

Enterprise Human Resources Management Based on Cluster Analysis

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Abstract: Human resources have become an important strategic resource for the core competitiveness of enterprises. To improve the effectiveness of human resource management of enterprise is a subject that every enterprise leader must study seriously. Cluster analysis can help enterprise leaders to analyse the types of employees, and reform and innovate the traditional models of human resource management under the guidance of "classified management". This paper points out the concrete steps of the cluster analysis to improve human resource management effectiveness, which includes the steps of indexes selection, data collection, clustering analysis and result analysis. A case of human resources management optimization is provided, in which the staff can be divided into the types of core staff, general staff and auxiliary staff. We make differences in recruitment, training, assessment and salary of different types of staff to effectively improve the effectiveness of human resource management.

1. Introduction

The human resource is the source of the continuous competitive advantage of the enterprise. In the practice of human resource management, enterprises need to innovate in the field human resource management to carry out classified management for the employees of different types. On the one hand, it can reduce labour costs and maintain the flexibility of enterprises; on the other hand, it can attract, motivate and protect the core employees of enterprises to enhance the core competitiveness and maintain sustained competitive advantage of enterprises. Under the background of economic globalization and information networking, competition among enterprises is becoming more and more intense. The management and motivation of employees become more and more important, so employees' performance evaluation is gradually being emphasized. Employee performance evaluation is a key link in improving the management of human resources, and is the basis for determining the promotion and reward of the employees. Performance evaluation is the assessment of employees' work performance. According to the work objectives or certain performance standards, we should regularly evaluate the employees' work completion and duty performance by using scientific methods, and feedback the evaluation results to employees.

Data clustering analysis is a method to study the objects that are clustered into different categories according to their respective characteristics. It is an unsupervised learning model, which has no models to refer to or follow. It mainly solves how to achieve cluster aggregation that satisfies this requirement without prior knowledge. The selection of cluster analysis methods depends on the type of data, the purpose and application of clustering. In recent years, many methods of cluster analysis have emerged. Because of various kinds of clustering analysis methods are not completely independent of each other, cross each other, so it is very difficult for the clustering analysis method is divided in the strict sense, the clustering analysis method of the development process is divided into two categories: cluster analysis cluster analysis method of traditional methods and new development. These methods cover all aspects of artificial intelligence science, and have achieved satisfactory results in some specific fields. Now, the theory of cluster analysis is developing, and its content is constantly enriched, and the scope of research is also expanding. In the process of studying the human resource management of enterprises, we combine the clustering technology and

management ideas to achieve the goal of separating categories to improve the quality of human resource management.

2. Concept and Methods of Cluster Analysis

2.1 Concept of cluster analysis

Cluster analysis is a new method of multivariate statistics, which is first used in taxonomy. As a classification technology, clustering analysis is rough compared with other multivariate analysis methods, and its theory is not perfect. However, it can solve a lot of practical problems, which has been very successful in application. Therefore, it is called one of the three-major multivariate analysis methods with the regression analysis and the discriminant analysis. Cluster analysis is also called group analysis, point group analysis or cluster analysis. It directly categorized the nature of things and classified them into one class. Clustering analysis method can be divided into two categories according to the classification of objects: one is the classification of samples, that is, Q clustering; the other is the classification of variables, that is R clustering. The method used in this article is a Q type classification for the samples. We divide the samples or variables into many classes according to the corresponding definitions. The process of classification is a process of decreasing classes. At every level of clustering, we must satisfy the principle of "small difference between classes and large difference among classes" until they belong to one class. The index of evaluating clustering effect is generally variance, and the class variance composed of small distance samples is smaller. There are two commonly methods used clustering analysis. One is K-means clustering, also called fast clustering. The other is hierarchical clustering, also known as system clustering. The application of the two methods and the process of clustering are different. The results of clustering have no absolute standard, but the results of the analysis should be in accordance with the reality.

2.2 System clustering method

The system clustering method is the most widely used clustering method at present. The basic idea of the method is that the sample with closer distance is first clustered into classes, and then it becomes a class after a distance. The systematic clustering process of the sample can be divided into the following steps. First, it is assumed that there are n samples in total, and each sample is defined as a class and there is a total of n classes. Second, we choose the way to calculate the distance between samples. According to the formula of the sample distance, we gather the two samples that are closer to one class, and the other samples are clustered into n-1 classes. Third, the method of selecting the distance between the computing classes is further clustered into one class of the nearest two classes and together into the n-2 classes. Fourth, the above steps have been carried out, and all the samples are all together in the end. To visually reflect the above system clustering process, we can draw the whole classification system into a pedigree map, because the final pedigree graph is like a big tree, also known as a dendrogram, which is an important basis for subsequent analysis. System clustering, also known as hierarchical clustering, is a way to divide data objects into several classes. There are many ways to calculate distances, which can meet different requirements.

2.3 K-mean value method

The number of the class number of K-means clustering needs to be specified in advance. It can process large sample data and produce a single clustering solution. The core steps of K-means clustering: First: randomly select K samples as the initial cluster centre from the sample data; second: calculate the distance of the sample to the similarity measurement standard of the cluster centre according to the principle of proximity. Calculate the sample to the minimum distance class centre class in the initial sample all the data into the K type; third: redefine K cluster centres. The

average value of all data in each category is calculated and used as a new clustering centre. Fourth, according to the redefined clustering centre, the second, third step process is continued until the condition of ending clustering is achieved. The characteristic of K-means process is that all data are involved in operation and adjust the distribution of all data in each iteration process, thus entering the next iteration process. The advantage is that the algorithm is fast and simple, and the processing efficiency of large data sets is high, and it is suitable for mining large-scale data. The drawback is also obvious. First, we need to determine the number of clusters K, because the K of clustering data needs to be given in advance to carry out the algorithm, while the real research is often without any prior knowledge, and the selection of K is difficult. It is necessary for us to make use of other ways to determine the K value. In addition, the initial clustering centre of the K-means process is also very important, although it is a random selection of the system, which may affect the final clustering effect.

3. Steps of application of cluster analysis to improve human resource management effectiveness

We use cluster analysis to improve the human resource management effectiveness. First, we should cluster the performance of the employees. We divide all employees into three categories: core employees, general employees and auxiliary employees. We use different human resource management methods for different kinds of employees, which can effectively improve the effectiveness of human resource management. The concrete steps are as follows:

The first step is to select indexes. We integrate the mature assessment methods of human resources in various enterprises, and design the indicators that can reflect the human resources status of the employees, which include work quantity, work quality, work attitude, personal economic value and customer satisfaction degree.

The second step is to collect data. We collect all the indicators of employee human resource performance that needs to be analysed. These indicators need to be scored through test scores. Part of the test has a clear scoring standard, such as the work quality and the economic value of the individual. Some of the indicators are subjective, such as the quality of work, work attitude and customer satisfaction degree.

The third step is to apply the cluster analysis. We adopt the professional software to complete the cluster analysis and generate the dendrogram.

The fourth step is to make an analysis of the results to help us to make decisions. We make a difference in recruitment, training, promotion and so on, which can greatly improve the effectiveness of human resource management.

4. Empirical analysis of effectiveness improvement of human resource management based on cluster analysis

This paper will make statistics on the performance of thirty employees' human resources, and use clustering algorithm to cluster the staff into three types, which are core employees, general employees and auxiliary employees.

4.1 Step 1: indexes selection

The comprehensive human resources performance of the thirty employees will be studied in this paper. The aim is to do the research on the comprehensive performance of the thirty staff. Therefore, we choose the work quantity I_1 , work quality I_2 , work attitude I_3 , personal economic value I_4 , and customer satisfaction degree I_5 . The calculation methods are shown in Table 1.

Table 1. Index selection of human resource management performance

Index	Data source
Work quantity I ₁	Successful products data from department manager
Work quality I ₂	First grade products / total products *100%
Work attitude I ₃	Statistical data from department manager
Personal economic value I ₄	Project value * personal contribution share
Customer satisfaction degree I ₅	Statistical data from customer

4.2 Step 2: data collection

We use a variety of ways to collect data. In the process, we should pay attention to the accuracy of the data during the collection process. We verified the authenticity of some data. If necessary, we invoked the company's original data for verification. The collected data is shown as follows:

Table 2. Data of the selected indexes of 30 employees

Index	I ₁	I ₂	I ₃	I ₄	I ₅
Employee 1	117	0.90	85	2630	80
Employee 2	122	0.84	60	651	71
Employee 3	139	0.66	40	2310	96
Employee 4	93	0.94	89	2950	81
Employee 5	146	0.26	72	1315	89
Employee 6	108	0.73	77	854	97
Employee 7	117	0.75	69	2086	68
Employee 8	135	0.65	98	2871	86
Employee 9	94	0.48	20	884	57
Employee 10	129	0.84	88	2045	66
Employee 11	79	0.72	46	2086	55
Employee 12	111	0.95	73	2522	84
Employee 13	125	0.01	77	2901	96
Employee 14	127	0.88	77	1011	82
Employee 15	110	0.96	78	2325	70
Employee 16	77	0.67	92	2988	92
Employee 17	88	0.22	85	2437	75
Employee 18	78	0.67	73	1672	81
Employee 19	70	0.85	87	1590	59
Employee 20	148	0.91	96	2485	80
Employee 21	81	0.82	28	1488	99
Employee 22	107	0.71	41	2096	64
Employee 23	87	0.90	98	2429	76
Employee 24	118	0.87	91	1906	78
Employee 25	90	0.90	94	2592	99
Employee 26	87	0.74	41	1451	78
Employee 27	106	0.71	86	2835	75
Employee 28	60	0.77	87	1631	60
Employee 29	118	0.96	88	1360	80
Employee 30	99	0.78	93	1245	73

4.3 Step 3: clustering analysis

We use the system clustering method to do the clustering analysis with the help of the software of SPSS 24.0 (Statistical Product and Service Solutions 24.0). We consider the thirty employees as the “cases” and the work quantity I_1 , work quality I_2 , work attitude I_3 , personal economic value I_4 , and customer satisfaction degree I_5 . We get the table of the results of the cluster. From the table, we can see that the samples are divided into three categories. The first category is composed of Employee 1, Employee4, Employee 10, Employee 12, Employee 25; the second category is composed of Employee 2, Employee 6, Employee 8, Employee 11, Employee 17, Employee 22, Employee26 and Employee30; others belong to the category three. The clustering figure is shown in Table 3.

Table 3. Clustering result of thirty employees

Case	Category
Employee 1	A
Employee 2	B
Employee 3	C
Employee 4	A
Employee 5	C
Employee 6	B
Employee 7	C
Employee 8	B
Employee 9	C
Employee 10	A
Employee 11	B
Employee 12	A
Employee 13	C
Employee 14	C
Employee 15	C
Employee 16	C
Employee 17	B
Employee 18	C
Employee 19	C
Employee 20	C
Employee 21	C
Employee 22	B
Employee 23	C
Employee 24	C
Employee 25	A
Employee 26	B
Employee 27	C
Employee 28	C
Employee 29	C
Employee 30	B

4.4 Step 4: conclusion analysis

It can be known from the characteristics of the data index, Employee 1, Employee4, Employee 10, Employee 12, Employee 25 are the core staff; Employee 2, Employee 6, Employee 8, Employee 11, Employee 17, Employee 22, Employee26 and Employee30 are the general staff; other employees are the auxiliary staff.

5. Improvement Strategies of Effectiveness of Human Resource Management based on Cluster Analysis

5.1 Improvement strategies of core staff management

For the core staff, the enterprise can design work, assessment and salary system according to the characteristics of the employees. Enterprises can recruit and equip employees according to the potential development potential of the employees rather than the current knowledge and skills. In addition, enterprises focus on promoting employees inside. When employees' ability to learn and develop unique qualities of enterprises is increased, the recruitment should focus on their abilities, qualifications and learning abilities, rather than the achievements they have achieved. Enterprises often invest a lot in training and development, especially in areas related to the specific skills of enterprises. The focus of attention is on the development and use of corporate know-how, to complete training and development. Many companies tend to invest in training and development, especially in the related field and enterprise specific skills, the focus falls on the development and use of specialized knowledge to complete the training work, the enterprise can make employee occupation career planning in detail, to encourage employees to build more conducive to the enterprise rather than other enterprise. Individual learning. The performance evaluation system needs to focus on the results of training and development mainly from the feedback situation to examine the staff's contribution to the enterprise strategy. Enterprises can pay higher salaries and salaries to core employees, usually higher than the market average wage level to ensure that remuneration has market competitiveness and attract core human capital to serve the enterprises.

5.2 Improvement strategies of general staff management

Managers often define the job responsibilities of general employees according to their job needs. Managers require general employees to carry out the scheduled tasks and exercise appropriate authorization. Employees' participation is likely to be confined within the boundaries of their positions. Since this type of model focuses on the acquisition of human capital rather than investment, human resource management emphasizes the recruitment process and immediate skills. Therefore, unlike the recruitment of core employees, enterprises will emphasize external recruitment, focus on employee achievements relative to the core staff, general staff is unlikely to get more training and development, even if there is short-term, specific and limited to enterprise. Because the skills that employees have are not unique to the business. If the employees leave, it will be hard for the enterprise to return the investment. Instead of developing general skills, an enterprise is better than an individual who has the skills that should have the required skills from the outside. Paying attention to the immediate performance of general employees, enterprises often adopt the result-oriented approach and use the goal management method to ensure the productivity of the employees. Based on the position, the market wage is balanced and the internal fairness is guaranteed. If incentives are to be made, they pay more attention to recent productivity goals. Pay higher remuneration, which is usually leading or matching the average wage level of the market, to ensure that the remuneration is competitive and attract enough qualified professionals to serve the enterprise. Based on performance and performance as the basis for payment, the enterprise can adopt the performance wage system, such as the commission system for the sales staff.

5.3 Improvement strategies of auxiliary staff management

The hire type employment model can be applied to auxiliary employees. Hire type employment includes temporary workers, loose arrangements and other forms of short-term contract work. This employment model will focus on ensuring employees' compliance with the concept and conditions of the contract without requiring too much organizational responsibility. A human resource management system based on employee obedience can be implemented for auxiliary employees. To promote obedience, the enterprise often strengthens the rules and regulations and regulations, formulates the regulations related to the work, and ensures that the standards are in conformity with

the presupposition. In doing so, enterprises will probably restrict employees' freedom and concentrate on Implementing Rules and regulations, support specific regulations of work treaties, and ensure compliance with prior standards. An enterprise is recruited for a special task. Enterprises are often recruited for special tasks. Companies can hire employees temporarily from a company that provides temporary jobs. In view of the high emphasis on obedience, enterprises are likely to pay by hours or temporary contracts, such as piecework wage system for production workers, and hourly service agreement with cleaner.

6. Conclusion

It has good maneuverability to classify employees by cluster analysis and adopt different management methods for different categories. The enterprise human resource management based on cluster analysis can effectively reduce the cost of human resource management and improve the effectiveness of human resource management. The concrete conclusions of this paper are as follows:

(1) The application of cluster analysis to optimize human resource management usually include the process of indexes selection, data collection, clustering analysis and result analysis.

(2) The index of enterprise human resource evaluation should include five indicators, which are work quantity, work quality, work attitude, personal economic value, and customer satisfaction degree.

(3) We can use the method of system clustering to classify the employees of enterprises. For core employees, the strategy of loose management and high salary is adopted. For general employees, moderate authorization and moderate incentive strategies are adopted; for auxiliary employees, the strategy of outsourcing recruitment and piecework payment should be used.

Although we have different management models for different types of employees, the managers should have the strategic idea of human resource management, who should respect the power and dignity of every employee.

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