Original Research Article

Human resource management decision-Making in vocational colleges enabled by big data: Insights from data mining and analysis

Yufei Tian[1,2] , Raemah Abdullah Hashim[1]

1 City University Malaysia, 461000, Malaysia

2 Liming Vocational University, Quanzhou 362000, China

Abstract: Human resources constitute a core competitive asset for vocational colleges.To attract and retain high-caliber personnel and ensure the sustainable development of these institutions, it is crucial to align human resource management (HRM) decisions with their specific contexts.The rapid development and widespread adoption of big data technology have facilitated notable advancements in HRM decision-making.By leveraging data mining and analysis, vocational colleges can effectively evaluate their human resource status and workforce needs, enabling more evidence-based and strategic HRM decisions that foster employee motivation, enhance job satisfaction, reduce staff turnover, and ultimately strengthen organizational competitiveness.However, many HRM departments within vocational colleges exhibit insufficient awareness and practical skills in applying big data, leading to inadequate and inaccurate analyses that compromise the validity of decision-making.This paper investigates HRM decision-making in vocational colleges through the lens of big data mining and analysis, with the aim of improving decision quality and promoting the sustainable development of these institutions.

Keywords: Big data; Data mining and analysis; Vocational colleges; Human resource management decisions

1. Introduction

Vocational colleges, as crucial institutions for cultivating skilled professionals, demonstrate a strong correlation between their teaching quality and the caliber of their personnel. However, the current state of HRM in many of China's higher vocational colleges reveals a generally suboptimal faculty quality, which significantly impacts the effectiveness of HRM practices. This is particularly evident in the insufficient number of faculty members often coupled with lower hiring standards. Furthermore, the overall academic and professional profile of teachers in these institutions, concerning titles, educational attainment, and structural distribution, remains comparatively underdeveloped[1]. Moreover, a persistent reliance on traditional management models in most institutions hinders a complete transition, resulting in the application of outdated concepts and methodologies within HRM. The limited adoption of big data technology in HRM impedes the advancement of informatization within this function. Consequently, vocational colleges must prioritize the enhancement of HRM decision-making, foster the development of faculty teams, and elevate the overall capabilities and ethical standards of their HRM practices. Presently, big data technology is increasingly being utilized in HRM decision-making. Through data mining and analysis, institutions can gain comprehensive insights into their current human resource status, employee career aspirations, and talent requirements. This enables the formulation of more evidence-based and rational HRM systems and recruitment strategies, optimizes the allocation of human resources, and improves overall management efficiency.

2. Big data technology

This section elucidates big data technology, examining its processing workflow, including data collection, cleaning, analysis, and visualization.While a universally accepted definition of big data remains elusive, it is

commonly characterized by its volume, variety, velocity, and the inherent limitations of traditional processing methods.

For instance, the U.S. National Science Foundation describes big data as large, diverse, complex, and distributed datasets from multiple sources.Gartner emphasizes its nature as an information asset necessitating innovative processing.McKinsey further highlights that these datasets exceed the capacity of conventional software tools for effective analysis and management [2].

Big data processing typically comprises four key stages.First, data is collected from diverse sources to ensure comprehensive coverage and real-time relevance.Second, collected data undergoes rigorous cleaning and filtering to remove redundancy, errors, and irrelevant information.This is followed by secure storage and initial organization to facilitate subsequent analysis.Third, advanced analytical tools are employed to extract insights, identify patterns, and uncover latent value.Finally, analysis results are visualized in accessible formats, enabling users to interpret complex information and support informed strategic and operational decisions.

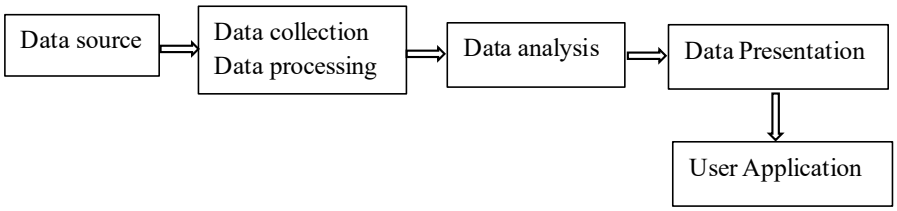

Figure 1. Processing flow of big data.

3. Strategies for HRM decision-Making in vocational colleges based on big data mining and analysis

Vocational colleges can utilize big data mining and analysis technologies to conduct theoretical and skills training, recruit highly-matched talents, make reasonable salary decisions, design and improve performance assessment indicators, etc., thereby enhancing the accuracy and scientificity of HRM decisions in vocational colleges and strengthening the utilization rate of human resources.

3.1. Strengthen the training of big data theory and skills, and improve the data mining and analysis abilities of managers

By leveraging big data analysis technology to understand the data mining and analysis capabilities of management personnel, and through diversified training content and online and offline teaching methods, the data analysis capabilities and information literacy of management personnel can be enhanced, thereby improving the quality of their work.

The HRM departments of vocational colleges are increasingly adopting big data technologies to enhance decision-making. In order to effectively implement these technologies, it is necessary to use the Apriori algorithm to evaluate and improve the theoretical understanding and technical proficiency of human resources personnel. Based on the outcomes of such assessments, colleges can develop diversified training programs that cover big data theory, practical technical skills, application methods across various scenarios, and relevant case studies.

A blended approach combining both online and offline training methods should be adopted to improve the operational capabilities in big data and the overall information literacy of HRM personnel. Following the implementation of these training programs, big data tools can be employed to collect and analyze various performance indicators of participating staff during the learning process—such as course completion rates, test scores, improvements in work quality, and practical applications of big data techniques. This allows human resource managers to intuitively and comprehensively evaluate the effectiveness of the training and identify areas for further development, thereby improving the overall quality of HRM decisions.

Moreover, to further enhance the motivation and independent learning capacity of faculty and staff, vocational colleges can actively develop personalized self-learning platforms powered by big data technology. These platforms intelligently recommend learning resources, training courses, and practical development opportunities based on each staff member's learning preferences, competency levels, and career development goals. This data-driven learning model not only significantly enriches the learning pathways available to faculty but also greatly enhances the relevance and effectiveness of training. Ultimately, it promotes the dual advancement of individual professional capability and the overall competitiveness of the institution.

3.2. Integrating big data into recruitment to improve talent matching accuracy

Big data is applied to the whole process of recruitment, demand analysis and planning, intelligent resume screening, accurate positioning of talents needed, ensuring the quality of talents, reducing recruitment and later management costs.

To enhance the intelligence and effectiveness of talent recruitment in vocational colleges, a series of strategic measures can be implemented to optimize the recruitment process and ensure the selection of high-quality candidates. First and foremost, vocational colleges should fully integrate big data technology throughout all stages of recruitment, particularly during the recruitment planning phase. Big data possesses robust capabilities in data processing and analytics, enabling the in-depth exploration and assessment of current human resource demands.

Through the natural language processing technology of big data technology to analyze job responsibilities description, vocational colleges can gain clearer insights into the specific requirements of various positions, including professional competencies, work experience, educational background, and other essential attributes. These insights provide an accurate and data-driven foundation for formulating recruitment plans, which not only enhances their scientific validity and rationality but also prevents blind recruitment practices and reduces talent mismatch or resource waste [3].

Secondly, during the resume screening stage, vocational colleges should make full use of big data technology to significantly improve both the efficiency and quality of candidate selection. Traditional resume screening methods rely heavily on manual review, which is time-consuming, error-prone, and susceptible to human bias or oversight. In contrast, big data systems can automatically screen and rank resumes according to machine learning algorithms based on set screening criteria, ensuring that only qualified candidates proceed to subsequent stages. This automation not only streamlines the recruitment process and lowers operational complexity but also enhances the overall quality of the talent pool by providing a more objective and comprehensive evaluation of candidates' capabilities and potential.

Furthermore, the application of big data technology helps vocational colleges to accurately identify the most suitable talents for each role, minimizing randomness and uncertainty in the recruitment process. In addition, by improving candidate-job matching from the outset, big data can indirectly reduce subsequent costs related to training, onboarding, and workforce management, thus contributing to long-term organizational efficiency and stability.

3.3. Leveraging big data technology to inform rational salary decisions

Big data is used to evaluate positions, explore the salary willingness of faculty and staff, design salary strategies in layers, improve satisfaction, reduce turnover rate, and ensure the stability of talents in colleges and universities.

In the construction of salary and benefits systems within vocational colleges, big data technology plays a central and transformative role. It enables institutions to conduct multidimensional and in-depth evaluations of each position—assessing factors such as individual contribution to institutional development, strategic impor-

tance of the role, and job complexity. Moreover, big data supports the fine-grained categorization and structuring of salary systems to better align with organizational goals and employee expectations.

Specifically, vocational colleges can use Logistic regression model to mine and analyze the data related to employees' salary expectations and existing salary structure, and design a scientific and fair salary framework. This data-driven approach not only enhances salary satisfaction but also reduces the likelihood of talent loss resulting from perceived inequities or dissatisfaction with compensation.

For middle and senior-level managers, as well as core faculty members, a more flexible and performance-based salary strategy should be adopted. This includes moderately reducing the proportion of fixed income while increasing variable pay components that are linked to teaching outcomes, research achievements, and competition awards. Such a system encourages continuous engagement in teaching, academic innovation, and administrative excellence, motivating staff to produce high-quality results.

For frontline teachers and educational support personnel, it is advisable to set a reasonable base salary aligned with industry standards. Additionally, performance-based bonuses should be implemented and directly tied to measurable teaching outcomes—such as student satisfaction rates, evaluations of teaching quality, and contributions to curriculum innovation. These incentives can significantly enhance faculty motivation, improve teaching performance, increase compensation satisfaction, and reduce turnover rates, thereby supporting long-term talent retention and institutional development.

3.4. Designing performance assessment indicators based on big data to enhance human resource evaluation

Use big data to integrate multi-dimensional information, design comprehensive assessment indicators, scientifically evaluate the performance of staff and teachers, stimulate work enthusiasm and creativity.

In the context of big data, performance appraisal indicators for human resources in higher vocational colleges should integrate both qualitative and quantitative methods to more comprehensively and scientifically evaluate the actual occupational status of faculty members. Vocational colleges leverage big data platforms to aggregate vast amounts of information from multiple departments and systems—covering diverse dimensions such as teaching performance, scientific research output, administrative responsibilities, and student feedback. This integration enables centralized data storage, efficient processing, and intelligent analysis, providing robust data support for the development of performance assessment indicators.

A comprehensive and multidimensional set of evaluation metrics is thus designed. These indicators encompass traditional quantitative measures—such as teaching workload and the number of research publications—as well as qualitative factors, including teaching quality evaluations, student satisfaction surveys, teamwork skills, and innovative thinking. This holistic approach ensures that performance assessments accurately reflect both the comprehensive capabilities and the actual contributions of faculty members.

Furthermore, with big data support, vocational colleges can establish more efficient, transparent, and responsive feedback and incentive mechanisms. Timely and precise feedback on performance appraisal results helps staff identify their strengths and areas for improvement. Concurrently, based on faculty performance and institutional development goals, scientific and reasonable incentive systems are designed—incorporating performance bonuses, promotion opportunities, training resources, and other benefits—to stimulate enthusiasm and creativity among faculty and staff [4].

4. Conclusion

The advent of the era of big data has provided unprecedented opportunities and challenges for HRM decisions in vocational colleges. From the perspective of data mining and analysis, we can deeply explore the hidden value in human resource data, providing a scientific basis for key links such as the construction of the

teaching staff, talent cultivation, and performance evaluation in vocational colleges. However, there are still some limitations, such as insufficient analysis of data privacy and security risks, and the differences in data mining and analysis by management personnel. Subsequent research can be carried out in the following directions. The first is to explore effective paths for protecting data privacy and network security. Second, we should enhance the research on the integration of big data with cutting-edge technologies such as artificial intelligence and blockchain, thereby further improving the intelligence and automation level of HRM decisions, facilitating more accurate and efficient decision-making, and promoting the innovation and development of HRM in vocational colleges.

About the author

Tian Yufei, Male, Chinese, PhD in progress, assistant researcher, research interest: human resource management.

References

[1] Gao Haixia(2020).Research on the Main Problems and Strategies of Human Resource Management in Vocational Colleges [J]. Economic Management Digest, 99-100.

[2] Li Hua, Zhang Xiaogang(2023). The value significance and realization path of data enabled-human resource management . Journal of Xidian University (Social Science Edition), 33(3), 41-45.

[3] Cheng Shiliang(2024).Discussion on the innovation of Human resource Management in the era of Big Data. Consumer Guide, 33-36.

[4] Zhang Lulu(2024). Data-driven Decision Analysis: The key to improving the effectiveness of human resource management. Fortune Life, 85-87.