Research on the Information Management Model of Universities Supported by Big Data and Artificial Intelligence

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Abstract: With the rapid development of information technology, the application of big data and artificial intelligence (AI) technologies has become increasingly widespread in various fields. As an important base for knowledge dissemination and talent cultivation, universities must follow the trend of big data and AI, change traditional concepts, establish big data thinking, respond to the changes brought about by big data and AI in educational activities, and promote innovation in information management models. This paper explores the application of big data and AI in university information management and analyzes how they contribute to innovation in management models to achieve intelligent teaching management in universities.

1. Introduction

The Ministry of Education issued the "Education Informatization 2.0 Action Plan," which proposes to "basically achieve the 'three comprehensive, two high, and one large' development goals by 2022." With the internet evolving into the Web 2.0 era, educational informatization is also characterized by features of the Informatization 2.0 era. The rise of big data and AI technologies provides new ideas and methods for university information management. Through effective use of big data and AI, universities can innovate their management models, improve management efficiency, enhance the quality of education and teaching, provide personalized services, and achieve greater breakthroughs in the educational field. However, universities must also pay attention to data privacy and security issues, as well as balance the application of technology with humanistic concerns, ensuring the sustainable development of information management models.

Under the assistance of big data and AI, university information management models face several challenges. The first is data privacy and security. The collection and storage of large amounts of data may involve risks of personal privacy leakage and data security, which require universities to strengthen data protection and privacy management measures. The second challenge is balancing technological application with humanistic care. While big data and AI can provide more efficient management approaches, universities also need to ensure humanistic and personalized education[1].

2. Current Situation of University Information Management Development

At the beginning of 2022, the Ministry of Education launched the National Education Digitalization Strategy, upgrading China's educational informatization from Education Informatization 2.0 to a digital strategy action, transitioning from a supporting system to a strategic action, opening a new chapter of qualitative development. Despite progress in technology application, management concepts, personnel quality, and funding, university information management still faces challenges, such as fragmented and isolated digital campuses, digital decision-making analysis, and network and information security, which require continuous improvement[2].

Regarding the development of university education information management, the Ministry of Education is actively organizing the preparation of the "China Smart Education Development Plan," focusing on the new educational ecosystem in the intelligent era. From the perspective of promoting

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supply-side reform in education, under the guidance of educational modernization, universities are adhering to their essential roles of "cultural transmission, knowledge creation, and talent cultivation." From the basic standpoint of "moral and character education," the plan aims to guide the integration of big data and AI into higher education. The use of educational technologies, such as "Big Data Education" and "AI Online Classes," can have a significant impact on the educational ecosystem, environment, methods, and management activities.

Although the majority of universities in China are moving towards informatization and intelligent teaching management, and educational resources are gradually being effectively integrated, this situation has both advantages and drawbacks. On the one hand, it greatly expands the horizons of learners and provides educators with a more optimized platform. On the other hand, most of the educational resources are not differentiated for various student needs, neglecting individualized training for learners, which makes it difficult for some students to benefit from the convenience and efficiency brought by abundant teaching resources[3].

3. Overview of Big Data and Artificial Intelligence

Big data and artificial intelligence are two crucial concepts and technologies in today's technological domain. Big data refers to a large and complex data set that is difficult to acquire, manage, process, and organize into effective information for decision-making using traditional data processing methods within a reasonable time. Its characteristics include large volume, diverse data types, fast data processing speed, and low data value density. Big data technology involves multiple stages, such as data collection, storage, processing, analysis, and visualization. Artificial intelligence refers to technologies that allow computers to simulate human intelligence. It aims to enable computers to learn, think, reason, and solve problems like humans. AI has a wide range of applications, including machine learning, deep learning, natural language processing, computer vision, intelligent robots, and expert systems. Big data provides rich data resources for AI, enabling AI models to learn and predict more accurately. AI, in turn, can extract more valuable information and knowledge from big data, realizing intelligent processing and application of data. The two complement each other and jointly drive technological advancement and societal development. As AI and big data technologies continue to progress, their integration with university information management becomes closer, profoundly influencing information management and changes in teaching models[4].

4. Applications of Big Data and Artificial Intelligence in University Information Management

Big data and artificial intelligence have a profound impact on university information management, further pushing the level of informatized management to new heights. Firstly, big data and AI can ensure that data in university information management is effectively managed, improving the value of data utilization. They enable timely analysis of relevant issues through data and facilitate effective decision-making. Secondly, big data and AI can expand the scope of university information management and encourage greater participation, ensuring more accurate decision-making. With more effective data support in decision-making, decision-makers have more references, which helps better integrate teaching and management.

4.1. Student Management

The application of big data and AI technologies in student management can further improve management efficiency. Universities can establish comprehensive student information management systems, collecting and managing student information to understand their daily situations. The system also considers course selection to meet students' diverse needs, generating a variety of data. These massive datasets can be efficiently managed using big data and AI technologies. By analyzing students' consumption data, library visits and borrowing data, internet behavior management data, etc., universities can assist in psychological health management, support counselors in managing students, and help decide on financial aid for students in need. For example, by analyzing the time and location of students' consumption data, universities can identify those who may be socially

isolated, assisting in evaluating their mental health. By combining students' internet behavior data and class attendance data, universities can check for potential truancy. By comprehensively considering library visits and daily consumption data, universities can assess eligibility for financial aid. AI can also be used to design intelligent chatbots that understand students' natural language questions and quickly provide accurate answers. This improves efficiency, increases the precision of responses, and has strong scalability, saving time for both teachers and students, enhancing the efficiency of administrative staff, and avoiding redundancy in building information systems. These technologies can penetrate all aspects of students' and teachers' daily learning and life.

4.2. Application in Teaching Models

Universities must strengthen their transformation of teaching models, incorporating advanced quality education concepts to cultivate talents. In education, students should be placed in the central role, and full interaction and communication between teachers and students must be ensured. The application of big data and AI in teaching models can bring many innovations and improvements. Firstly, personalized learning can be achieved. By analyzing students' learning data and behavior, the system can create personalized learning paths and plans for each student, tailoring teaching to individual learning styles and needs. Based on students' learning data and performance, AI systems can provide personalized tutoring and feedback to help students overcome learning difficulties and improve their learning efficiency. Secondly, teaching content can be optimized. Based on students' interests, learning history, and skill levels, the system can intelligently recommend appropriate textbooks and learning resources, improving learning outcomes and engagement. By analyzing learning data and feedback, the system can intelligently optimize course content and teaching methods, making teaching more engaging and effective. Thirdly, the teaching process can be improved. AI systems can automatically evaluate students' learning performance and comprehension levels, providing teachers with more accurate and comprehensive assessment data, which helps teachers adjust their teaching strategies in time. Through big data analysis of students' learning data, the system can provide real-time feedback on student learning conditions and performance, allowing teachers to identify problems early and intervene. Lastly, teaching management and supervision can be enhanced. By analyzing teaching data and student feedback, the system can monitor teaching quality, identify problems and bottlenecks, and implement timely improvements. By analyzing teachers' teaching data and student evaluations, the system can assess teaching abilities and provide personalized training and support for teachers. The application of big data and AI in teaching models helps improve teaching effectiveness, personalized learning, optimization of teaching content and methods, and enhances teaching quality and management levels. As these technologies continue to develop and improve, they will bring more innovations and improvements to the education field.

4.3. Application in Faculty Development

Utilizing big data and artificial intelligence technologies can provide comprehensive solutions that enhance teachers' abilities, continuously improving their overall quality, and cultivating qualified talents. This can address issues such as the imbalance in the age structure of faculty, misalignment between disciplinary backgrounds and program setups, and mismatches between teaching abilities and student needs. Firstly, in recruitment and selection, big data can be used to analyze students' academic performance, interests, and overall quality, helping universities to conduct more scientific selection and recruitment for faculty development programs. Combined with AI technology, interviews, evaluations, and selection for faculty training programs can be enhanced, improving the objectivity and fairness of the selection process. Secondly, in course design and teaching, big data analysis of students' learning needs and teaching outcomes can optimize course designs for faculty development to better align with practical requirements, improving training quality. AI can provide personalized teaching assistance to faculty training instructors, helping them better respond to students' learning characteristics and needs. Thirdly, for internships and practical training, big data analysis of students' internship situations and feedback can intelligently arrange internship tasks and practical activities for faculty development participants, enhancing the quality of practical training. Big data can also analyze practical training data, helping faculty development students better

understand the real work environment and demands, thereby improving practical training outcomes. Lastly, in teaching management and evaluation, big data analysis of teaching data and student feedback can monitor and evaluate the quality of faculty training, identifying problems promptly and implementing improvements. AI can evaluate and guide the teaching abilities of faculty training instructors, improving their teaching skills and capabilities. The application of big data and AI in faculty development can help improve training quality, personalize training, optimize course design and teaching methods, and enhance teaching quality and management levels. As technology continues to evolve, these applications will bring more innovation and improvement to the field of faculty development.

4.4. Application in Administrative Management

University data can provide references for administrative departments to adjust work priorities and better serve faculty and students. The application of big data and AI in university administrative management can bring numerous innovations and improvements. In terms of enrollment and student management, big data analysis of past enrollment data and trends can help universities in enrollment planning and forecasting, allowing them to better face future enrollment challenges. A student record management system can be established using big data technology to comprehensively record and manage student information, providing more personalized services. In teaching quality management, big data analysis of students' course evaluation data and academic performance can help universities optimize course settings and teaching methods, improving teaching quality. Combined with AI technology, an academic early warning system can be established to help universities identify student learning problems early and intervene, improving student academic performance and graduation rates. In financial and resource management, big data analysis of university financial data can establish an intelligent financial forecasting model, helping universities in financial planning and improving financial management efficiency. Big data analysis of university resource usage can optimize resource allocation and usage efficiency, enhancing resource utilization and management levels. In campus safety and supervision, AI technology can be used to establish an intelligent campus safety monitoring system, achieving smart monitoring and warning for campus safety, thereby improving campus safety management. In human resource management, AI can establish an intelligent recruitment system to assist in recruitment and assessment, improving talent acquisition and management efficiency. Big data analysis of faculty performance data can help establish a performance evaluation system, enhancing faculty management levels. The application of big data and AI in university administrative management can help improve management efficiency, optimize resource allocation, improve teaching quality and student services, and enhance overall management and service quality. As technology continues to develop and improve, these applications will bring more innovation and improvements to university management.

5. Conclusion

The innovation of the information management model of universities supported by big data and artificial intelligence provides new opportunities for university development. Through the rational application of big data and AI technologies, universities can innovate their management models, improve management efficiency, and enhance education quality. Promoting the integration of big data, AI, and educational management aligns with the intrinsic requirements of higher education reform and is an inevitable trend of the times. Universities and educators should leverage technology to empower education, fully explore the educational potential of AI in educational management, efficiently utilize big data and AI information resources, and comprehensively implement technological means. This will create favorable conditions to comprehensively enhance the quality and efficiency of educational management work, lead modernization through digitalization, realize intelligent education management, and support the healthy growth and comprehensive success of university students in the new era.

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