

Research on the application of university education management driven by big data

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Abstract: With the rapid development of information technology, the application scope of big data is becoming increasingly widespread. In the management of higher education, big data plays an irreplaceable role. This article first analyzes the application cases of big data in universities, and further explores its advantages in analyzing students' learning behavior and evaluating teaching quality, then, highlights the problems in the application of big data and puts forward targeted suggestions to further promote the intelligent and efficient development of university education management.

Key words: big data; higher education; information safety

1 Introduction

In the digital era, big data technology has had a profound impact on the management of higher education. By studying the application of big data in student learning behavior analysis, teaching quality evaluation, and other aspects, its potential advantages and problems are explored. At the same time, ensuring data security and privacy protection, promoting interdepartmental cooperation and information sharing, will promote the direction of intelligent and efficient education management in universities.

2 The potential and challenges of big data in higher education management

2.1 The significance and background of big data in education management

The widespread application of big data technology in various fields, such as personalized recommendation, data analysis, learning behavior analysis, prediction and trend analysis, as well as resource optimization and efficiency improvement, demonstrates its importance in decision support, resource optimization, personalized services, and other aspects. In education management, big data technology is also of great significance. By analyzing students' learning behavior, personality traits, and learning trends, schools can customize learning plans and teaching content for each student, thereby improving learning efficiency and motivation. The continuous advancement of big data technology will bring new ideas and methods to university education management, further improving the quality of education and student development.

2.2 Existing problems in higher education management

The current education management in universities faces some challenges and problems, mainly including information asymmetry, uneven resource allocation, difficulties in evaluating and monitoring teaching quality, insufficient student learning support, imperfect professional development and incentive mechanisms for teachers, and slow progress in the application of new technologies [1]. These issues may affect the scientific, fair, and efficient management of higher

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education. To address these issues, university administrators need to strengthen information sharing and communication, establish a scientific resource allocation mechanism, build an effective teaching quality evaluation system, strengthen student learning support and guidance. Through these efforts, universities can optimize education management, improve education quality, and better meet the needs of students and society.

2.3 The potential of big data technology in education management

The application of big data technology in university education management has great potential, especially in analyzing students' learning behavior and evaluating teaching quality. Through big data technology, schools can achieve personalized learning support, predict student's learning risks, analyze student's learning behavior patterns, and better meet students' learning needs and improve learning outcomes. At the same time, establishing a comprehensive teaching quality evaluation system, utilizing big data visualization to present teaching effects, and timely obtaining teaching feedback from students can help teachers and school administrators optimize teaching strategies and improve teaching quality [2].

2.4 Privacy and security issues in big data applications

Figure 1 shows the scale of the domestic network information security market from 2016 to 2022. From the perspective of big data security, the bar chart of the increasing scale of the domestic network information security market from 2016 to 2022 reflects the continuous development and increasing importance of big data in the field of network information security. With the application of big data technology, the importance of network information security should also increase.

The application of big data technology in education management also faces important issues such as privacy protection and data security. The application of big data usually involves a large amount of personal data of students and teachers, such as academic performance, learning behavior, health information.

Due to the complexity and diversity of big data, it may face various security risks during the collection, transmission, storage, and processing processes. These security issues may lead to the leakage of sensitive data and even cause serious damage to education management.

In addition, the sharing and collaboration of big data also poses challenges to privacy protection and data security. In the field of education, different institutions may need to share student data for educational research and evaluation, but data sharing involves issues such as managing data access permissions and limiting data usage. In the process of data sharing, it is necessary to ensure that data privacy is effectively protected to avoid data abuse and illegal use.

The application of big data in education management faces important issues such as privacy protection and data security. Universities and related institutions should attach importance to these issues, establish strict data management and privacy protection systems, adopt encryption and secure transmission technologies, strengthen data access control, and establish data security monitoring and emergency response mechanisms.

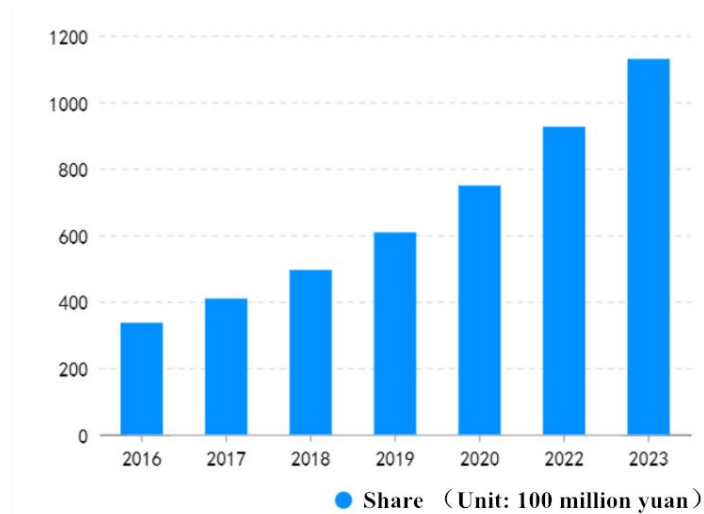


Fig. 1. Scale of China's network information security market from 2016 to 2022.

3 A case study on the practice of higher education management driven by two big data sources

3.1 Application of big data in analyzing student learning behavior

Taking universities as an example, using big data technology to analyze students' learning behavior and provide personalized learning suggestions is an important development direction. By collecting, integrating, pre-processing and cleaning students' learning data, schools can deeply explore students' learning behavior, and understand their learning patterns and difficulties. This application will make higher education management more intelligent and personalized, providing students with better learning experiences and development opportunities.

3.2 Big data support for teaching quality evaluation and improvement

Utilizing big data technology to comprehensively evaluate teaching quality and provide scientific data support for teachers is an important means of optimizing course design and teaching methods. By , integrating, pre-processing and cleaning students' learning data, it is contribute to establishing evaluation indicators and models to comprehensively evaluate teaching quality. Based on the evaluation results, it is contribute to providing personalized teaching suggestions and optimization plans for teachers to help them adjust teaching strategies and improve teaching quality.

3.3 Application of big data in enrollment and student development planning

In the process of college enrollment, using big data technology to predict students' potential development directions and provide accurate student development plans is an important and challenging task. Universities can use big data technology to collect and integrate data on students' academic performance, interests, social activity participation, and other aspects. These data can be used to build personal portraits of students, forming a comprehensive student information database.

Through big data analysis and data mining techniques, universities can conduct in-depth mining of student data, explore students' learning characteristics, potential interests, and advantages, and predict their potential development direction.

On the basis of predicting students' development direction, universities can use machine learning algorithms and intelligent systems to create personalized student development plans for each student. These plans can include selecting courses that are suitable for students' interests and abilities, providing opportunities for participation in academic research, social practice, and internships [3].

Importantly, universities need to continuously update and improve their student information databases, and conduct data analysis and optimization to improve the accuracy and relevance of predictions and planning.

4 Strategies for the reform of higher education management driven by three big data

4.1 Optimizing data collection and processing processes

To improve the data collection and processing process in university education management, ensure data quality and effectiveness, universities can take the following measures:

(1) Establish standardized data collection procedures and standards. Universities should clarify the purpose, scope, and frequency of data collection, and develop relevant data collection standards and norms. At the same time, the format and data fields of data collection for subsequent data processing and integration should also be unified.

(2) Utilize modern information technology means for data collection. Universities can utilize advanced technologies such as information systems, learning platforms, and academic management systems to achieve automated or semi-automated data collection. This not only improves the efficiency of data collection, reduces human errors, but also ensures the timeliness and accuracy of data.

(3) Strengthen data quality control and verification. During the data collection process, universities should establish dedicated data quality control positions or teams responsible for monitoring the accuracy and completeness of data. They should verify the collected data, promptly identify data issues, and collaborate with relevant departments to resolve them. At the same time, establish data quality evaluation indicators should be established and data quality should be regularly evaluated and improved.

(4) Establish a comprehensive data processing process and data analysis methods. Universities should establish special data processing teams responsible for data cleaning, integration, and analysis. The data processing process should be scientifically standardized to ensure the integrity and consistency of the data. At the same time, universities should select appropriate data analysis methods and use technologies such as data mining and machine learning to discover hidden information and patterns in the data, providing scientific basis for educational management decision-making.

(5) Universities should strengthen the security and privacy protection of data management. Education data involves personal information of students and teachers, and the protection of data security and privacy is crucial. Universities need to establish a sound data security management system, strengthen the confidentiality and permission management of educational data, and ensure the security of data during collection, processing, storage, and transmission.

4.2 Strengthen teacher training and technical support

In order to better apply big data technology to education management, universities need to take measures to strengthen teacher training and technical support. In addition, shared communication opportunities promotes experience exchange, technical support teams provide real-time assistance, and incentive measures encourage active use. These measures will enhance teachers' proficiency and confidence in big data technology, promote the development of educational management towards data-driven and intelligent direction, and provide better educational experiences and development opportunities for students.

4.3 Establishing privacy protection and data security mechanisms

To protect student privacy and ensure data security, universities can take a series of effective measures to prevent potential security risks. The most important thing is to establish strict data management systems and policies, clarify the principles of data collection, storage, transmission, and use, as well as hierarchical management of data access permissions, in order to standardize the legitimate use of data and prevent unauthorized access and use. Universities also need to strengthen data access control, establish permission management mechanisms, and restrict different users' access to data

[4]. At the same time, in the process of data transmission and storage, universities can use data encryption technology to encrypt sensitive data, ensuring that the data is not illegally obtained and tampered with during transmission and storage, and use secure transmission protocols such as SSL/TLS to ensure the security of data during network transmission. In addition, universities should establish a data security monitoring team to regularly monitor data access and usage, timely detect abnormal behavior, and establish a data security emergency response mechanism to quickly respond to and handle potential data leaks and security incidents.

4.4 Encourage cross departmental cooperation and information sharing

By promoting cooperation and information sharing among different departments, big data technology can be better utilized to promote the development of higher education management. In the management of higher education, it involves multiple departments and various educational data, such as student academic performance, student registration information, and teaching evaluation. These data are scattered across different systems and departments, and if they cannot be effectively integrated and shared, it will limit the application effect of big data technology in education management.

Therefore, universities should encourage cooperation and collaboration between different departments and establish cross departmental data sharing mechanisms. By sharing educational data, various departments can have a more comprehensive understanding of students and teaching situations, form a global data perspective, and better make decisions and optimize educational management. For example, data on students' learning performance, participation in activities, and other learning behaviors in different courses can be integrated for comprehensive analysis, providing more accurate student development planning and teaching improvement suggestions for teachers and school managers.

Establishing a cross departmental data sharing mechanism also helps to improve the quality and accuracy of data. Data sharing between different departments can promote data validation and verification, avoid data duplication and errors, and thus improve the credibility and effectiveness of data. In this way, by better utilizing big data technology for education management, universities can have a more comprehensive understanding of the education situation, make more accurate decisions and plans, and thereby improve the level and efficiency of education management.

5 Conclusion

The application of big data technology in university education management is of great significance. However, the application of big data also faces privacy protection and data security issues, requiring the establishment of strict data management systems and strengthening of data security measures. By promoting cooperation and information sharing among different departments, and making better use of big data technology, the development of intelligent and efficient education management in universities will be promoted.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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