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Research on Supplier Problems--Based on Topsis Comprehensive Evaluation Model

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Abstract

First, through the research of literature and data, 6 indicators with pertinence , globality, computability and representation are selected for 402 suppliers; the indicators include the percentage of orders, supply of each supplier Percentage, weekly average supply , difference between supply and order, supply , weeks of order, and variance of weekly supply . According to the 6 indicators, use the entropy weight method to analyze the 402 × 6 matrix, and use Matlab to calculate the weight of the 6 indicators; then establish the Topsis The comprehensive evaluation model introduces the constraints of the weekly production demand of the enterprise, and the 402 The importance of the top suppliers was ranked and the 50 most important suppliers were selected.

Keywords

Topsis method ; supplier problem; quantitative analysis; evaluation model.

1. Introduction

Raw material procurement is not only the starting point of production and operation , but also the focus of enterprise cost control . Do a good job in raw material procurement. Cost control work is very important for an enterprise to improve its operating efficiency , enhance its competitiveness in the industry, and develop the market through capital flow. have a significant effect. Under the background of intensifying competition in the industry and increasing operating pressure faced by major enterprises , How to strengthen the cost control of raw material procurement, so as to maximize the benefits in the process of enterprise operation and become enterprise management Difficulties and priorities in the field . The cost of raw material procurement includes purchase, packaging, loading and unloading, The human, financial and material resources spent in transportation, storage and other links , raw material procurement cost control refers to the process of reducing procurement costs through a series of measures and institutional arrangements around the above-mentioned raw material procurement costs .

fundamental purpose of the production and operation of an enterprise is to obtain a certain return on investment and operation. The income or profit of the enterprise is equal to the income minus the cost . Under the condition of a certain income, the better the cost control is, the more the enterprise income and profit will be. high. From this point of view, the control of raw material procurement costs can improve the operating efficiency of enterprises. Finally, the purpose of doing a good job in the cost control of raw material procurement is to improve the price competitiveness of the company's products in the terminal market and build a competitive advantage. Generally speaking , the stronger the cost control ability of the enterprise, the more the enterprise can take the initiative in the fierce price war, and can give consumers more price discounts to enhance the price competitiveness of the enterprise's products.

This paper conducts quantitative analysis based on the data of supplier supply and enterprise goods ordering , establishes a model that reflects the importance of ensuring the normal

production of enterprises , and selects 50 companies by considering the order quantity and the percentage of supply quantity, supply risk, etc. The most important supplier to meet the normal production needs of the enterprise.

2. Modeling and Analysis

2.1. Data preprocessing

Data quantization processing

Since in the original data sample, we comprehensively evaluated each supplier and listed 6 evaluation indicators, which are the order percentage, supply percentage, weekly average supply ranking, and the difference between supply and order volume of 402 suppliers. , the range of weekly supply, the variance of weekly supply and use Excel and Matlab to sort or classify to determine Determine the evaluation index and preprocess the index to standardize the index, determine the weight coefficient, select the comprehensive evaluation model, and calculate the comprehensive evaluation index. Sort and classify the data according to the index .

Data normalization

Since the range interval of each data is different, the data change interval span is relatively large. It is reduced to the interval [0 , 1] , which not only unifies the data change interval, but also allows different independent variables to be in one There is a better presentation on the graph and a more intuitive analysis of the change trend, which brings great convenience to the follow-up evaluation model. The data normalization adopts the max-min method .

2.2. Entropy weight method to determine index weight

Inheritance method is an objective comprehensive evaluation method used for multiple objects and multiple indicators. According to the degree of variation among the indicators , it uses the information to calculate the direct weight of each index, and then corrects the weight of each index through the direct weight, so as to obtain a more objective index weight.

(1) Data standardization

This time, the original data is used first . In the algorithm formula of the entropy weight method, the formula for data standardization is included, so it is not necessary to calculate separately here .

(2)find the information entropy of each index

(3)Determine the weight of each indicator

where the result is :

Table 1 Entropy weight method to find the weight result of each index

Indicator	order percentage	supply percentage	Weekly average volume	Availability and Order Quantity difference _	overorder weeks of shipment	Weekly supply very poor
weight _	0. 2308	0. 2594	0. 2594	0. 1644	0. 0851	0. 0007

It can be seen from the results that the most important weights are the weekly average supply, supply percentage and order percentage. These three indicators can accurately reflect the supply capacity of these suppliers.

2.3. Topsis comprehensive evaluation model

Topsis method established in this question is based on the closeness of the six evaluation indicators to the supplier's supply capacity target. Row sorting is to evaluate the relative merits

of existing objects. Since this method has no strict sample size limitation, it has a wide range of applications and is relatively simple in operation, so it can be applied to the research field of supplier importance evaluation . Topsis _ The basic principle of the method is to sort by detecting the distance between the evaluation object and the optimal solution and the worst solution [1-2] .

Build a matrix from raw data

If the evaluation object of the evaluation system has n , the evaluation index is p , then we can construct an $n \times p$ of space matrix, denoted as $X1$; This question has 402 evaluation objects, so the matrix is very large, so it is not written in the paper, but directly input in Matlab .

Normalize the raw data

In the original sample data, for the comparability of data, it is necessary to convert both positive and negative indicators into indicators of the same direction. In this study, the data can be standardized to obtain a standardized matrix

Determine the weight of each indicator

In order to determine the degree of influence of the indicators on the evaluation results to be studied, it is essential to determine the weights of the indicators. A step of. There are many ways to determine the weight. In this study, the coefficient of variation method is used to determine the weight of each index; at the same time , it is compared with the weight obtained by the entropy weight method to eliminate the influence of abnormal data.

Build Weighted Normalization Matrix

(5) Determine the optimal solution and the worst solution

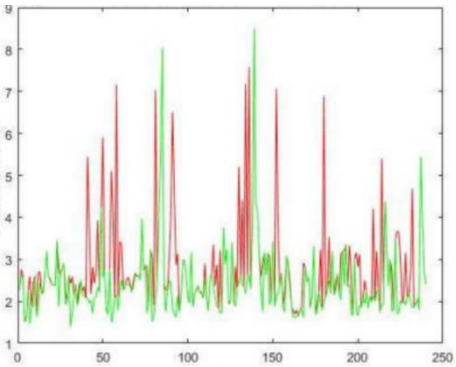
(6) Calculate the distance ideal solution

(7) Comprehensive evaluation

Each evaluation object is ranked according to the size of relative proximity . The greater the relative proximity of the evaluation object, the better, and vice versa .

2.4. Result verification

Analyzing the order quantity and supply quantity of the most important 50 suppliers, it is found that the data contains periodicity: that is, a The order demand is high for a period of time, and the order demand is low for a period of time. This is because the production surplus is stored during the period of time when the order demand is high. We first make a comparative analysis of the order quantity and the total supply quantity of 50 companies, as shown in Figure 1 shown.



Picture 1 Changes in the order quantity and supply quantity of the top 50 suppliers

Figure 1 , the red line represents the order quantity, and the green line represents the supply quantity. It can be found from the figure that in more than 90% of the cases, the supply capacity of these 50 merchants can match the order demand. Therefore, after verification from the results of the algorithm model, it can be found that these 50 suppliers are the most important.

3. Model summary and evaluation

purpose of this article is to select the most important 50 suppliers from the 402 suppliers ; that is, it is necessary to select an appropriate evaluation index system to evaluate and guarantee the production of the enterprise, and determine the top 50 from the 402 suppliers. the most important suppliers and the circumstances affecting the production of the company. In order to be able to select targeted, global, Under the condition of ensuring the production of enterprises, the evaluation of computability and extensiveness of indicators, this paper evaluates the data in Excel . Carry out a quantitative analysis to obtain 6 quantitative indicators, including the percentage of orders for each supplier, the percentage of supply , the average weekly supply , the difference between the supply and the order, and the number of weeks in which the supply > the order. and week Variance of supply. According to the 6 indicators, use the entropy weight method to analyze the 402 × 6 matrix, and use Matlab to calculate the weight of the 6 indicators ; then establish the Topsis comprehensive evaluation model, introduce the constraints of production demand, the importance of 402 suppliers A ranking was conducted to select the 50 most important suppliers .

In this paper, by consulting a large number of literatures before data analysis, we understand how the six evaluation indicators affect the It affects the supplier's supply capacity, so it has better accuracy when using the entropy weight method and the Topsis method to evaluate the model . When doing data analysis, different mathematical methods are used for analysis, and the results obtained by the analysis are summarized. It provides higher accuracy for subsequent prediction models and ensures the authenticity of the predicted data . The analysis angle is comprehensive, and the mathematical modeling method is used to analyze related problems, which has reference significance for the problems related to supplier ordering.

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