

Fuzzy Synthetic Evaluation on Allocation Efficiency of Enterprise Information Resource

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Abstract—The allocation efficiency of enterprise information resource positively correlates with the core competitiveness of an enterprise in the information age. Relying on introducing the Fuzzy Synthetic Evaluation method, the paper establishes an indicator system to explore how to evaluate the allocation efficiency of enterprise information resource. In order to demonstrate the validity of the method, an empirical study was carried out by inviting 20 participants from an enterprise to take a field survey, and it guarantees initial data concerning evaluation indicator is scientific and objective. Some valuable findings of the paper can help managers of the enterprise to identify the weakness and the strength concerning the allocation of enterprise information resource.

Keywords- enterprise information resource; allocation efficiency; fuzzy synthetic evaluation; field survey.

1. Introduction

As one of fundamental resources dominating the core competitiveness of enterprises, information resource has attracted managers' attention in the field of optimizing enterprise business process, leveraging technology innovation and promoting management performance, and so on (Ruiqing Shao 2010)[1]. The collection, processing and utilization of information resource have played an important role in the process of enterprise informatization, which have influenced the success of an enterprise. However, the scarcity of information resource isn't an absolutely positive correlation with the increasing IT investment in the enterprises. At some extent, the allocation of enterprise information resource relates to the utility of information resource that is directly experienced by information users. The paper focuses on the allocation efficiency of enterprise information resource from a vision of information user, which applies the Fuzzy Synthetic Evaluation (FSE) method to appraise the allocation efficiency of enterprise information resource and takes a private enterprise for a case study.

2. Methodology and date

2.1. The Fuzzy Synthetic Evolution Method

As a widely applied research method in decision making and resource allocation evaluation processes, the Fuzzy Synthetic Evaluation (FSE) method is able to deal with uncertain, imprecise and vague variables, which are collected for approximate reasoning and logical analysis throughout the processes of resource allocation evaluation. The FSE method can be divided into a series of steps as follows: Firstly, the evaluation indicator set should be built up, such as $U = \{u_1, u_2, \dots, u_n\}$, where u_i means i th evaluation indicator and n stands for the number of indicators lying in the same indicator layer; Secondly, the assessment vector set should be built up, such as $V = \{v_1, v_2, \dots, v_m\}$, in which v_j means j th assessment vector and m

stands for the number of assessment vectors; Thirdly, to construct the evaluation matrix of the vector, the matrix reflects the fuzzy correlation relationship from the evaluation indicator set U to the assessment vector set V, which presents the assessment vector set V describes all evaluation indicators in the evaluation

indicator set U with a set of numeric variables, such as the evaluation matrix $\tilde{R} = \begin{bmatrix} R_1 \\ R_2 \\ \dots \\ R_n \end{bmatrix} =$

$$\begin{bmatrix} r_{11} & r_{12} & \dots & r_{1m} \\ r_{21} & r_{22} & \dots & r_{2m} \\ \dots & \dots & \dots & \dots \\ r_{n1} & r_{n2} & \dots & r_{nm} \end{bmatrix} = (r_{ij})_{n \times m};$$

Fourthly, according to the evaluation of information users, the weight set $\tilde{W} = \{w_1, w_2, \dots, w_n\}$ can be interpret the evaluation indicator set U into the evaluation weight set, in which w_i means the weight of i th evaluation indicator in the evaluation indicator set U. Meanwhile, the

weight set can be expressed $\tilde{W} = (w_1, w_2, \dots, w_n)$ and $\sum_{i=1}^n w_i = 1$; Fifthly, to construct the

synthetic evaluation model $\tilde{B} = \tilde{W} * \tilde{R}$, the new synthetic evaluation set $\tilde{B} = (w_1, w_2, \dots, w_n) \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1m} \\ r_{21} & r_{22} & \dots & r_{2m} \\ \dots & \dots & \dots & \dots \\ r_{n1} & r_{n2} & \dots & r_{nm} \end{bmatrix} = (b_1, b_2, \dots, b_n)$ can be obtained.

Through normalizing the weights of the synthetic evaluation set \tilde{B} , a new vector can be derived as as

$$\tilde{B}' = (b'_1, b'_2, \dots, b'_n) \text{ and } b'_j = \frac{b_j}{\sum_{j=1}^m b_j};$$

Finally, the total score for every evaluation indicator can be calculated as $S = \sum_{j=1}^m b'_j * v'_j$, in which b'_j means j th evaluation weight and v'_j stands for j th numeric

assessment variable of the assessment vector set V. According to the total score of the FES, we can make a judgment for the allocation efficiency of enterprise information resource.

2.2. Indicator Selection

It's no doubt that the allocation efficiency of enterprise information resource is determined by various factors such as IT investment, information personnel, infrastructure and information itself, and so on. In this paper, a set of general indicators built by Zha Xianjing (Zha Xianjing 2008) [2] is applied to evaluate a private enterprise as an empirical study, which is shown as Table I. According the set of general indicators, we can evaluate the allocation efficiency of information resource from two aspects: input efficiency and output efficiency, and two multilevel fuzzy relation matrixes can be constructed which consists related input indicators or output indicators.

TABLE I. THE GENERAL INDICATORS OF ALLOCATION EFFICIENCY EVALUATION OF INFORMATION RESOURCE

<i>Indicator</i>		<i>Explanation</i>
Input Indicator	allocation cost	the cost of information infrastructure and information system
	time of allocation	the time spent on statifying information users' needs
	the numeber of inforamtion personnel	the numeber of inforamtion personnel who participate information resource allocation

Output Indicator	information resource affluent coefficient	the sum of productivity and development potential of information resource
	equilibrium of information resource allocation	the equilibrium coefficient can describe the difference of information resource allocation in different sectors of an enterprise
	satisfaction rate of information resource	the rate of the amount of information needed by users to the total amount of information of an enterprise
	utilization rate of information resource	The rate of the actual amount of information utilized by users to the total amount of information held by them
	economic income	the economic income or loss caused by information resource allocation

2.3. Field Survey and Date

In this study, a total of 20 managers and IT personnel from Anhui Longhua Industry & Trading Co., Ltd, a leading bamboo flooring manufacturer in China, were invited to participate a field survey according to the general indicators during limited periods (Chiun Sin Lin 2010) [3]. Within the participant: 7 were top managers of trading department who were handling in dealing with import & export business on e-commerce platform; 5 were information personnel who maintained information infrastructure and system; 8 were from production department who were experienced in collecting, processing and storing information concerning suppliers and customers in details. Prior to taking the survey, the participants had fully understood the explanation of the general efficiency evaluation indicators of information resource allocation, and they stated that they were familiar with related data concerning the general indicators in the company such as the cost of information infrastructure and information system, etc. Based on the data and the allocation efficiency of information resource that was perceived by participants, they evaluated the set of general indicators with a five-class Likert-type scale where 85= excellent, 70= good, 55= so-so, 40= poor, and 25= bad. Thus, the assessment vector set $V = \{\text{excellent, good, so-so, poor, bad}\}$ could be built up.

3. results and implications

Through the assessment vector of set V to evaluate every indicator of the general indicator, we built up input evaluation matrix \tilde{R}_1 and output evaluation matrix \tilde{R}_2 . Meanwhile, according to the extend of importance perceived by the participants, the weights of every indicator in the general indicators set were obtained with the Analytic Hierarchy Process (AHP) approach (T. L. Saaty 2008) [4], which built up the input weight set \tilde{W}_1 and the output weight set \tilde{W}_2 . And then, we calculated the total score of the synthetic evaluation set. Finally, a judgment for the allocation efficiency of information resource in the enterprise had been made.

Based on the result of the field survey made by the participants, the input evaluation matrix \tilde{R}_1 that consists of 3 general indicators can be constructed:

$$\tilde{R}_1 = \begin{bmatrix} 0.4 & 0.3 & 0.1 & 0.1 & 0.1 \\ 0.2 & 0.1 & 0.3 & 0.2 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \end{bmatrix}. \text{ With the pairwise comparison of the importance of 3 general}$$

indicators, the input weight set \tilde{W}_1 can be built by applying AHP approach: $\tilde{W}_1 = (0.5 \ 0.3 \ 0.2)$. The synthetic evaluation model is $\tilde{B} = \tilde{W} * \tilde{R}$, so the new synthetic evaluation set

$$\tilde{B}'_1 = (0.5 \ 0.3 \ 0.2) \begin{bmatrix} 0.4 & 0.3 & 0.1 & 0.1 & 0.1 \\ 0.2 & 0.1 & 0.3 & 0.2 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \end{bmatrix} = (0.4 \ 0.3 \ 0.3 \ 0.2 \ 0.2) \text{ by complex operating}$$

on the law of max-min. Through normalizing the weights of the synthetic evaluation set \tilde{B}'_1 , a new vector \tilde{B}'_1 can be derived as:

$\tilde{B}'_1 = (0.286 \quad 0.214 \quad 0.214 \quad 0.143 \quad 0.143)$. So the total score of input indicators is $S1 = 85 \times 0.286 + 70 \times 0.214 + 55 \times 0.214 + 40 \times 0.143 + 25 \times 0.143 = 60.355$, and the allocation efficiency of enterprise information resource can be regarded as the medium level from the aspect of input indicators (Rehan Sadiq 2004) [5]. Similarly, the output evaluation matrix \tilde{R}_2 that consists of 5 general indicators can be constructed:

$\tilde{R}_2 = \begin{bmatrix} 0.2 & 0.3 & 0.2 & 0.1 & 0.2 \\ 0.2 & 0.2 & 0.3 & 0.2 & 0.1 \\ 0.1 & 0.2 & 0.4 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.2 & 0.2 & 0.2 \\ 0.3 & 0.2 & 0.1 & 0.2 & 0.2 \end{bmatrix}$, and the input weight set \tilde{W}_2 can be built by applying AHP approach:

$\tilde{W}_2 = (0.2 \quad 0.1 \quad 0.1 \quad 0.3 \quad 0.3)$. Therefore, the total score of input indicators is $S2 = 85 \times 0.250 + 70 \times 0.250 + 55 \times 0.167 + 40 \times 0.167 + 25 \times 0.166 = 52.085$, so the allocation efficiency of enterprise information resource isn't satisfying from the aspect of output indicators.

4. Conclusion

According to the result of efficiency evaluation, the allocation efficiency of enterprise information resource can be reflected directly and objectively with the FSE method. Take Anhui Longhua Industry & Trading Co., Ltd for an example, the allocation efficiency of enterprise information resource needs to be improved. Comparing input indicators with output indicators, managers in the enterprise paid more attention to invest IT infrastructure, but the income is still far away from increasing investment. On the other hand, in this study, we found that the participants intended to emphasize traditional economic indicators such as allocation cost of enterprise information resource. It can be considered as an obstacle to promote the allocation efficiency of enterprise information resource due to the lack of innovation consciousness for the decision-maker in the enterprise.

5. Conclusion

The Fuzzy Synthetic Evaluation method provides an objective and effective way to evaluate the allocation efficiency of enterprise information resource. Through an empirical study, the paper demonstrates the process of the allocation efficiency of enterprise information resource with the application of the FSE method. Based on the scientific general indicator set, the paper explores a convenient evaluation method to identify the weakness and the strength concerning the allocation of enterprise information resource, which can help managers of the enterprise to establish core competitiveness rely on rational investment in the field of information resource.

6. Acknowledgment

This paper is supported by supported by National Natural Science Foundation of China under grant No. 71073118.

7. References

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