Applying Big Data Technology to Improve Human Resource Performance Management

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Abstract. Big data makes mining human resources more precise and convenient. It makes enterprise organizational structures more systematic and flat. At the same time, it also makes human resource planning more scientific and intelligent. Through the application of big data, enterprises can not only build a human resource performance database but also innovate performance management methods through big data analysis, making enterprise human resource performance management more scientific, standardized and effective.

Keywords: Big data technology; Human resource; Performance management

1 Introduction

Big data has brought revolutionary changes to enterprise data collection and management, especially the high-value, diverse, massive, rapid and accurate collection, processing and analysis of human resource data. By applying big data analysis techniques, the work mode of enterprise human resource performance management has been reconstructed and enterprise performance management efficiency has been improved[1].

2 Application of Big Data Technology in Human Resource Performance Management

2.1 Data-driven Human Resource Performance Evaluation

Big data can provide rich data support for human resource performance evaluation. By analyzing employee performance data, enterprises can better understand employees' work performance and achievements to conduct fair and objective evaluation of employees. In addition, performance evaluation based on big data can also help enterprises identify potential problems and risks in a timely manner to adjust and optimize management strategies. The performance management system is shown in Figure 1.
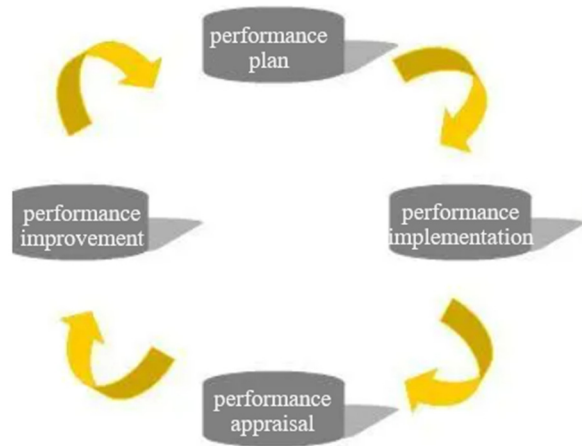
Fig. 1. Performance Management System

2.2   Intelligent Data Analysis and Human Resource Decision Making

Intelligent data analysis technologies can automatically process and analyze a large amount of human resource data to extract valuable information. This information can provide important references for enterprise decisions such as recruitment strategies and employee promotion decisions. Through intelligent data analysis, enterprises can make human resource decisions in a more scientific way and improve their competitiveness[2] .

2.3   Precise Management of Salaries and Benefits

With big data technologies, enterprises can better understand employees' salary and benefit needs to formulate more reasonable and precise salary and benefit policies. In addition, big data can also help enterprises monitor the implementation of salaries and benefits in real time and make timely adjustments and optimizations to ensure employees receive fair and reasonable treatment.

Royalty formula:Commission = Σ （Qi×Ni）

Note: In the accounting formula, Q = sales completion amount or sales volume, N = commission proportion or amount, i means a certain product. Sales people may sell different kinds of goods, different kinds of goods may correspond to different commission proportion or amount.

Total amount of performance bonus distribution = (weighted value coefficient of the department, quarterly assessment coefficient of the department) total amount of quarterly distributable performance bonus of the enterprise / [(quarterly department value coefficient)] + quarterly reward and penalty amount of the department[3].

2.4   Information Security and Privacy Protection

In the process of applying big data technologies to improve human resource performance management, information security and privacy protection must be addressed. Both enterprises and employees need to strictly abide by relevant laws, regulations and provisions to ensure the legal use of data and protection of privacy. At the same time, necessary technical and management measures should be taken to prevent data leaks and security risks[4].

2.5   Realize Automatic Warning

Big data provides enterprises with real-time synchronization capabilities for performance management and has the ability to realize automatic warnings. That is, compare performance management targets with individual performance simultaneously, quickly find differences, and find the root causes of differences. The big data system can automatically warn employees when performance gaps are not large, giving them a reminder so they know what they are doing, thus achieving incentive effects. The big data system will first remind employees to continue monitoring their own behavior. If their performance does not improve or there are further signs of deterioration, they will be reminded again and their situation will be fed back to the management. This allows companies to understand employees' dynamics in a timely manner to prompt, guide, train, and improve employee, departmental or even overall company performance[5].

3   Problems in Human Resource Performance Management

3.1   Primitiveness of Employee Data Collection Methods and Inconvenience in Data Access

Many companies are still using Windows-based files and forms for data collection. Some use paper forms or handwritten records, which are immature compared to the big data era. When the HR department needs employee information for performance management, they have to flip through or search many folders, and manually find the desired information in various folders, which greatly reduces the efficiency of human resource management by failing to efficiently obtain accurate information[6].

3.2   Subjectivity in Performance Appraisals and Evaluations

Currently, most enterprises evaluate their employees through their own HR management systems, with data mostly completed by employees themselves. When evaluating employees, a large number of forms and files need to be referenced along with subjective impressions of employees, which form the basis for performance evaluations. This evaluation method is too subjective, vague and lacks data support. It is not convenient for leaders and the evaluation methods are not direct enough[7].

3.3   Lack of Intelligent Planning for Talent Cultivation

While human resource performance management should establish the foundation for talent training, most enterprise performance management is stuck in formality, only evaluating employees at month-end, quarter-end and year-end. Employees mostly fill various evaluation forms under the pressure of performance bonuses. Therefore, the combination of performance appraisals and incentive mechanisms has not worked very well. This type of performance management usually only reflects employees' work performance but fails to truly measure work quality and attitude, which is unfavorable for cultivating composite talents within enterprises.

4   Advantages of Applying Big Data to Human Resource Performance Management

4.1   More Conducive to Collection, Sorting and Retrieval of Employee Performance Data

The biggest contribution of big data to human resource management is the ability to more efficiently and quickly mine more useful employee performance-related data. Based on this, vague data can be classified, intelligently analyzed to determine internal relationships between data and personnel, and provide users with information tailored to their needs during retrieval. Such data sources allow leaders to more intuitively see employee data when evaluating performance, letting data speak and assessing work attitudes, behaviors and capabilities from multiple dimensions for more objective evaluations. The organizational strategic objectives map is shown in Figure 2.
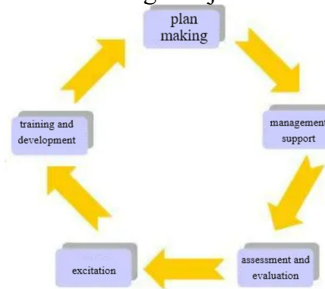

Fig. 2. Organizational Strategy Map

4.2   Promoting Systematization and Flattening of Enterprise Organizations

Big data can help enterprises achieve systematic management by eliminating barriers between different levels, driving organizational structure flattening. A HR management system is constructed based on big data, realizing cross-level, cross-departmental and cross-regional flow of employee information to achieve talent data flow and sharing. Performance management of different departments, regions and levels of same talents can also be collaboratively managed, promoting enterprise development[8].

4.3   Improving Scientificity and Strategic Role of Talent Planning

Through talent analysis, a talent management method based on big data is proposed. Big data systems can provide wider, more accurate and better matching information in talent assessments. Combined with enterprise talent needs, reference can be made to more talent development plans to formulate the most suitable cultivation approaches. Talent tracking also allows real-time updates and systematic records for more intuitive cultivation pathways and effectiveness[9].

5   Big data technology to improve HR performance management programming.

The programming steps of big data technology to improve HR performance management are as follows:

5.1   Data collection

First, all kinds of data related to HR performance need to be collected. This includes basic employee information, job performance, training and development records, reward and punishment records, etc. At the same time, employee satisfaction and job expectations can be collected through survey and assessment tools.

5.2   Data cleaning and integration

After data collection, data cleaning and integration are required to ensure the accuracy and consistency of the data. This includes identifying and correcting errors, omissions or inconsistent data, and integrating data from different sources to form a complete dataset.

5.3   Data storage and management

In order to facilitate the subsequent data analysis and processing, an efficient data storage and management system is needed. This can include using Database Management Systems (DBMS) or cloud storage services to store and manage data.

5.4   Data analysis and mining

on the basis of data storage and management, the big data analysis technology is used to in-depth analyze and mine the collected data. This can include the use of statistical analysis, machine learning, data mining and other techniques to identify patterns, trends and associations in the data. Through these analyses, deep insight into employee performance can be gained to discover potential areas and opportunities for improvement.

5.5   Performance evaluation and management

According to the analysis results, formulate the corresponding performance evaluation and management strategies. This includes setting specific performance goals and indicators, setting performance evaluation plans and processes, and conducting regular performance evaluation and feedback. At the same time, according to the performance evaluation results, the corresponding incentive and incentive measures are formulated to improve the enthusiasm and performance of employees.

5.6   Continuous improvement and innovation

Human resource performance management is an ongoing process that requires continuous improvement and innovation. According to the performance evaluation results and data analysis results, constantly optimize the performance objectives and indicators, adjust the performance evaluation plans and processes, innovation incentives and incentive measures, so as to improve the effect of human resource performance management and employee satisfaction.

Through the above steps, enterprises can use big data technology to improve the effect and accuracy of human resource performance management. It should be noted that the application of big data technology needs to comprehensively consider the actual situation of human resources, financial resources, technology and other aspects of the enterprise, and choose the appropriate technologies and methods to realize the optimization and innovation of human resource performance management[10].

6   Strategic Analysis of Applying Big Data to HR Performance Management

6.1   Strengthening Mining, Analysis and Sorting of Employee Performance Data
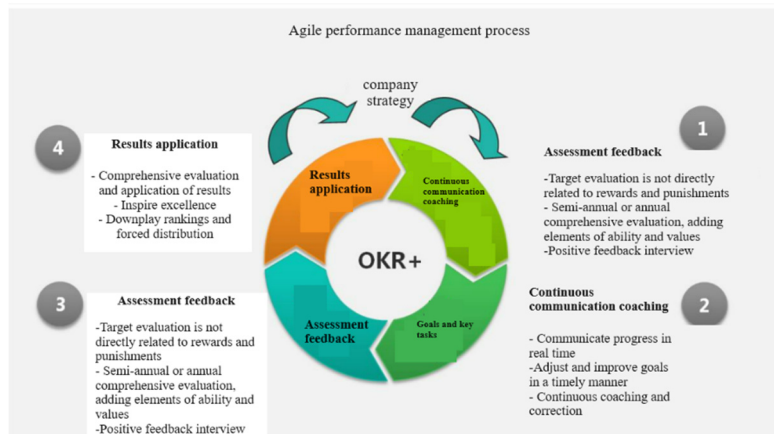

Fig. 3. Agile Performance Management Process

In HR management, mining and collection of employee basic information, developmental dynamics and quality potential in three aspects must be emphasized in big data applications. Employee basic data includes basic information, job descriptions, positional levels, authority scopes and salaries. Developmental dynamic data features attendance, internal transfers, promotions, demotions, resignations and performance grades. Quality potential analysis data comprises satisfaction, attitudes, task completion levels. Metrics like attrition and talent growth curves can also be derived. HR personnel can filter various data according to agile performance management process needs as Figure 3 shows, deeply understanding employee conditions through dynamic data, tracking talent development and conducting scientific performance assessments while timely discovering and solving employee issues to improve satisfaction and organizational recognition[11].
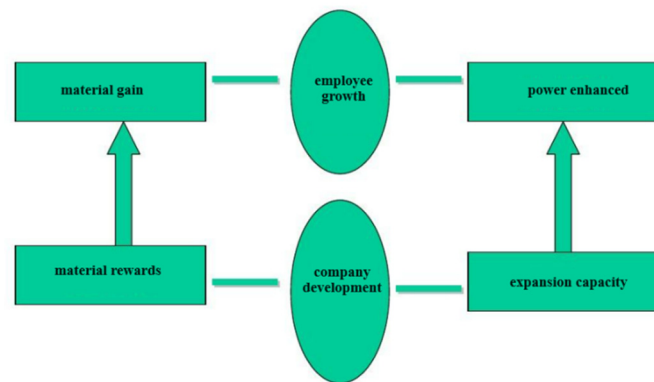

Fig. 4. Create a Performance-Based Human Resource Management

6.2 Continuously Improving Enterprise Performance Management Processes with Big Data

Performance management based on big data is a new area that requires a gradual acceptance process. A transformation is needed in new performance appraisal indicators, management implementation processes and feedback models, whether for management or general employees. A performance management process must be established under the new system and new work habits cultivated - a long-term reform involving participation and adjustments from all. In the initial application of big data, problems are inevitable. As a performance manager, organizational structures, performance management systems and workflow should continuously improve to match the new big data system. Achieving expected benefits of enterprise big data performance management relies on synergistic progress across factors towards organizational goals, representing higher demands for personnel, organizational structures, workflows and institutional standards. The above improvements ensure big data-backed implementation and application of enterprise performance management systems, improving overall work and management efficiencies. Data systems like ERP

and HR management should also be strengthened in application to create performance-based HR management as Figure 4 shows, extracting corresponding data from these systems with big data to improve information processing efficiency while ensuring timeliness and reliability of data collection and analysis. Managers can ultimately obtain visualized data promptly and intuitively for mastering basic operations, ensuring smooth execution and reducing communication errors[12].

6.3   Innovating Human Resource Performance Management Methods with Big Data

Previously in HR performance management, insufficient attention was paid to data use. Most evaluations relied on self-reported forms and tables by employees in a behavior-oriented and results-oriented manner lacking data support, consistent standards or considerations of a broader scope.Big data's information organization and intelligent analysis functions should be fully leveraged. Performance appraisal indicators can be redesigned on the big data basis to incorporate both qualitative and quantitative aspects. For calculable metrics like sales, attendance and profits, software can generate intuitive curves and tables. Models like social platforms allow more holistic evaluations of fuzzier aspects like diligence, teamwork and innovation capabilities.

6.4   Establish a data quality management and verification mechanism to ensure the accuracy and integrity of the data

The results of the big data analysis will depend largely on the quality and accuracy of the data. If there is bias or error in the data, then the results of the analysis are likely to be affected, leading to poor decision making or erroneous insights. To solve this problem, companies need to take a series of measures to ensure the accuracy and integrity of the data.

First, it is very important to establish data quality management and validation mechanisms. This mechanism should include a process of data cleaning, validation, and proofreading, designed to eliminate erroneous and duplicate data, and to ensure the accuracy and consistency of the data. With data cleaning, errors, omissions or inconsistent data can be identified and corrected. Data verification can be done either by comparing it with other reliable data sources, or by using statistical methods to verify the reliability and accuracy of the data.

Second, enterprises need to establish data standards and control processes. Data standards refer to the format, coding and definition of data to ensure that data is compatible and consistent between different departments or systems. The risk of data inconsistency and error can be reduced by developing uniform data standards and control processes.

Third, a continuous data quality assessment is also necessary. Through the regular review and analysis of the data, enterprises can find the data quality problems and take timely measures to correct them. Such evaluation can include methods such as statistical analysis and pattern recognition to better understand the properties and quality of the data[13].

7   Conclusion

In summary, technological development provides unprecedented opportunities for many occupations and work, reflecting future career trends. As a people-centric role, HR management must keep up with human thinking in daily oversight, where information technology profoundly impacts cognition. Applying big data to enhance HR performance management has become a modern enterprise necessity. Data-driven insights into employee needs and satisfaction coupled with optimized processes and strategies can raise welfare and productivity. Attention to information security and privacy protection ensures lawful and private data handling as well.

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