Application of Big Data Processing Technology in Human Resource Management Information System

Jiayi Zeng*

Department of Business School, Xi’an Fanyi University, Xi’an, Shaanxi 710105, China

*Corresponding author e-mail: zengjiayi@xafy.edu.cn

Abstract. As an important part of the high-level management model, human resource management has attracted much attention in all fields. Human resource management faces a large number of data problems, and it is urgent to discover valuable knowledge and provide decision-making support for enterprises to develop talent training strategies. The purpose of this article is to analyze the application of big data processing technology in human resource management information system. This paper proposes a literature research method, a case research method and a comparative research method to conduct a comprehensive analysis of the human resource management information system of a company. In addition, this paper takes the human resource data of a company as an example, through a large amount of data preprocessing work, design a human resource data mining system based on association rules is implemented, which realizes the application of incremental association rule mining algorithm to human resource data mining, realizes visualization, and finally mines valuable information. The experimental results of this paper show that the number of users of the client and server in the human resource management information system is less than 100, and the performance of the system can fully meet the needs of actual work in actual use.

Keywords: Big Data Processing Technology, Human Resource Management Information System, Association Rule Mining, Talent Training

1. Introduction

Now, the competition in the commercial market is globalizing and becoming high-tech. Almost all entrepreneurs know that human resources are the most active and expensive resources among all the resources of an enterprise, and they are also one of the most important factors in competition. People's participation is inseparable from all links in the business process such as product design, manufacturing, sales, and service [1-2]. The quality and ethics of employees are the foundation of the company's survival and development. Excellent talent management helps companies create an environment for talent training and enhance their competitiveness. In this sense, the effectiveness of enterprise training of talents is a strategic factor to promote enterprise development [3-4].
The enterprise establishes a human resource management organization composed of company managers, and the line manager and human resource management professional group (human resource department) implement systematic and comprehensive human resource management concept dynamics [5]. As the demand for human resource managers continues to increase, and the degree of specialization of human resource departments continues to increase, an effective tool is needed to assist managers in management [6-7]. At the same time, data mining technology is becoming more and more mature, which can discover hidden rules from the saved data, provide a basis for decision-making, and also provide us with new ideas and methods to solve these problems [8].

In today's knowledge-based economy, the success of an organization largely depends on the performance of human resource management (HRM) [9-10]. In addition, Human Resource Management (HRM) has recently focused its attention on knowledge sharing and strategic workforce analysis, and has gradually developed into an important contributor to organizational strategic management [11]. Shahibi MS proposed a framework based on human resource management information system (HRMIS) to evaluate user satisfaction. His purpose is to evaluate previous human resource management models, determine the user satisfaction level using HRMIS, and information quality, system quality and service is there any relationship between quality and user satisfaction using HRMIS. However, the complexity of the system framework is too high, leading to some errors in the results [12].

The innovation of this paper lies in the in-depth study of association rule mining technology, and proposes an incremental association rule mining algorithm based on clustering partition. On the basis of a large amount of data preprocessing work, it has achieved the Association analysis of resource data.

2. Human Resource Management Information Methods under Big Data Processing Technology

2.1. Association Rule Mining Technology in Big Data

Association rules are commonly used techniques in association analysis, and sequence functions are commonly used techniques in association analysis. Connection rules are used to find the association of different elements that appear in the same event. If it is the association rule X==>Y, then the number of transactions containing X object sets in the D transaction set is called the support number (frequency) of the X object sets. The support for all X objects is declared as support(X).

\[
\text{sup port}(X) = \frac{a}{|D|} \times 100\%
\]

Here, |D| is the number of transactions in transaction set D. When support (X) exceeds the minimum support (min sup) specified by the user, X is called a frequent item set.

The support degree of association rule X==>Y is recorded as supert(X==>Y), which is the percentage of transaction inclusion (that is, both X and Y) in D. It is the probability P(XUY).

\[
\text{sup port}(X ==> Y) = \text{sup port}(X \cup Y) = P(X \cup Y)
\]

The confidence of the association rule X==>Y is recorded as confidence(X==>Y), that is, the transaction that contains x in D: also contains the percentage of Y. This is the conditional probability P(Y|X).

\[
\text{confidence}(X ==> Y) = \frac{\text{sup port}(X \cup Y)}{\text{sup port}(X)} \times 100\% = P(Y | X)
\]

2.2. Research Methods of Human Resource Management Information

(1) Literature research method
By organizing and summarizing publicly published papers and reports by relevant experts, as well as various related documents and materials, sorting out the research status and results related to big data at home and abroad, and combining basic theories such as big data expertise and modern human resource management knowledge, etc. Provide sufficient basis for the research foundation and method selection of this article, and provide strong theoretical support for this article.

(2) Case study method

Case study method refers to a research method of theoretical analysis and in-depth research on real cases. This article uses company A’s big data to recruit and select, employee relations, performance management, salary management, training and development, and talent evaluation in human resource management. Conducted investigation and research and found that the application of big data in company A’s salary management, talent recruitment, and performance appraisal process was a case, as well as a case of risk prevention and control in actual application, and analyzed the advantages of the company in the process of application practice. Shortcomings, and continue to optimize and improve, and hope to provide reference for other companies of similar scale through the optimization case of the actual application of big data in the human resource management of A company.

(3) Comparative research method

In the process of optimization research, we will look for relevant reports and literature on the big data application of companies of the same type (similar industries, similar development stages, and similar scales) on the basis of in-depth understanding of the current situation of company A's big data application, And personally in-depth enterprise research, through the comparison with the actual application of big data in the human resource management of similar companies in A company, find out some rules and practical experience of similar companies in the application of big data, and then further apply to A. In the company’s series of human resources modules, on the one hand, avoid detours and avoid risks. On the other hand, it can speed up the in-depth and effective application of big data in human resource management, thereby reducing labor costs and enhancing the core competitiveness of the company’s market.

3. Human Resource Management System Design

The main functions of the system are as follows: comprehensive management of a series of projects such as the organizational structure of the staff and authors, human resources information, labor management, and performance appraisal of the company. It can give enterprises decision-making basis and data support, avoid repetitive and complicated data reporting and statistics, achieve information sharing, and carry out work efficiently. Therefore, after users enter the system, they can perform related functional operations within their authority.

System overall design: In the analysis of the needs of the human resource management information system, structured analysis methods will be used. First, there are three levels of user login: super administrator, administrator, and ordinary user. The super administrator has all the permissions, such as assigning permissions to administrators and users, and each is responsible for its own permissions according to the permissions. The administrator has business information module functions, such as HR module information management, work plan management, employee information prompt management, data management and other functions. Due to the large content, the data management part is omitted. Ordinary users are generally department managers, who only have basic information for querying and counting employees in their department.

Business flow: The system flow chart is the steps of the designer to design the system and the operation process of each functional module. The flow chart can reflect the designer's design ideas and operation methods. The flow of this system is through the operator’s login interface for identity verification. When the login information is completely correct, it enters the main interface. When the login information is wrong, check whether the account, password, and user authority are correct, after logging in, manage human resource management according to the operating authority. The five major functions of the information system are mainly the input, addition, deletion, modification, query, statistics, and export of the data of each individual module of the six HR modules, to obtain specific
information about the employees of the enterprise, and these information will ultimately serve the upper level of the enterprise.

4. Application Analysis of Big Data Processing Technology in Human Resource Management Information System

4.1. Status Quo of a Company's Human Resource Management Information

On the basis of detailed research, looking at the development of company A's big data in human resource management applications, it is still in the early stage. In human resource management, it is only in recruitment and selection, performance management, training and development, and compensation. Do some preliminary applications in management and other links. In fact, there are still a lot of data in the system that can be collected and analyzed in depth. How to better use big data to improve the human resource management level of A company is still a long-awaited problem. Of course, a company also has many problems in the current big data application stage. The main problems faced are shown in Table 1, Figure 1:

| Table 1. Problems in company a's human resource management information system |
|---------------------------------------------------------------|
| problem                                      | Lack of information comprehensive analysis | Poor information processing ability | Low efficiency of big data processing | Poor real-time data analysis capabilities | Low information management ability |
| Percentage | 20.4% | 12.3% | 10.8% | 9.7% | 33.6% |

From Figure 1, it is not difficult to see that the main problem of company A in human resource management data analysis is the lack of comprehensive data analysis methods. This shows that even if company A has a large amount of management data and information, it cannot manage The real and effective application of big data in the process. Therefore, below we mainly analyze the main reasons for the above problems from several aspects.

(1) Not enough attention from senior management
For many years, the company’s senior managers believe that the informatization of human resource management is something large companies do. It has nothing to do with small and medium-sized enterprises such as a company. As long as the human resources department recruits people and pays the right salary on time, it is enough, although it has been used. The enterprise information management software includes software for office automation and human resource management (mainly personnel management and reports, with simple functions), but most managers still stay at the traditional human resource management level in terms of management thinking.

(2) Lack of professionals proficient in data mining and analysis

Talents are the main support force for the implementation of human resource management big data, but for now, company a lacks compound talents who can dominate computer and network technology and manage human resources. Professional and technical personnel who specialize in extracting and analyzing big data are even more important. Lack of. On the other hand, there is also a lack of professional talents proficient in comprehensive human resource management in Company A. The current human resource management is still transferred from administrative positions. Basically, the daily work is busy dealing with the complicated and trivial matters related to personnel. Wanting to free up energy to carry out the application of big data in human resource management can only "have more than enough energy".

4.2. Human Resource Management Information System Performance Test

The performance test first tests the responsiveness of the user to provide data to the server, then tests the speed of information conversion between the system backend and the database, then tests the speed of using HTTP to transfer data back to the user's browser, and finally tests the user's direct operation feedback. Data, the accuracy of viewing, browsing and processing. The main purpose of the test is to test the response speed of the modules of the system.

Table 2. Client performance test

| Test items                  | Login response time | Number of test users | Number of logins per second |
|-----------------------------|---------------------|----------------------|-----------------------------|
| Test Results                | 4.345               | N/A                  | 14.325                      |

Figure 2. The relationship between the number of virtual users, login response time, and the number of logins processed per second
The test results using the load generator are shown in Figure 2 and Table 2. The main user of this design is Company A, and the number of clients and server users is less than 100. From the results of the performance test, the performance of the system can meet the needs of actual work. In actual use, the server's response speed and data transmission speed can meet the actual needs of the enterprise to a certain extent.

5. Conclusions
The human resource management information system is based on human resource management projects. In addition to big data-related information theory and technology, the unit functions and database applications introduced above are used to realize the practical application of the solutions proposed in the management are combined. In principle, the design and application of human resource management information system are introduced. The development of human resource management information system, through performance management to improve the level of human resource management, to ensure the flexible use of mechanisms and effective management of the internal market, play a decisive role in the creation of human resource management information.

References
[1] Akoyo S I , Sma M . Towards a Theoretical Model for Human Resource Management Information Systems, Government Policy and Organizational Performance: A Research Agenda [J]. IOSR Journal of Business and Management, 2017, 19(1):43-53.
[2] Shahibi M S , Saidin A , Izhar T A T . A Framework Based on Human Resource Management Information System (HRMIS) for the Evaluation of Users Satisfaction [J]. International Journal of Academic Research in Business and Social Sciences, 2016, 6(10):62-76.
[3] Arifin M A , Tajudeen F P . Impact of human resources information systems in the military environment – ScienceDirect [J]. Asia Pacific Management Review, 2020, 25(4):198-206.
[4] Wang S Y , Hsu S C , Li Y , et al. Promoting uncommon use of knowledge in information system departments: The role of human resource management practices[J]. Information Technology & People, 2018, 31(5):1008-1034.
[5] Janssen M , Haiko V D V , Wahyudi A . Factors influencing big data decision-making quality [J]. Journal of Business Research, 2017, 70(JAN.):338-345.
[6] Rathore M M U , Paul A , Ahmad A , et al. Real-Time Big Data Analytical Architecture for Remote Sensing Application[J]. IEEE Journal of Selected Topics in Applied Earth Observations and Remote Sensing, 2017, 8(10):4610-4621.
[7] Wang Y , Kung L A , Byrd T A . Big data analytics: Understanding its capabilities and potential benefits for healthcare organizations [J]. Technological Forecasting & Social Change, 2018, 126(JAN.):3-13.
[8] Zhang Y , Qiu M , Tsai C W , et al. Health-CPS: Healthcare Cyber-Physical System Assisted by Cloud and Big Data[J]. IEEE Systems Journal, 2017, 11(1):88-95.
[9] Cai H , Xu B , Jiang L , et al. IoT-Based Big Data Storage Systems in Cloud Computing: Perspectives and Challenges[J]. IEEE Internet of Things Journal, 2017, 4(1):75-87.
[10] Xu W , Zhou H , Cheng N , et al. Internet of Vehicles in Big Data Era[J]. IEEE/CAA Journal of Automatica Sinica, 2018, 5(1):19-35.
[11] Jaafar M A , Rezaeian A , Tabarsa G A , et al. Implementation of Human Resources Information System: Exploratory Case Study on Lebanon Universities[J]. International Business Management, 2017, 11(7):1560-1567.
[12] Shahibi M S , Saidin A , Adil T , et al. Evaluating User Satisfaction on Human Resource Management Information System (HRMIS): A Case of Kuala Lumpur City Hall, Malaysia[J]. International Journal of Academic Research in Business & Social Sciences, 2016, 6(10):95-116.