.71 & 0 & 0 \end{bmatrix}$$

$$R_{32} = \begin{bmatrix} 0 & 0.49 & 0.51 & 0 & 0 \\ 0 & 0.66 & 0.34 & 0 & 0 \end{bmatrix} \quad R_{41} = \begin{bmatrix} 0 & 0.39 & 0.61 & 0 & 0 \\ 0 & 0.56 & 0.44 & 0 & 0 \end{bmatrix} \quad R_{42} = \begin{bmatrix} 0.20 & 0.19 & 0.61 & 0 & 0 \\ 0.32 & 0.33 & 0.35 & 0 & 0 \end{bmatrix}$$

$$R_{51} = \begin{bmatrix} 0.60 & 0.40 & 0 & 0 & 0 \\ 0.40 & 0.60 & 0 & 0 & 0 \end{bmatrix}$$

The secondary fuzzy evaluation results are:

$$B_{11} = w_{11} \bullet R_{11} = \begin{bmatrix} 0.4 & 0.4 & 0.2 \end{bmatrix} \circ \bullet \begin{bmatrix} 0.08 & 0.89 & 0.03 & 0 & 0 \\ 0.07 & 0.90 & 0.03 & 0 & 0 \\ 0.09 & 0.20 & 0.71 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0.078 & 0.756 & 0.166 & 0 & 0 \end{bmatrix}$$

$$B_{21} = \begin{bmatrix} 0.55 & 0.4 & 0.05 & 0 & 0 \end{bmatrix} \quad B_{31} = \begin{bmatrix} 0 & 0.47 & 0.53 & 0 & 0 \end{bmatrix} \quad B_{32} = \begin{bmatrix} 0 & 0.575 & 0.425 & 0 & 0 \end{bmatrix}$$

$$B_{41} = \begin{bmatrix} 0 & 0.475 & 0.525 & 0 & 0 \end{bmatrix} \quad B_{42} = \begin{bmatrix} 0.23 & 0.225 & 0.545 & 0 & 0 \end{bmatrix}$$

$$B_{51} = \begin{bmatrix} 0.5 & 0.5 & 0 & 0 & 0 \end{bmatrix}$$

The first level fuzzy evaluation results are:

$$B_1 = w_1 \bullet R_1 = \begin{bmatrix} 1 \end{bmatrix} \bullet \begin{bmatrix} 0.078 & 0.756 & 0.166 & 0 & 0 \end{bmatrix} = \begin{bmatrix} 0.078 & 0.756 & 0.166 & 0 & 0 \end{bmatrix}$$

$$B_2 = \begin{bmatrix} 0.55 & 0.4 & 0.05 & 0 & 0 \end{bmatrix} \quad B_3 = \begin{bmatrix} 0 & 0.5225 & 0.4775 & 0 & 0 \end{bmatrix}$$

$$B_4 = \begin{bmatrix} 0.0759 & 0.3925 & 0.5316 & 0 & 0 \end{bmatrix} \quad B_5 = \begin{bmatrix} 0.5 & 0.5 & 0 & 0 & 0 \end{bmatrix}$$

The final evaluation result is

$$B = \begin{bmatrix} 0.1576 & 0.5030 & 0.3394 & 0 & 0 \end{bmatrix}$$

This paper uses the weighted average method to calculate the comprehensive evaluation effect of indicators at all levels. (as shown in Table 2)

Table 2. Evaluation results of performance of logistics enterprises

	Evaluation results
Evaluation results of performance of logistics enterprises	3.8182

According to the evaluation results, the performance evaluation result of SF Express is 3.8182, indicating that the performance result is "good".

4. Conclusion

The importance of performance evaluation in logistics enterprises is not only reflected in improving operational efficiency and service quality, but also in enhancing overall performance and competitiveness, optimizing resource allocation, achieving sustainable development, and other aspects. The new performance evaluation index system for logistics enterprises proposed in this article is effective and feasible.

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