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# Exploration on Innovation Paths of Higher Education Management in the Big Data Environment

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**Abstract:** With the rapid development of information technology, the era of big data has arrived, which brings new opportunities and challenges to the work of higher education management. This paper deeply analyzes the significance of big data in higher education management, elaborates on the existing problems in current higher education management, and proposes a series of targeted innovation paths. The aim is to make full use of big data technology, promote the scientization, precision, and efficiency of higher education management, improve the level of higher education management, and cultivate high-quality talents who meet the needs of the new era.

**Keywords:** Big data; Higher education management; Innovation paths

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## 1. Introduction

Nowadays, big data technology has increasingly become a strong backing for innovation in educational management at colleges and universities. By leveraging big data technology, colleges and universities can collect, analyze, and mine massive amounts of educational data to gain a thorough understanding of students' learning situations, interests, psychological characteristics, and more. This enables them to provide personalized educational services tailored to students, optimize resource allocation, and enhance the scientific rigor and accuracy of decision-making. However, big data technology also harbors risks and challenges. How to correctly utilize big data to improve the effectiveness of educational management has become a crucial issue of the times for colleges and universities [1].

## 2. The significant role of big data in university education management

### 2.1. Meeting students' individualized learning needs

In traditional management models, the large gap between the number of teachers and students, coupled with

limitations in teachers' time and energy, often makes it difficult to address students' individualized needs or provide targeted educational management. The application of big data technology in education management effectively remedies this shortcoming: it can collect data on students' learning, daily life, and other aspects based on their actual situations, generate personalized academic profiles, better respond to the significant individual differences among students, and simultaneously meet their needs for individualized teaching, thereby improving the overall effectiveness of student education management [2]. Big data technology permeates various aspects of students' lives. For example, in learning, it can comprehensively analyze multi-dimensional learning data such as study duration, frequency of discussions, and homework completion. This analysis enables the delivery of precise learning resources, the formulation of personalized study plans, and helps students efficiently enhance their academic performance [3].

### 2.2. Enhancing the scientificity of educational management decisions

Traditional university education management relies on manual decision-making, which places high demands on managers' experience, analytical skills, and other capabilities. Additionally, it is heavily influenced by subjectivity, which to some extent undermines the scientificity of decisions. The introduction of big data technology presents objective data, allowing decision-makers to intuitively understand and grasp the current operation of the university, the distribution of teaching staff, student feedback, and other aspects. This data serves as a crucial reference for educational management decisions, reducing the subjectivity inherent in manual decision-making, minimizing biases, and enhancing the scientificity of decisions [4]. Furthermore, universities can develop predictive models that connect historical and current data to identify issues in current management practices, warn of potential risks in educational management, and conduct predictive analyses based on current trends in education development. This further improves the feasibility and effectiveness of decisions.

### 2.3. Optimizing the allocation of educational resources

Many universities face problems such as limited quantity of educational resources and irrational resource allocation, which hinder improvements in educational quality and management effectiveness [5]. How to allocate educational resources fully and reasonably, improve resource utilization efficiency, and enhance educational management has become a critical issue for universities to address urgently. The application of big data technology helps university administrators solve this problem effectively. It provides administrators with a comprehensive, intuitive overview of educational resource usage, analyzes existing issues in current resource allocation and utilization, and intelligently assesses the varying resource needs and practical differences among different departments. This enables optimized resource allocation, maximizes resource utilization efficiency, and avoids uneven distribution, waste, or idleness of resources.

## 3. Innovation paths of university education management in the big data environment

### 3.1. Innovating management concepts to enhance management effectiveness

Concepts are the forerunners of guiding behaviors, and there is a close and direct connection between managers' concepts and management practices. With the in-depth development of the big data era, university managers should actively transform their education management concepts to improve the efficiency of education management work. First, student-centeredness. Students have always been an important target of education

management work; it can be said that university education management work, to a certain extent, serves students' development [6]. Therefore, in the process of management, universities should fully respect students' dominant position. They should take students' development as the starting point and goal of education management work, refer to students' personalized and diversified development needs, and aim to cultivate high-quality talents with comprehensive development of comprehensive literacy.

Second, strengthening data-driven awareness. With the support of big data technology, universities should fully recognize the advantages and potential value of data, transform the traditional experience-driven management model, actively utilize big data technology, and reconstruct a data-centered education management system. This will help break information silos, optimize communication efficiency, and provide support for student education management. For example, schools can establish a unified data platform to integrate, analyze, and mine students' data from multiple aspects, forming comprehensive and accurate student profiles to facilitate the formulation of personalized education plans. The data types should be comprehensive, covering various dimensions such as students' learning, life, internships, and psychology, to conduct a comprehensive evaluation and provide precise guidance of students, and provide more targeted support and services, such as career guidance, mental health education, and academic counseling [7].

Finally, enhancing innovation awareness. Higher education is in constant development. To keep up with the current development trend of higher education and the new demands of the market for high-level talents, universities should uphold the management concept of keeping pace with the times and continuous innovation, courageously innovate and take challenges, break the constraints of traditional education management work, explore innovative education management models, adapt to students' ever-changing learning and development needs, meet the new expectations of the times for higher education, and contribute to the development of higher education [8,9].

## 3.2. Strengthening the mechanism construction to ensure data application

Data is the foundation of big data technology. On one hand, the accuracy and integrity of data have a significant impact on educational management analysis and decision-making. On the other hand, data faces the risk of leakage during application. Therefore, while enjoying the convenience brought by data, colleges and universities should strengthen the construction of relevant mechanisms and systems to ensure the security and reliability of data applications.

First, establish an efficient communication mechanism [10]. An efficient communication mechanism emphasizes smooth communication between various departments, ensuring the timely transmission and sharing of data information, and avoiding the impact of information silos on management work. Based on this, colleges and universities should build a unified data platform, formulate data standards and specifications, ensure consistency in data collection templates, and enable various departments to connect management work more quickly. At the same time, the requirements for data models are also conducive to improving the accuracy and integrity of data, avoiding the impact of data missing, errors, and redundancy on work.

Second, ensure data security. Student data often involves privacy, and improper use of data may lead to issues such as privacy leakage. Therefore, colleges and universities should establish a sound data security management system to ensure data security [11]. They can formulate corresponding systems, clarify data usage specifications, and allow teachers and relevant staff to operate in a standardized manner within the scope permitted by the systems, ensuring the security of students' personal information and privacy rights. In addition, set up a special service mechanism and a dedicated technical support team to provide timely technical guidance

and security guarantees, ensuring the security and reliability of data. Meanwhile, to further ensure data security, colleges and universities should also formulate detailed data leakage contingency plans, so that they can respond quickly and take effective measures to remedy when a data leakage occurs, minimizing losses to the greatest extent.

Finally, develop a data collection platform. There are various types of data collection. To achieve efficient collection, colleges and universities should build a multimodal data collection platform, realize the integration of traditional data collection models with modern technologies, enhance the collection of data on social students in mobile terminals, social media, etc., thereby ensuring coverage of all aspects of students' life and study, improving the comprehensiveness and real-time performance of data collection, and providing strong support for precise educational decision-making.

## 3.3. Increase investment and optimize infrastructure

Hardware facilities are the foundation for colleges and universities to use big data technology to improve the efficiency of educational management. Colleges and universities should fully recognize the importance of hardware facilities, increase investment in funds, human resources, etc., enhance the advancement and stability of hardware equipment, and ensure the efficiency of data processing [12]. Specifically, colleges and universities can increase capital investment to upgrade the campus network, such as improving network speed, expanding broadband coverage, and enhancing server performance, to provide a good network environment for educational managers. At the same time, colleges and universities should set up a dedicated maintenance team to regularly inspect and maintain the campus network environment and hardware facilities, ensuring the stable operation of relevant facilities, thereby guaranteeing the integrity and efficiency of data transmission. In addition, colleges and universities can optimize the relevant functions of educational management systems to provide students with more advanced and powerful learning experiences. In addition to big data technology, teachers can also introduce cutting-edge technologies such as artificial intelligence, cloud computing, and virtual reality to enhance the intelligent characteristics of educational management. This helps teachers enrich teaching methods, assists decision-makers in improving management efficiency, and jointly lays a solid foundation for cultivating high-quality talents [13].

Secondly, colleges and universities should also attach importance to the important role of information technology talents in educational management. Through a combination of external introduction and internal training, they can attract outstanding external talent to join the educational management team, while strengthening the training of existing personnel. This will help build a high-quality talent team with both management capabilities and information literacy, providing talent support for university educational management and injecting sustained impetus into its innovative development.

Thirdly, strengthen the development of software facilities. Based on their actual conditions, colleges and universities can set up software development teams to customize software systems that meet the needs of educational management, such as intelligent teaching evaluation systems, learning behavior analysis systems, and student mental health monitoring systems, to improve the accuracy and personalization of educational management.

Finally, carry out teacher training to improve information literacy [14]. Conduct big data training for university educational managers to enhance their awareness of big data and their ability to apply it. The training content should include basic knowledge of big data, data analysis methods and tools, and data-driven educational management decision-making. In addition, colleges and universities can provide sufficient technical support

and resource guarantees for educational managers, encourage them to actively participate in big data research, practice, and other activities, and improve their abilities in collecting, analyzing, and applying data. This will help them easily cope with the challenges of big data and solve various difficult problems. Colleges and universities can also formulate corresponding incentive policies, incorporate big data application capabilities into performance evaluations, enhance the motivation of managers to learn and apply data technology, and promote the improvement of the comprehensive quality of the management team.

### 3.4. Flexibly utilize high-tech and improve the evaluation system

The evaluation system is an important part of educational management. On the one hand, the traditional evaluation system relies on manual judgment; on the other hand, the evaluation methods are relatively simple, mainly based on qualitative evaluation, which has problems such as low efficiency, incompleteness, and strong subjectivity. With the support of big data technology, colleges and universities should build an intelligent evaluation system and establish a three-dimensional and comprehensive evaluation mechanism.

First, adopt diversified evaluation channels in the industry. Teachers can introduce big data technology for online evaluation, and obtain multi-dimensional evaluation data by analyzing students' online learning behaviors, interaction frequency, and homework completion. However, at the same time, teachers should not completely abandon the traditional manual evaluation method, but should combine online and offline evaluations. By leveraging the comprehensiveness of online learning data and the depth of offline evaluations, they can form complementary advantages to comprehensively reflect students' learning status and development trends. It should be noted that online evaluation should focus on protecting students' data security and privacy information security. At the same time, it should be combined with students' offline learning performance for comprehensive evaluation, to build a more comprehensive and scientific teaching evaluation system, ensure the mutual complementarity of online and offline teaching evaluations, and form a three-dimensional teaching evaluation network [15].

Second, establish a generative and dynamic evaluation mechanism. Use big data technology to dynamically monitor students' online learning data, such as learning duration, behavior trajectory, and interaction frequency, to grasp learning dynamics in real time. Combine with offline performance, such as the completion of practical activities and the activity level of the second classroom. Starting from the perspective of students' daily learning and dynamic development, dynamically capture their growth and development trajectory to form a dynamic evaluation, which can more accurately reflect students' real learning situation and improve the scientificity and practicability of evaluation results.

Finally, make full use of the evaluation results. The evaluation results should serve educational management. Teachers and relevant management departments can adjust teaching plans, optimize resource allocation, etc., according to the evaluation results, to provide precise guidance and full support for students' development. For example, through a comprehensive assessment of students' academic performance and internship performance, their future career development trends can be predicted, to provide students with personalized career development suggestions and employment guidance, help them clarify their career direction, and enhance their employability.

## 4. Conclusion

Against the backdrop of big data technology, university education management faces both new opportunities and significant challenges. Universities should fully recognize the advantages of big data technology in management

work, such as its value in providing personalized education, enhancing the scientific nature of decision-making, and optimizing resource allocation. Finally, they should adopt a proactive attitude towards the arrival of big data technology, update modern management concepts, strengthen the optimization of the management talent team, establish a sound evaluation system, improve infrastructure and equipment, and other measures to further enhance the scientificity and efficiency of education management. In this way, they can improve the quality of talent cultivation and cultivate high-quality innovative talents who can meet the needs of the new era.

## Disclosure statement

The author declares no conflict of interest.

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