



Data Management and Solutions in the Open
University from the Big Data Analysis
Perspective

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Abstract

Purpose – In order to break the Information Island (it refers to computer application systems that are not functionally related or mutually supportive, do not share or exchange information) through relevant information technology, the following findings and implications are proposed to solve the cult of big data (only have belief in big data and lose own thinking), the risk of "big data only" and the problem of data security.

Design/methodology/approach – This article have used four methodologies, including Literature research method; Design-based research; Questionnaire survey method and Data modeling method.

Findings – Under the perspective of big data, also combined with the university environment of open education, the findings of big data analysis in open education can be found. Firstly, it is necessary to break the information barrier through relevant information technology, so as to achieve the real sense of campus openness. Secondly, it should provide relevant data and information which can support the construction of open campus. Exploring the applications of big data analytic in open education and its extended Applications in teaching services, campus services and campus management. Thirdly, it is necessary to achieve data sharing of university reuse through the mutual platform construction. What is more, considering hierarchical management & implement intelligent applications as well as strengthen the top-level design, and start pilot study on Smart Alliance Campus (it refers to campus have close connection with smart machines & software). Protecting data privacy, and improving information security at the same time. It also indicates the comprehensive governance of big data in education.

Originality/value/implications –

The big data technology is a new technology that has emerged in recent years and is closely integrated with peripheral enabling technologies such as cloud computing and artificial intelligence, and is somewhat cutting-edge. The mining and analysis of huge amounts of data has become an inevitable trend in the information age. It has become the consensus of the society that whoever grasps the data will have the first chance to develop. Therefore, it is necessary to use big data analysis as technical support for the long-term development of colleges and universities to do infrastructure construction. Explore the construction of a new type of learning community that is interconnected, open and sharing high-quality teachers. Committed to making big data analysis technology ubiquitous, popular, intelligent, and more adaptable to the increasingly open and shared modern universities.

Keywords: data management, open university, big data

1 Introduction

Due to the state's recent tightening of criteria and increasing spending, information technology-driven education modernization has emerged as a crucial approach for China's educational growth in recent years. Extensive data analysis, representing campus information technology, has distinct development possibilities in the constantly developing and accelerating field of contemporary information technology. With the advent of Education 4.0, new conceptual frameworks for educational growth and paradigm shift are available (Wang, 2020). Like the above, China Education Modernization 2035 highlights the importance of emphasizing innovation and technical skill development, stressing the requirement for universities to positively respond to campus information technology development goals and develop information capabilities in an integrated plan. As a strategic resource for advancing educational modernization, data is becoming an increasingly important component of the in-formalization of universities.

1.1 Background

Big data technology has emerged in recent years and is now deeply entwined with other enabling technologies like cloud computing, artificial intelligence, and other ancillary ones. The extraction and analysis of massive volumes of data have become standard practice in the digital age. The prevailing consensus in society is that the one with the best chance of advancement is the one who is skilled with data. On the other hand, big data analysis techniques are still being tested and explored in the context of colleges and universities. And the confluence of open learning and research is something new. The development of projects at colleges and universities relies heavily on expanding big data platforms, and the shift from traditional data center platforms to big data platforms is an inevitable trend in that development. To build the infrastructure necessary for colleges and universities to flourish over the long term, extensive data analysis must be employed as a technological help.

It is essential to dismantle information silos with the help of relevant information technology to achieve a natural feeling of campus openness. To promote the growth of an open campus, it is also vital to give pertinent data and information. With the help of big data, the university environment of open education, and application on the ground in teaching services, campus services, campus management, and other areas, we investigate the use of extensive data analysis in open education on the various types of wisdom embodied in the learning and work of teachers and students as well as audience users.

2 Problems

2.1 The Problem with Data silos

According to the definition of a data silo provided (Wu, 2020), each department's data functions as an island that cannot or is very difficult to connect to and interact with when it comes to other internal departments' pertinent data. The development of university informatization complies with the mainstream construction direction of "one network, three channels, and two platforms," as stated in the National Education Informatization "13th Five-Year Plan" and the "Education Information Technology Development Plan." In particular, "Smart Alliance Campuses" (including network integration), management information bases (including extensive data analysis and decision support systems), learning resource bases, and other related products and services have taken center stage in the common building approach, which is similar to "one network, three channels, and two platforms." Due to this, there is a concern about the homogeneity of core operations and the need for more research and development for peripheral products. Due to the lack of top-level design in building planning and the chimney construction issue brought on by "Education Informatization 1.0," data silos are becoming more prevalent. Promoting deep data mining to assist decision-making, which is an exceptional performance in university information management and maintaining and keeping daily data, takes a lot of work.

2.2 Personalized, Widespread, and Multi-terminal learner group features

The Open University supports customized, dispersed, and multi-terminal student groups due to its emphasis on open education. The Open Institution, a new kind of university built on the Internet and using multiple media technologies as the medium, primarily for adult learners, has entered the 2.0 phase with the expansion of information media (Bao, 2018). As an example of how Zhejiang Open University has adapted to the blending of online and offline learning styles (with the use of resources in the learning resource library), the Zhejiang Learning Network based on B/S is presented to students; the Zhejiang Learning app based on C/S (convenient for learners to use mobile devices to learn anytime and anywhere) & Microtelecom University (a WeChat-based institution which is convenient for learners to log in WeChat for learning and information inquiry). It is essential to consider carefully adjusting to the popular learning styles of socialized learning and personalized learning, as well as coordinating and managing the learning channels based on each platform and system so that students can appreciate the convenience of multifaceted learning channels.

2.3 The Big Data Cult and the Danger of "Big Data Only"

According to research, Big Data exhibits the 4Vs, or volume, velocity, variety, and value (Nan, 2020). The risk of "big data only" for individual users or the entire population may result from the blind worship and excessive use of big data. Through several processes, such as data cleansing based on enormous data gathering, data mining, analysis of valid data, derivation of pertinent information, and pushing of adaptive services, big data is offered to each individual. The direction of extensive data mining and analysis is greatly influenced by learning and inferring the characteristics of individual users. This approach is vulnerable to issues like unthinkingly pushing similar and identical user interest points, resulting in diminishing marginal utility.

2.4 Data Security Concerns

Big data's fluid and interchangeable nature maximizes information sharing, yet indiscriminate data mining, excessive data gathering, and misuse result in several data security issues (Jin, 2020). The campus Wi-Fi and its accompanying infrastructure are the most evident embodiment in higher education (including wireless hot spots, network access, etc.). Access to university intranet office websites and informational repositories on campus, such as knowledge networks, typically lacks additional firewalls and other security barriers, making them highly vulnerable to hacker attacks. One example is altering school homepage images on ZJU's official website to achieve illegal propaganda goals. On the other hand, when university data is shared with organizations outside the institution, like suppliers, it is not encrypted or sent through insecure channels, which easily allows for the leakage of related student and parent information and poses a hidden risk to the security of Internet privacy.

3 Solutions

The solutions can be put forward as follows:

3.1 Platform Interoperability and Data Sharing & Reuse

Construct an open data platform utilizing open-source software to facilitate data sharing and reuse and ensure platform compatibility. We are extending to developing university platforms, i.e., creating a platform for university public data and gathering data using API (application programming interface) technology. Data integration, sharing, and application of business systems are further enhanced by combining data collectors and achieving data storage, interchange, and sharing. We converge, filter, and categorize a substantial amount of video teaching materials about the widely used MOOC and SPOC course systems, in addition to the technological tools of micro-class and flipped classrooms, to build the province's university application data resource base and effectively create a blended learning environment for students. Zhejiang Provincial Education Bureau relies on the Zhejiang Provincial Education Technology Center to build a unified database in the province from the ground up. This database gives universities in Zhejiang Province a uniform reference audit

standard table structure, specifies the primary table's mandatory fields and reference field classification, and provides basic construction information like database Chinese and English cross-reference annexes. From a more visual perspective, considering Fig. 1 below, the Zhejiang Learning Code can count the number of applicants in real-time and match it to the map board to draw a visual image of the analysis conclusion and achieve the goal of data sharing. The Zhejiang Learning Network is open to both academic and non-academic education.



Fig.1: Zhexuema running data visualization screen

3.2 Hierarchical management and Intelligent applications

The gathered ample data resources can be intelligently applied using artificial intelligence (AI), augmented reality (AR), virtual reality (VR), and other cutting-edge technologies to create immersive experience activities, support personalized learning, and adapt to the needs of personalized, ubiquitous, and multi-terminal learner groups. A reference application example that demonstrates how it can be used in conjunction with AI, extensive data analysis, new media technology, and data screens to create a social service center that integrates brilliant learning experience and teaching display is the Zhejiang Kai Le Learning Port on Jiaogong Road in Hangzhou, Zhejiang Province. Beginning with hierarchical administration, we might employ matching algorithms to manage and track adaptive learning and use the interaction module to develop an advanced adaptive online education learning system.

3.3 Enhancing Top-level Design with Smart Alliance Campuses

The Ministry of Industry and Information Technology (MIIT) issued a three-year action plan (2018-2020) in August 2017 to aid in developing a new generation of AI industry. The Ministry of Education created the "Development Plan for AI+Education" of the Open University using this data and the actual circumstances of

the Open University as a foundation, stressing the significance of paying close attention to the top-level design of "AI+Education" and the pilot study of the Smart Alliance Campus. The Smart Alliance Campus concept and architecture should be used to increase the accuracy of educational services. The specific implementation process should make full use of big data technology to achieve dynamic, extensive data collection, real-time analysis, and decision support, as well as to support new technologies like the Internet of Things, cloud computing, mobile 5G, etc., and connect to various teaching applications. The creation of a network security assurance system is also crucial; this system must be set up to enable real-time monitoring of vulnerability mining and security testing in addition to being effective at preventing holiday network security. Fig. 2, which depicts the topology of the university network as it is being built, top-level security configuration work deployment, monitoring security situational awareness system, paying attention to network attacks, inspecting log auditing system, viewing logs of each security device, paying attention to database firewall, fortress machine, and antivirus software, analyzing network security architecture, troubleshooting network security risks, and implementing.

3.4 Protecting data, Maintaining privacy, and Improving Information Safety

The school should use information security techniques and sustainable management practices to protect data and privacy. These techniques are required to address various data security issues brought on by information mining, overzealous data acquisition, and abuse. The Network Security Law and the Implementing Rules of Equal Protection 2.0, among other essential laws and regulations, have been adopted, providing the necessary policy support for successful information security activities at the political level. The increase in network attacks has indirectly sped up the development of information security solutions, and colleges may now choose from a broader range of products with better features. It is suggested that an electronic file data management platform separate from the school's data center be created due to the significant data convergence aspects of the Open University. As a result, electronic file data may be maintained, stored, archived, and used effectively and independently. During the daily maintenance and processing of big data, the school will establish firewalls and other security barriers, and security instruments like fortress machines will record the information used by system administrators and users to play a supervisory role.

The Open University shall use caution when sharing personal information with parties other than suppliers to protect student data privacy and prevent unauthorized information disclosures. It is proposed that universities utilize technologies like tokens and passwords and rely on processes like restricting access rights to protect user privacy better and increase information security.

3.5 Integrating Big Data Governance in Education

The four major components of integrated big data governance in education are listed below. We first look at the sensing data gathered by sensing devices and intelligent sensor technologies, including RFID and GPS, to understand the patterns of data

gathering at the physical level. The ample educational data resources gathered are carefully analyzed utilizing three essential data operations: data mining, data analysis, and storage. A variety of areas, including decision simulation, sentiment analysis, and learning prediction, are covered by data mining approaches. Modern data analysis methods based on extensive data analysis are used for statistical, graphical, and predictive analyses. Because it is effective and valuable, the Open University uses visualization analysis. Visualization displays can be built on campus to give real-time data updates on students, course materials, and learning outcomes.

Regarding supporting decision analysis, the development of the leader driving bin, which can visually display the results of extensive campus data analyses, is mentioned. These analyses include teacher arrival, stranger behavior, classroom and meeting room usage, and air conditioning and lighting energy consumption. To investigate the creation of a new learning environment with connectivity, transparency, and exchange of excellent instructors. We encourage the creation of an open campus with data and information. We will discuss the use of extensive data analysis in open education in the context of the university setting. We will look at how it can be applied to the work and learning of teachers, students, and audience members, as well as the use of extensive data analysis in teaching services, campus services, and other areas.

4 Conclusion

To look into creating a new learning environment that emphasizes connectedness, openness, and exchange of top teachers. We are committed to advancing big data analytics so that it is intelligent, pervasive, and better suited to modern organizations' more transparent and cooperative character. We provide information and data support to create an open campus. The application of extensive data analysis in open education will be presented in a university environment. We will also consider how it may be utilized in teaching services, campus services, campus administration, and other areas and how it can be used in the work and learning of instructors, students, and audience members.

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