Enterprise Culture Evaluation Based on Fuzzy Comprehensive Evaluation

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Abstract

In view of the indexes of enterprise culture evaluation system are difficult to quantify, this article will apply fuzzy comprehensive evaluation method to the enterprise culture evaluation, establish a multi-level and multi-indexes evaluation system of the enterprise culture. The results show that this method can effectively help enterprises to evaluate their enterprise culture.

Key words: Enterprise culture; Fuzzy comprehensive evaluation; Evaluation matrix

INTRODUCTION

Modern enterprise competition looks like the competition of products and services, but in fact it is the competition of managing capability and enterprise culture. Enterprises must seek a more scientific, systematic and integrated management system to survive and develop. Enterprise culture provides enterprise with the necessary organizational structure and management mechanism. Contemporary enterprise must develop its own unique enterprise culture to maintain steady and persistent development (Edgar, 1984). But the construction of the enterprise culture is a large and complex systematic project. For objective, accurate and integrated evaluation of the overall capability of enterprise culture, it is necessary to establish a comprehensive, multi-level Evaluation system reflects the actuality of enterprise culture, thus indicates the direction of the enterprise culture construction.

Efficiency evaluation of enterprise culture construction is a system influenced by many factors. It's feasible to use the multi-layer fuzzy comprehensive evaluation method to evaluate the enterprise culture construction efficiency scientific and comprehensive. In this article, fuzzy comprehensive evaluation method will be apply to evaluate the enterprise culture to consider and weigh the impact of different factors on enterprise culture, and to make the evaluation system more general, effective and practical.

1. THE BASIC PRINCIPLE OF FUZZY COMPREHENSIVE EVALUATION

Fuzzy comprehensive evaluation method is based on fuzzy math theory, use the fuzzy relations synthetic theory, to quantify some factors which are obscure and hard to quantitative, conducted a comprehensive evaluation (He, 1986). It has features like transparent result and strong systematic, can solve problems which are vague and hard to quantify, suitable for solving the non-deterministic problems.

1.1 Fuzzy Operations

Definition: If A, B are the obscure subsets of U, do Inner and outer product between A and B: $\underset{\sim}{A} \circ \underset{\sim}{B} = u \in \vee (\underset{\sim}{A}(u) \wedge \underset{\sim}{B}(u))$ was called the inner product of A and B.

1.2 The Process of Fuzzy Comprehensive Evaluation

When evaluate and analysis a fuzzy problem, generally follow the steps below.

Step1: Define the factors' domain of discourse of the

evaluation objects. If U is a domain of evaluation indexes, $U=\{u_1, u_2, u_3, \cdots, u_n\}$. The factors' weight allocations is a fuzzy subset of U, is recorded as: $A = \{a_1, a_2, a_3, \cdots, a_n\} \in P(U)$, a_i is the weight of i-th element and meet $\sum_{i=1}^{n} a_i = 1, i = 1, \cdots, n$ in U.

Step2: Define the domain of discourse of evaluation grade. If V is a remark grade set, $V=\{V_1, V_2, V_3, \cdots, V_m\}$, then V is a set composes of m remark grades. For all the m evaluations, they are not absolutely positive or negative. Therefore, comprehensive evaluation subset B should be a fuzzy subset in V, is recorded as: $B = \{b_1, b_2, b_3, \cdots, b_m\} \in P(V)$. Then b_j indicates the j-th evaluation's status in the comprehensive evaluation.

Step3: Do single factor evaluation, constitute fuzzy relationship matrix R. After the construction of the grade fuzzy subset, then should quantify each objects individually from every factors $u_i (i = 1, 2, \ldots, n)$. That is determine objects' membership ($R_i \mid u_i$) to each grade fuzzy subsets from single factor, and get fuzzy relation matrix R. Specific performance is as follows:

$$R = \begin{bmatrix} R \mid u_1 \\ \vdots \\ R \mid u_n \end{bmatrix}_{n \times m} = \begin{bmatrix} r_1 & \cdots & r_{1n} \\ \vdots & \vdots & \vdots \\ r_{n1} & \cdots & r_m \end{bmatrix}_{n \times m}$$

Among this matrix, $r_{ij} (i = 1,2,\cdots,n; j = 1,2,\cdots,m)$ indicate certain judge determines the membership to grade fuzzy subset v_j from the u_i factor's point of view. That is possibility degree of make the j-th kind of comment to the assessment system from the i-th factor's point of view.

Step4: Work out comprehensive evaluation results, and evaluate the results. According to the formula, $B = A \times R$.

2. FUZZY COMPREHENSIVE EVALUATION MODEL FOR ENTERPRISE CULTURE

2.1 Construction of Enterprises Culture Evaluation Index System

Enterprise culture is a kind of internal culture in the organization which has deal with economic activity. It is the external manifestation of enterprise employee's common concept, value orientation. It mainly includes four levels culture: material, behavior, institution and spirit. To establish a complete enterprise culture should begin with the following four aspects.

2.1.1 Material Culture

The material culture is one kind of implement culture constitutes of product and various material facilities. It is a kind of surface culture express in a physical form. The enterprise's products and services are the enterprise production and management's harvest. And they are the primary content of material culture. Secondly, products and services, production environment, enterprises visage, enterprise architecture, enterprise advertising, packaging

and design also constitute important parts of enterprise material culture.

2.1.2 Behavioral Culture

The behavioral culture refers to the one kind of activity culture which employees produced in production and management activities and learning and entertainment activities. It refers to one kind of culture phenomenon produced in enterprise's management, education and drumbeating, interpersonal relationship activity, recreational sports activity. It includes enterprise behavior norms, enterprise interpersonal norms and enterprise public relations norms.

2.1.3 Institutional Culture

Institutional culture provides the code of conduct which enterprise members should follow in the common production and management activities.

Institutional culture mainly includes three aspects: enterprise leadership system, enterprise organizational structure and enterprise management system.

2.1.4 Spiritual Culture

Spiritual culture refers to one kind of spiritual achievement and cultural ideas which come into being in the process of enterprise production and management activities and under the influence of certain social and cultural background and ideology. Spiritual culture includes the spirit of enterprise, the management philosophy of enterprise, enterprise Ethics, enterprise values and enterprise ethos, etc. And spiritual culture is the summation of the enterprise ideology.

On the basis of analyze the constituent elements of enterprise material culture, behavior culture, institutional culture, spiritual cultural, we can establish enterprise culture evaluation index system as shown in Table 1 (Zeng, 2003; Shao, 2007):

Table 1
Enterprise Culture Evaluation Index System

Enterprise culture evaluation index system	Material culture	Products and services
		Production environment
		Enterprises visage
		Enterprise architecture
		Business advertising
		Packaging and design
	Behavioral culture	Enterprise behavior norms
		Enterprise interpersonal norms
		Enterprise public relations norms
	Institutional culture	Enterprise leadership system
		Enterprise organizational structure
		Enterprise management system
	Spiritual culture	The spirit of enterprise
		The management philosophy of enterprise
		Enterprise ethics
		Enterprise values
		Enterprise ethos

2.2 Example Analysis

Construct above enterprise culture evaluation system on one enterprise, and use the fuzzy comprehensive evaluation method to evaluate should follow these steps:

Step 1: Determine the comprehensive evaluation indexes. The first level evaluation indexes: $U = \{U1, U2, U3, U4\}$ = {material culture level, behavior culture level, Institutional culture level, spiritual cultural level}.

The second level evaluation indexes: $U1 = \{U11, U12, U13, U14, U15, U16\}$ = {products and services, production environment, Enterprises visage, Enterprise architecture, Enterprise advertising, packaging and design}; $U2 = \{U21, U22, U23\}$ = {Enterprise behavior norms, Enterprise interpersonal norms, Enterprise public relations norms}; $U3 = \{U31, U32, U33\}$ = {Enterprise leadership system, Enterprise organizational structure, Enterprise management system}; $U4 = \{U41, U42, U43, U44, U45\}$ = {The spirit of enterprise, The management philosophy of enterprise, Enterprise Ethics, Enterprise values, Enterprise ethos }.

Step 2: Determine the evaluation set: Cause the evaluation of each factors of enterprise culture construction are vague, so the judges alone give the evaluation value, and set up evaluation set V for evaluation to all factors into five grades: $V = \{V1, V2, V3, V4, V5\}$ = {excellent, good, medium, low, poor}.

Step 3: Do single factor evaluation to the second level factors. Specialists do Evaluation scores on every evaluation factors, and then get the following matrix. Among the matrix, the membership is such a ratio of the number of specialists who in favor of this evaluation and the total number of specialists.

Evaluation matrix of material cultural level:

$$R1 = \begin{pmatrix} 0.2 & 0.3 & 0.4 & 0.1 & 0.0 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.3 & 0.4 & 0.3 & 0.0 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

Evaluation matrix of behavior cultural level:

$$R2 = \begin{pmatrix} 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.3 & 0.4 & 0.3 & 0.0 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

Evaluation matrix of institutional culture level:

$$R3 = \begin{pmatrix} 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

Evaluation matrix of spiritual culture level:

$$R4 = \begin{pmatrix} 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.3 & 0.4 & 0.3 & 0.0 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

Step4: Determine the weight distribution of evaluation factors in every level. After getting the results of the

specialists' discussions, use Analytic Hierarchy Process to calculate, and then get the weight set. That weight number meets the condition of normalization. The weight of every factor can be expressed as a fuzzy set of the factor set:

$A = \{A1, A2, A3, A4\} = \{0.4, 0.3, 0.2, 0.1\}$;

$A1 = \{a11, a12, a13, a14, a15, a16\} = \{0.4, 0.2, 0.1, 0.1, 0.1, 0.1\}$;

$A2 = \{a21, a22, a23\} = \{0.4, 0.3, 0.3\}$;

$A3 = \{a31, a32, a33\} = \{0.4, 0.3, 0.3\}$;

$A4 = \{a41, a42, a43, a44, a45\} = \{0.3, 0.2, 0.1, 0.3, 0.1\}$.

Step5: Comprehensive Judge and Evaluation.

According to the above evaluation factors, evaluation set and weight distribution to do comprehensive evaluation.

First evaluate factors of the second level, get evaluation matrix as $A_n \circ R_n$:

Comprehensive evaluation value of the material factors:

$$B_1 = A_1.R_1 = (0.4, 0.2, 0.1, 0.1, 0.1, 0.1). \begin{pmatrix} 0.2 & 0.3 & 0.4 & 0.1 & 0.0 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.3 & 0.4 & 0.3 & 0.0 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

$= (0.11, 0.25, 0.42, 0.15, 0.07)$

Comprehensive evaluation value of the behavioral factors:

$$B_2 = A_2.R_2 = (0.4, 0.3, 0.3). \begin{pmatrix} 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.3 & 0.4 & 0.3 & 0.0 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

$= (0.04, 0.23, 0.43, 0.20, 0.10)$

Comprehensive evaluation value of the institutional factors:

$$B_3 = A_3.R_3 = (0.4, 0.3, 0.3). \begin{pmatrix} 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

$= (0.03, 0.20, 0.47, 0.13, 0.17)$

Comprehensive evaluation value of the spiritual factors:

$$B_4 = A_4.R_4 = (0.3, 0.2, 0.1, 0.3, 0.1). \begin{pmatrix} 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.3 & 0.4 & 0.3 & 0.0 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \\ 0.1 & 0.2 & 0.4 & 0.2 & 0.1 \\ 0.0 & 0.2 & 0.5 & 0.1 & 0.2 \end{pmatrix}$$

$= (0.06, 0.22, 0.42, 0.20, 0.10)$

The summation of the components of $B1$、$B2$、$B3$、$B4$'s vector is 1, accord with the fuzzy comprehensive evaluation method rules. So we can get the second level factors comprehensive evaluation matrix R:

$$R = \begin{pmatrix} 0.11 & 0.25 & 0.42 & 0.15 & 0.07 \\ 0.04 & 0.23 & 0.43 & 0.20 & 0.10 \\ 0.03 & 0.20 & 0.47 & 0.13 & 0.17 \\ 0.06 & 0.22 & 0.42 & 0.20 & 0.10 \end{pmatrix}$$

Then seek comprehensive evaluation results:

$$B = A \circ R = (0.4, 0.3, 0.2, 0.1) \begin{pmatrix} 0.11 & 0.25 & 0.42 & 0.15 & 0.07 \\ 0.04 & 0.23 & 0.43 & 0.20 & 0.10 \\ 0.03 & 0.20 & 0.47 & 0.13 & 0.17 \\ 0.06 & 0.22 & 0.42 & 0.20 & 0.10 \end{pmatrix}$$

$$= (0.068, 0.231, 0.433, 0.166, 0.102)$$

The results show that: According to the principle of maximum membership degree, this comprehensive evaluation results show that about 43.3% specialists regard enterprise culture construction level in that enterprise as medium. And its enterprise culture evaluation level is medium.

CONCLUSION

This article selects the fuzzy comprehensive evaluation method to establish a multi-level and multi- indexes enterprise culture evaluation system. This system has added quantitative factors on the basis of qualitative, and then gets a better effect, provides an objective basis for the efficiency evaluation of enterprise culture. This method has the maneuverability, is very effective.

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