



Human Resource Management Effectiveness Evaluation Based on AHP-Entropy Weight Method

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Abstract. To improve the accuracy of the overall performance evaluation of the human resource management department, this study proposes a human resource management effectiveness evaluation method based on AHP-entropy weight method. This paper first analyzes the human resource management mode, and selects the influencing factors as the evaluation index from three aspects of talent construction, talent stability and third-party satisfaction, and then applies the AHP-entropy method to complete the selection of the weight of the evaluation index. It constructs a perfect evaluation system of human resource management effectiveness. It is applied to the actual evaluation of human resource management effectiveness in order to prove the practicability of the proposed evaluation method. The experimental results indicate that the proposed method can effectively and scientifically evaluate the effectiveness of human resource management in enterprises. Besides, the evaluation results are consistent with the actual results, which has certain accuracy and good application value.

Keywords: AHP · Entropy weight method · Human resources · Enterprise talent management · Effectiveness evaluation

1 Introduction

Under the guidance of economics and humanism, human resource management is the effective use of relevant human resources inside and outside the organization through recruitment, selection, training, remuneration and other forms of management to meet the current and future development needs of the organization and ensure the realization of organizational objectives and the maximization of member development. Its main contents include job analysis; manpower planning and recruitment; training and development; compensation and benefits management, performance evaluation; labor relations management. From the above definition, it is not difficult to find that, as a kind of “concrete” management, human resource management must be based on interpersonal communication. To achieve effective human resource management, efforts should be made in work motivation, evaluation, and screening [1]. At the same time, the work of performance appraisal, job title promotion, appointment, and removal should not be neglected.

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The concept of human resource management is mainly to build a scientific and effective management mechanism, so as to maximize the acquisition of talents, cultivate talents, and give full play to the potential of talents. At present, the level of human resource management in many enterprises is relatively low, human resource management lacks modern scientific concepts, and has not been able to build professional management institutions, so in the process of development of human resource management, its work content can only stay in the file management, employee salaries and employee attendance, and can not really play the role of human resources personnel training.

The research on the evaluation of the quality of enterprise human resource management in China and abroad can be roughly divided into two categories: one is the horizontal evaluation, that is, the quality of human resource management, which is included in the human resource index of the comprehensive index system of enterprises, and this kind of index mainly reflects the support degree of enterprise human resource to the survival and development of enterprises; The other is the vertical evaluation, that is, the evaluation of the quality of human resource management in enterprises.

The existing research on the evaluation index system of enterprise human resource management quality mainly includes the following aspects. The representative achievements abroad are the index system of human resource management work of the American Human Resource Management Association (1994) and the “key indicators of human resources” of the United States. In China, there is the “human resource index” index proposed by Professor Zhao Shuming (1999), the quantitative measurement and evaluation index of enterprise human resource management proposed by Zhang Guochu (2000), and the evaluation index system of enterprise human resource management proposed by Zhao Haixia (2004). These indicators mainly focus on the efficiency of enterprise human resource management (effectiveness or the comprehensive evaluation of the two) [2]. Generally speaking, the current evaluation index system of human resource management quality fails to study human resource management as a system. The design of the index system fails to integrate system, coordination, and efficiency. It can not systematically and comprehensively evaluate the quality of human resource management in enterprises.

Since the 21st century, China’s economy has been developing rapidly, and the major enterprises emerging from it have become the main force of national economic development. The so-called talent is the first productive force for the development of enterprises, so both large institutions and small private enterprises attach great importance to the introduction and training of talents. As the main department to communicate with the enterprise talents, the human resources department should do a good job in the construction of the corresponding talent team to ensure that it has a more stable working environment [3]. The quality of human resources management will directly affect the development of the enterprise, so this paper carries out the research on the effectiveness evaluation of human resources management based on personnel training. Based on the original human resource management evaluation system, this paper carries out human resource management effectiveness evaluation research based on the AHP-entropy weight method.

2 Human Resource Management Effectiveness Evaluation

2.1 Human Resource Management Effectiveness Evaluation System

The so-called human resource management is the upgrade of traditional personnel management, that is, under the guidance of economics and people-oriented thinking, through recruitment, selection, training, remuneration and other forms of management to effectively use the relevant human resources inside and outside the enterprise, it can reasonably predict the demand for human resources in the enterprise [4]. It can also regularly make human demand plans according to its plan to carry out the corresponding recruitment work. After the introduction of talents, it is also necessary to undertake the corresponding management work, that is, to train new recruits, assess their performance, pay them and adopt a certain mechanism to effectively motivate them, so that talents can actively cooperate with enterprises to complete the corresponding work. Select the corresponding indicators based on the functions of human resources, and complete the establishment of its management effectiveness evaluation system [5].

This study follows the principles of systematicness, scientificity, consistency, feasibility, and comparability to complete the selection of its evaluation indicators and the establishment of its evaluation system, as shown in Table 1.

Table 1. Evaluation index system of enterprise human resource management effectiveness

Target layer	Criterion layer	Indicator layer
Talent construction	Human Resources Planning	Human resource demand forecast and human resource supply forecast
	Job analysis	Job analysis, job evaluation
	Recruitment situation	Employment cost and utilization rate
	Training and development	Training investment and training income
Talent stability	Compensation design	Work homogeneity, internal homogeneity and external adaptability
	Performance appraisal	Rationality, implementation degree and assessment effect of the assessment system
	Industrial relations	Employee participation in management and interpersonal communication
Third-party satisfaction	Employee satisfaction	Compensation system, employee relations, communication
	Enterprise satisfaction	Retention rate, labor productivity

2.2 Index Weight and Entropy Weight Operation

With the above system of human resource effectiveness evaluation index as the core, each index is given weight by using the combination of AHP and entropy weight method, and then the enterprise human resource management effectiveness evaluation is completed.

1) AHP method to calculate weight.

The analytic hierarchy process is used to complete the calculation of the index weight, and the index is allocated according to the importance degree according to the 1-9 scale method, so as to construct the judgment matrix as shown below. See formula (1).

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \tag{1}$$

Normalize it to obtain formula (2):

$$M_{ij} = \frac{R_{ij}}{\sum_{i=1}^n R_{ij}}, i = 1, 2, \dots, n; j = 1, 2, \dots, m. \tag{2}$$

Summing over M_{ij} , we get formula (3):

$$M_i = \sum_{j=1}^m M_{ij} \tag{3}$$

M_i is then normalized to obtain formula (4):

$$w_i = \frac{M_i}{\sum_{i=1}^n M_i}, i = 1, 2, \dots, n. \tag{4}$$

Thereby obtaining an eigenvector formula (5):

$$W = [w_1, w_2, \dots, w_n]^T \tag{5}$$

where, $w_1 \sim w_n$ are the weights of each evaluation index.

2) Entropy weight method.

Let the initial matrix be represented by $R' = (r'_{ij})_{m \times n}$, where $i = 1, 2, \dots, m$, and $j = 1, 2, \dots, n$, and then, standardize the matrix to obtain the standard matrix $R = (r_{ij})_{m \times n}$ and standardize it formula (6):

$$r_{ij} = \frac{r'_{ij} - \min r'_{ij}}{\max r'_{ij} - \min r'_{ij}} * \lambda + 1 \tag{6}$$

where λ is the normalization factor and $\lambda > 0$. Let the information weight matrix be denoted by H , and its expression is formula (7):

$$H = [H_1 H_2 \dots H_m 1]^T \tag{7}$$

where, $i = 1, 2, \dots, m$.

If the information entropy of the i th evaluation index in the evaluation system is represented by H_i , then its expression is formula (8):

$$H_i = -k \sum_{j=1}^n f_{ij} \ln f_{ij} \tag{8}$$

where, f_{ij} can be expressed as formula (9)

$$f_{ij} = \frac{r_{ij}}{\sum_{j=1}^n r_{ij}} \tag{9}$$

where, $k = 1/\ln m$. When $f_{ij} = 0$, $f_{ij} \ln f_{ij} = 0$, let $k > 0$ be the Boltzmann constant.

Let the entropy weight of the i th index be represented by κ_i , and the expression of κ_i is formula (10):

$$\kappa_i = \frac{1 - H_i}{m - \sum_{i=1}^m H_i} \quad i = 1, 2, \dots, m \tag{10}$$

3) Comprehensive weight.

Considering the advantages of the above two methods, a more appropriate evaluation system is established, and its comprehensive weights are as follows formula (11):

$$\varpi_i = \frac{w_i + \kappa_i}{\sum_{j=1}^m w_j \kappa_j} \tag{11}$$

To sum up, the establishment of human resource management effectiveness evaluation system is established.

3 Experimental Analysis

The evaluation index system constructed in this paper is applied to the human resource management team of an enterprise to evaluate its human resource management effect [6]. In this paper, a medium-sized enterprise in a city is selected as the research object, and the human resource management departments of its three subsidiary enterprises are studied [7]. According to their actual management situation, the evaluation index system established in this paper is used as the standard to evaluate the management effectiveness of each human resource management department.

3.1 Result of Entropy Weight Operation

According to the above entropy weight calculation formula, complete the indicator weight, weight ranking and information entropy acquisition of relevant assessment, and evaluation indicators, as shown in Table 2 [8].

According to the data in Table 2, the top three evaluation index factors can be obtained, which are B9, B12 and B17 in turn, so the ranking values under the top three evaluation index factors can be obtained. The calculation formula is formula (12):

$$P_{ij} = 100 - rank(j) * n \tag{12}$$

In the formula (12), the score ranking of the *j*th human resource management department under the *i*th evaluation index is represented by *rank(j)*, where *i* = B14, B13, B7; *j* = 1, 2, ..., 10. *n* represents a natural number, and $n < \frac{100}{rank(j)}$. *n* = 5 was set in this application example.

Table 2. Entropy weight calculation results of each index

Evaluation index	Indicator weight	Weight ranking
B1	0.0436	12
B2	0.0445	14
B3	0.0428	10
B4	0.0421	9
B5	0.0420	8
B6	0.0419	7
B7	0.0407	3
B8	0.0405	2
B9	0.0475	19
B10	0.0403	1
B11	0.0408	4
B12	0.0483	20
B13	0.0417	6
B14	0.0412	5
B15	0.0445	14
B16	0.0436	12
B17	0.0485	21
B18	0.0471	18
B19	0.0422	9
B20	0.0432	10
B21	0.0433	11

Table 3. Overall performance evaluation results of 10 managers

Human Resource Management Department	Overall evaluation score	The overall sort value
Department 1	86.62	1
Department 2	83.15	2
Department 3	80.41	3

3.2 Assessment and Evaluation Results

According to the calculation method of formula (12), the scores and ranking values of the three human resource management departments under 21 evaluation indicators are obtained [9]. The overall performance evaluation results of the three human resource management departments can be obtained after averaging, as shown in Table 3 [10].

As shown in Table 3, in this appraisal process, the overall performance appraisal effect of department 1 is plus, and its comprehensive evaluation score is 86.62, while the comprehensive scores of departments 2 and department 3 are lower than that of the department. Comparing its score with the actual management situation of these three departments, it is consistent with the actual situation [11]. Based on this, it can be proved that the method in this paper can effectively evaluate its management effect.

4 Conclusion

As the source for enterprises to form the core competitiveness or maintain the original competitive advantage, the effectiveness of human resource management determines the existing viability and future development potential of enterprises. Enterprise human resource management evaluation is to help enterprises how to improve the effectiveness of human resource management, so as to achieve the strategic objectives of enterprises. This paper analyzes the functions of the department, establishes a scientific evaluation system of human resource management effectiveness, and finally proves its application value by using examples. The results indicate that the proposed method can effectively and scientifically evaluate the management effect, and has certain research value. It is hoped that the research of this paper can effectively promote the efficiency and quality of human resource management in Chinese enterprises.

References

1. Zheng Xiaoying, Yu Dianjiang. Human resource management performance evaluation model based on improved multi-attribute group decision making [J]. *Microcomputer Application*, 2022,38(07):38–42.
2. Wang Xiaoling and Xie Kang, Research on the Evaluation Index System of Enterprise Human Resource Management Quality, *Modern Management Science*, No.6, 2005, 20–22.
3. Jia Yun. Research on the application of competency model in enterprise human resource management [J]. *Inner Mongolia Coal Economy*, 2021, (08): 91–92.

4. Ye Zhiqing. Application of competency model in human resource management of state-owned enterprises [J]. *Fortune Today*, 2021, (03): 196–197.
5. Zhang Xuejiao. Application of competency model in human resource management of coal enterprises [J]. *Fortune Today*, 2021, (02): 202–203.
6. Qin Yuan. Research on Human Resource Performance Management of Construction Enterprises - Comment on Human Resource Management of Construction Enterprises [J]. *Industrial Architecture*, 2020,50(12):202.
7. Liu Tao, Liu Min, Hao Lihong, et al. Exploration of Human Resource Evaluation Model Based on ERP [J]. *Energy Science and Technology*, 2020, 18(09): 90–93.
8. Song Yuanlu. The application of competency model in enterprise human resource management [J]. *Writer's World*, 2020, (14):191–192.
9. Wu Jianguo, Liu Mingli. Risk Warning Model and Case Application of Human Resource Management in Chinese Multinational Enterprises [J]. *Modern Business*, 2020, (04): 102–103.
10. Xiao Jinghua, Wan Xiaowei, Xie Kang. Quality Evaluation Model and Empirical Analysis of Enterprise Human Resource Management [J]. *Management Review*, 2011, 23(08):143–151.
11. Wang Jianwei. Research on Dynamic Capability Evaluation of Human Resource Management in Foundry Enterprises [J]. *Special Casting and Nonferrous Alloys*, 2021, 41(10):1336–1337.

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