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Research Article

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Performance evaluation of pharmaceutical enterprise human resources management based on fuzzy comprehensive evaluation

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ABSTRACT

Performance evaluation of human resources management is important for promoting the development of pharmaceutical enterprise, and the application of fuzzy comprehensive evaluation on it is studied in depth. Firstly, the existing problems in performance evaluation of pharmaceutical enterprise are analyzed. Secondly, the construction principles of performance evaluation for human resources management are discussed. Thirdly, the basic theory of fuzzy comprehensive evaluation is studied. Finally, a case study is analyzed, results show that the fuzzy comprehensive evaluation is an effective method for evaluating the human resources management level of pharmaceutical enterprise.

Key words: Pharmaceutical Enterprise; fuzzy comprehensive evaluation; Human Resources Management

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INTRODUCTION

In recent years, the output of seven kinds of pharmaceutical industry in China has been maintaining fast growth. A complete pharmaceutical manufacturing system has been formed, which concludes chemical medicines and its preparation, chemical intermediate, Chinese patent drug, biochemical drug, diagnostic medicine, Chinese medicine and pieces, the pharmaceutical industry in China has the advantage in number and size. With the rapid development of economy, the pharmaceutical enterprises face the fierce competition, therefore it is necessary to carry out operation of pharmaceutical enterprise effectively, and develop the advantages of the pharmaceutical enterprises. The human resources are main parts of pharmaceutical enterprise, which collect intellectual capital, and it is the sources of improving competitiveness. The managing level of human resources of pharmaceutical enterprise is an important factor for promoting the development of it, and the scientific and reasonable performance evaluation mechanism should be confirmed [1].

The performance evaluation relates many affecting factors, the affecting degree of all kinds of factors is decided by subjective judgment, and the conclusions inevitably have fuzziness, therefore it is necessary to find out an effective evaluation method. The fuzzy comprehensive evaluation can deal with the problems mentioned above. It is a kind of mathematical method, which can make comprehensive evaluation for the objects with the fuzziness and many affecting factors. The fuzzy comprehensive evaluation is applied in evaluating the performance level of human resources of pharmaceutical enterprise in this research [2].

Existing problems in performance evaluation of pharmaceutical enterprise

In modern society, the development of pharmaceutical enterprise is decided by construction of talent team, the brain drain of high-quality talents and the deficiency of professionals has negative effect on the development of pharmaceutical, therefore the training of talent team is a task of top priority. The effective evaluation system can inspire the employees effectively, and form reasonable salary system, then the excellent talents can be retained, the development of the enterprise can be achieved. The existing problems of performance evaluation are listed as follows:

(1) The recognition of performance is low
The executor of performance evaluation is competent department of employees for most pharmaceutical enterprise, Very few of other main bodies are introduced to evaluate the employees, furthermore, although other reviewers are invited, the weight of them is often low, and they can not affect the results finally. On the other hands, the evaluation results lack fairness, many evaluations has no substantial progress, which have become a mere formality. The higher-ups want to make every department harmonious, they often pursue the equalitarianism. Those who work hard are seldom rewarded, the Go-slow people is not punished [3].

(2) Performance evaluation system is relatively isolated
At present, the performance evaluation system can not be combined with frame of human resources of pharmaceutical enterprise. The performance evaluation system of pharmaceutical enterprise can not link up with salary of employees, chance of promotion and the reward directly, and can not offer the projects of training the job skill of employees. The pharmaceutical enterprises only carry out pure performance evaluation, and ignore the feedback and amendment of performance, therefore the performance evaluation can not work effectively, and the employees can not be inspired effectively.

(3) Performance evaluation indexes are unreasonable
Generally the quantity index has a united calculating standard, can be expressed by the exact number, then the transparency and operability of evaluation can be improved, and it is benefit for the future informatization of performance evaluation system. Presently the number of quantifiable indexes is low for the performance evaluation of the pharmaceutical enterprises [4].

Construction principles of performance evaluation for human resources management
The performance evaluation of human resources management should be benefit for the implementation of strategic planning of pharmaceutical, which should follow the following principles:

(1) Hierarchy principle
The employees' ability of studying, innovation and practice pharmaceutical enterprise is different; therefore the performance evaluation of human resources management has the corresponding matching hierarchy.

(2) Guiding principle
Construction of human resources management performance evaluation index system of pharmaceutical enterprise can ensure the implement of strategic planning, and can offer effective human resources assignment. Therefore the performance evaluation index system should has the guiding effect, and lead to the development and management of human resources.

(3) Objective principle
The index system constructed should has a certain operability, then it can be applied in the actual problem. Therefore the choice of evaluation index system should consider the actual situation of pharmaceutical enterprise [5].

(4) Targeted principle
The performance evaluation of human resources management of pharmaceutical enterprise has varied manifestations; the quantitative indexes can reflect the changing rules of human resources management of pharmaceutical enterprise, which is benefit for the stable development.

Basic theory of fuzzy comprehensive evaluation
(1) Basic theory of fuzzy reasoning
The evaluation with many factors that is difficult to quantify only be described by fuzzy language. The evaluator can set out from many factors make degree fuzzy evaluation based on judgment, such as "excellent, good, normal, poor, and bad". Therefore the evaluation with many factors are difficult, the main reason is that the factors are considered comprehensively at the same time, and the importance of every factors is different, then the problem becomes complex, while the fuzzy mathematics can offer an effective method for comprehensive evaluation [6].

(2) Mathematical model of fuzzy evaluation
The evaluated object is defined as P, and the evaluation indexes of it can be expressed by finite collection, which is shown as follows:

$$U = \{u_1, u_2, \cdots, u_n\} \quad (1)$$

The finite collection of judgment is expressed as follows:

$$V = \{v_1, v_2, \cdots, v_n\} \tag{2}$$

The component in U can be evaluated fuzzily according to the grade index of judgment collection, the judgment matrix can be obtained as follows [7]:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_2 2 & \cdots & r_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \tag{3}$$

where r_{ij} denotes the membership of u_i to v_j, (U, V, R) forms a fuzzy comprehensive evaluation model.

After the importance of every index is confirmed, let $\sum_{i=1}^{n} a_i = 1$, $A = \{a_1, a_2, \cdots, a_n\}$, $a_i \in [0,1]$, then the following expression can be obtained:

$$\overline{B} = A \cdot R = \{\overline{b}_1, \overline{b}_2, \cdots, \overline{b}_m\} \tag{4}$$

After the normalization is carried out, the judging level of evaluated object P can be confirmed.

Simulation experiment setup and analysis

According to the characteristics of human resources management of pharmaceutical enterprise, the performance evaluation index system is shown in table 1.

Table 1 performance evaluation index system of human resources management of pharmaceutical enterprise

Object layer	First grade index	Second grade index
Performance evaluation of human resources management of pharmaceutical enterprise (U)	Appointment of employees (U_1)	Recruitment system can hire the right person (U_{11})
		Selection process and operation (U_{12})
		quits rate of new employee (U_{13})
		Adaptability degree between the employee's ability and business requirement (U_{14})
	Education and training (U_2)	Continuing education and training of employee (U_{21})
		Rate of training charge to mean number of employees (U_{22})
		Rate of training charge to revenue (U_{23})
		Evaluation of education and training achievement (U_{24})
		Total period of training for every employee (U_{25})
	Performance management (U_3)	Productivity and output quality of employee (U_{31})
		Standard-reaching rate of performance index (U_{32})
		Feedback degree of head to the performance of employee (U_{33})
		Satisfaction of employ to performance evaluation system (U_{34})
	Salary management (U_4)	Welfare system (U_{41})
		Salary system (U_{42})
		Management of labor cost (U_{43})
		Retirement and pension scheme of employee (U_{44})
	Strategy and planning of human	Human resources planning (U_{51})

	resources management (U_5)	Incubator program of head (U_{52})
		Degree of human resources department entering the planning of strategy (U_{53})
		Adaptability of human resources department with other function departments (U_{54})

The weight collection is constructed based on analytic hierarchy process. To ensure the scientific rationality of evaluation index system of human resources management, the subjective factors should be eliminated. Several human resources management experts are invited to evaluate the evaluation index. According to the comments suggested by the experts, the judgment matrix P of first grade index is confirmed through multiple comparisons of all first grade index, and the components of P satisfy the scale o 1-3, the following rules are setup [8]:

$P_{ij}=1$, the effect of i th factor is same as that of j th factor (5)

$P_{ij}=2$, the effect of i th factor is slight stronger than that of j th factor (6)

$P_{ij}=3$, the effect of i th factor is very stronger than that of j th factor (7)

The levels that are somewhere in between grades mentioned above can be denoted by 3/2 and 5/2, $P_{ij}=1/P_{ji}$, the maximum eigenvalue and corresponding eigenvector of P can be calculated based on MATLAB softw, are, and the weight vector Q can be obtained through normalization of the eigenvector, the judgment matrix and weight of the first grade indexes are shown in table 2.

Table 2 Judgment matrix and weight of the first grade indexes

U	U_1	U_2	U_3	U_4	U_5	Weight
U_1	1	1/3	1/2	1/3	3	0.10
U_2	3	1	5/2	3/2	2	0.18
U_3	2	5/2	1	2/5	3	0.26
U_4	3	2/3	5/2	1	1/3	0.32
U_5	1/3	1/2	1/3	3	1	0.14

The consistency index can be calculated by the following expression:

$$CI=\frac{\lambda-n}{n-1}=0.0521 \quad (8)$$

The random consistency index $RI=1.12$, then the uniformity ratio can be calculated by the following expression:

$$CR=\frac{CI}{RI}=0.0465<1 \quad (9)$$

According to the calculating result, the consistency index has good consistency, then the weight of index calculated is meaningful.

The judging matrix of second grade index can be obtained based on the same calculating procedure.

Then the evaluation collection can be constructed, the performance evaluation has five grades, which can be expressed as follows:

V={“excellent, good, normal, poor, and bad”} (10)

The corresponding matrix is expressed as follows:

$$V=\{9,7,5,3,1\} \quad (11)$$

The judgment matrix can be obtained finally, the multi grade fuzzy comprehensive evaluation can be carried out.

RESULTS AND DISCUSSION

A pharmaceutical enterprise is used as an example; the corresponding fuzzy comprehensive evaluation is carried out, 30 human resources management experts are invited to evaluate the index of this pharmaceutical enterprise, based on the calculating procedure of fuzzy comprehensive evaluation the weigh of every index can be calculated, the corresponding results are shown in table 3.

Table 1 performance evaluation index system of human resources management of pharmaceutical enterprise

First grade index	Weight	Second grade index	Weight
U_1	0.28	U_{11}	0.32
		U_{12}	0.28
		U_{13}	0.16
		U_{14}	0.24
U_2	0.23	U_{21}	0.15
		U_{22}	0.32
		U_{23}	0.22
		U_{24}	0.15
		U_{25}	0.16
U_3	0.20	U_{31}	0.22
		U_{32}	0.16
		U_{33}	0.35
		U_{34}	0.27
U_4	0.16	U_{41}	0.41
		U_{42}	0.18
		U_{43}	0.22
		U_{44}	0.19
U_5	0.13	U_{51}	0.13
		U_{52}	0.46
		U_{53}	0.28
		U_{54}	0.13

The final score of human resources management performance evaluation for this pharmaceutical enterprise is calculated by the following expression:

$$W = U \cdot V^T = 8.014 \tag{12}$$

According to the final score, the human resources management of this pharmaceutical enterprise is good, this result shows that this pharmaceutical enterprise has strong strength, and has the rising space in salary management and strategy and planning of human resources management.

CONCLUSION

In recent years, the pharmaceutical enterprise has a good developing prospect. The whole pharmaceutical industry should be optimized constantly, the pharmaceutical enterprise should improve the level of human resources

management, then it can have competitive advantages, and develop in further. The fuzzy comprehensive evaluation is an effective method to evaluate the level of human resources management of pharmaceutical enterprise. Based on the results of evaluation, the pharmaceutical enterprise can find out the disadvantages, and take measurement to make up them.

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