Research on Travel Agency Human Resource Crisis Early Warning Model based on BP Neural Network and Computer Software

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Abstract. With the rapid development of tourism market, the human resource requirements of travel agencies are higher and higher. Tourism is one of the largest industries in the world, and it is also the most sensitive industry. Sustainable development is an important principle of tourism development. As the crisis events may occur in unlimited forms in many years, the crisis events will have a great impact on the sustainable development of tourism in both time and space. In the competitive environment of economic integration, human resource management of travel agencies is facing many crises, which has caused serious impact on travel agencies. Therefore, we must establish a scientific and reasonable human resource crisis early warning model, which will better achieve early warning and early control. This paper constructs the evaluation index system of human resource crisis management for travel agencies, which is based on three aspects of organization, development and management. At the same time, through BP neural network and computer software, this paper determines the weight of the index, which will be more effective for empirical analysis of the crisis.

Keywords: BP neural network, Computer Software, Travel Agency, Human Resource Crisis, Early Warning Model

1. Introduction

In the era of global economy, the crisis of enterprises is inevitable. Therefore, crisis management is an important means to contain the crisis. The crisis warning system can accurately judge the crisis of travel agency, which can reasonably determine the state of enterprise crisis. Through the crisis warning model, we can grasp the development trend of enterprises in time, which will provide decision makers with scientific analysis methods\textsuperscript{[1]}. Through the establishment of the index system, we can test and reflect the situation of human resource crisis management, which will better early warning and pre control the occurrence of crisis. Through the crisis warning model, we can realize the self-balance and self-development of enterprise management activities, which will provide a reliable
basis for the formulation of enterprise development strategy and adjustment policy\[^2\]. Modern human resources are the carrier of knowledge and wisdom, which has become the driving force of economic growth. At present, people pay more and more attention to the significant role of human resources in economic growth\[^3\].

2. The performance of human resource crisis

2.1. Enterprise leader fault

According to the survey, if the upper leadership has an unnatural resignation, it will have a very adverse impact on the company. The top leaders need to have the ability to operate the whole company from a macro perspective, which requires us to combine our long-term experience of contacts and affairs. Enterprise leaders are familiar with the operation mode of enterprises. Therefore, once leaving, it is difficult for enterprises to find substitutes from their own and external human resource pool in a short time. On the other hand, the company's middle and senior leaders often have many customers who belong to the enterprise itself. Therefore, if the enterprise leaders leave the company, they will take away a number of customers, which will also enter the competitors of the original enterprise. Therefore, the fault of enterprise leaders will inevitably bring huge losses to the original enterprise\[^4\].

2.2. Uneven supply and demand of human resources

The imbalance of supply and demand of human resources is mainly reflected in the following two aspects, namely, the crisis of human resources surplus and the crisis of shortage. Surplus crisis is mainly due to the existence of talents beyond their own needs in the process of enterprise development, which will lead to the crisis of idle personnel. The surplus crisis is mainly manifested in the following aspects. First, after the failure of enterprise strategy, in order to make up for the demand, a large number of human resources were introduced, resulting in a large number of redundant personnel. Second, it occurs when the business scale needs to be cut down due to the poor management of the enterprise. Third, the personnel wealth produced by repeated institutions after M & A. The shortage crisis is caused by the lack of key talents. In the growing market competition, the company's goal is to be able to obtain more value on the road of sustainable development. Therefore, the company will have a higher standard for the overall core competence, which requires the efforts of various talents. Therefore, the shortage of key human resources will lead to the dilemma of enterprise strategy, which will cause and produce crisis\[^5\].

2.3. Group job burnout

When employees feel hopeless about their future development, they may have a negative attitude towards work. Group job burnout is very common in many enterprises, which can be classified as "group job burnout". The main reasons are low work efficiency and low work efficiency. Group job burnout seems small, but it does great harm, which will make the enterprise go downhill. Therefore, we must monitor in real time and make corresponding countermeasures, which will have a very adverse impact on the company\[^6\].

2.4. Major labor disputes

Major labor disputes are caused by various labor disputes, which may have more serious consequences. "Major labor disputes" are often because they are not paid attention to by the company initially, which will cause significant consequences.

2.5. Collective change

Collective change is mainly manifested in the majority of employees independently launched together, which will produce resistance psychology and behavior, such as strikes, petitions and so on. At the same time, we need to take all kinds of radical measures, which will put pressure on the enterprises. "Collective change" has great harm, which will seriously affect the normal operation of enterprises. By
damaging the reputation of the enterprise, collective change will lead to the escalation of the incident, which will seriously split the relationship between employees and the enterprise.

3. Basic theory of BP

3.1. Overview of neuron model
The basic structure of the nervous system is the neuron nerve cell, which is the basic unit to process human information transmission. The brain can handle extremely complex analysis and reasoning. On the one hand, the number of neurons is huge, on the other hand, neurons can process input signals non-linearly. Therefore, the establishment of engineering neuron mathematical model can better study engineering problems, as shown in Figure 1. The model is a multi-input single-output nonlinear element. The weights represent the connection strength between neurons.

\[
    y_j = f\left(\sum_{i=1}^{p} w_{jp} x_p - \theta\right)
\]

Among them,

- \( w_{jp} \) is Connection Weight Coefficient;
- \( x_p \) is the input signal at the input end;
- \( \theta \) is the neuron threshold;
- \( p \) is the number of input signals;
- \( y_j \) is the output of neuron at the j-time;
- \( f(\cdot) \) is the excitation function.

3.2. BP model
BP model is also called Back Propagation Network and Multilayer Forward Network. The structure of BP model is shown in Figure 2.

4. Research on human resource crisis of travel agency based on computer software

4.1. Raw data collection
In this paper, the neural network toolbox of MATLAB engineering calculation software is used to design, train and test the established BP neural network early warning model. First, we can preprocess the index data of travel agencies from 2020 to 2022. After normalization, we can carry out dimensionless index values, as shown in Table 1.
4.2. Training and testing of BP
After normalization of 2020 and 2022 data, we can get the training results, as shown in Table 2. After normalizing the 2022 data, we can use the corresponding risk degree matrix as the input and expected output of the model test. Through the simulation of the trained network, we can get the detection results, as shown in Table 3.

Table 1. Input data of BP model.

| Index                                      | 2020 | 2021 | 2022 |
|--------------------------------------------|------|------|------|
| Talent introduction rate                   | 0.31 | 0.28 | 0.29 |
| Competency of recruitment and introduction of employees | 0.98 | 0.96 | 0.95 |
| The relationship between training and employee needs | 1    | 0.33 | 0    |
| Return on human capital investment         | 0.8  | 0.73 | 0.7  |
| Voluntary turnover rate                    | 0.31 | 0.41 | 0.49 |
| Employee turnover growth rate              | 0.25 | 0.3  | 0.31 |
| Employee satisfaction with incentive mechanism | 1    | 0.33 | 0    |
| Satisfaction rate of employees to the evaluation system | 1    | 0.28 | 0    |
| Absence rate                               | 0.1  | 0.1  | 0.1  |
| Incidence of sick leave                    | 0.16 | 0.28 | 0.37 |

Table 2. Training output of BP network model.

| Expected output | Actual output | Grade |
|-----------------|---------------|-------|
| 2020 (1000)     | (0.9995 0.0002 -0.0010 0.0005) | Security |
| 2021 (0010)     | (0.0017 0.0014 0.9996 0.0009) | Crisis  |

Table 3. Detection output of BP network model.

| Expected output | Actual output | Grade |
|-----------------|---------------|-------|
| 2022 (1000)     | (0.9996 0.0009 0.0015 0.0006) | Security |

The human resource crisis situation of travel agencies is security, all aspects of human resources management is good, there is no sign of crisis, in a safe state.

5. Conclusion
Human resource management has become the primary problem and restriction of travel agencies, which has become the "bottleneck" factor in the development of travel agencies. The enterprise only carries on the effective modern human resources research, this needs to construct the scientific modern human resources crisis management early warning index system. Through systematic and scientific human resource crisis management, we can better prevent the occurrence of enterprise human resource crisis.

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