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Exploring the Information Management and Information System Framework for Smart Campus Construction

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Abstract

As research and applications related to big data and artificial intelligence continue to deepen, people are gradually recognising the value of data as an important strategic resource. In various fields, resource sharing and data interaction have become the norm in daily life, and the education field is no exception. 2021, the CPC Central Committee and the State Council issued the 'Opinions on Promoting the High-Quality Development of Modern Vocational Education', which explicitly puts forward the goal of accelerating the integration of modern information technology and education teaching, in order to improve the quality of teaching and learning. Therefore, there is an urgent need to build a 'smart campus' on the basis of existing technology and optimise the integration of campus information systems.

Keywords

Smart campus construction; modern information technology; information systems.

1. Development of Smart Campus

1.1. Smart Campus Concept and System Framework

The development history of smart campus construction can be traced back to the beginning of the 21st century. With the rapid progress of information technology, the education field began to try to integrate digital and networked technologies into campus management and services. At first, the main focus was on the construction of basic information technology facilities, such as campus networks and digital libraries. Subsequently, it entered the stage of integration and application to achieve intelligent upgrading of teaching, management and service through the integration of ERP, CRM and other systems. In recent years, with the introduction of cutting-edge technologies such as big data, cloud computing, artificial intelligence, etc., the construction of smart campuses has moved towards deep integration and innovative development, and is committed to building a future education ecosystem of personalised learning, intelligent management, and all-round services.

Currently, there are a huge number of campus information systems, each of which is targeted at solving specific problems, but lack circulation and interaction. There are separate systems for student tuition payment, campus one-card top-up, academic affairs management and human resources management. This fragmentation leads to inefficient use and increased time costs. At the same time, the communication of some important information still relies on telephone or manual communication, with the risk of cyber fraud. The graduate departure process also suffers from inefficiencies, such as the need to go to various offices with paper slips, leading to inefficiencies. Therefore, we urgently need to optimise and integrate the existing campus information system. The purpose of this paper is to analyse and explore the information management and information system framework for the construction of smart campuses, and put forward feasible suggestions for the existing campus system for the reference of relevant personnel. At the same time, based on big data and artificial intelligence technology, intelligent

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campus management is realised through advanced information technology to meet the requirements of the development of the times and educational needs.

2. Development Dilemma of Smart Campus Construction

2.1. Data Silos

Nowadays, all kinds of information systems on campus are like stars, covering teaching management, student services, library resources, financial management and one-card services, etc., which largely improve the efficiency and convenience of campus management. However, this phenomenon also brings a problem that can not be ignored: most of these systems are independent of each other, the lack of unified planning and effective integration, resulting in the 'data silo' problem is becoming more and more prominent. In addition, this data fragmentation also greatly impedes the process of data-driven decision-making. When making long-term plans, evaluating teaching quality and adjusting resource allocation, school management often finds it difficult to make scientific and accurate decisions due to incomplete or untimely data access. For students, frequent switching between different systems to search for information not only reduces their experience, but also affects their overall satisfaction with campus services.

2.2. Lack of unified long-term planning layout

On the one hand, most of the information systems currently in use lack foresight in design and fail to keep pace with the rapid development of education informatisation, making it difficult to quickly adapt to the growing diversity of needs in terms of functionality and performance, with key business areas not receiving the attention and support they deserve, and non-core functions occupying too many resources, resulting in a needless waste of resources. On the other hand, the lack of global planning has weakened the development potential of the system, and it is difficult for all participants to agree on the goal setting and interests, which directly leads to the slow construction process and makes it difficult to effectively respond to the new challenges and demands that may arise in the field of education informatisation in the future.

2.3. Difficulty in actual implementation

Firstly, the integration and upgrading of technology is a major challenge. The compatibility of information systems from different vendors and standards, as well as the stability and security considerations in the application of new technologies, have all made the promotion of smart campuses more difficult. Secondly, the high cost of capital investment and continuous maintenance, especially in the initial construction and later continuous optimisation phases, requires a large amount of financial security, which is an unaffordable risk for some schools with limited resources, especially in remote and backward areas. Furthermore, the acceptance of the smart campus system by teachers and students and the cultivation of their usage habits is also an issue that cannot be ignored. Some teachers and students may not be able to give full play to the advantages of the system or even slow down the efficiency of the work due to their unfamiliarity or resistance to the new technology. In addition, the construction of smart campuses faces institutional obstacles such as insufficient policy guidance and support, and the difficulty of cross-sectoral collaboration... All these bring considerable challenges to the full-scale promotion of smart campuses.

3. Construction Objectives of Smart Campus

3.1. One-stop online service to reduce manpower and time costs

In fact, it is not difficult to find out that most of the management systems put into use by institutions of higher education are scattered and fragmented: a separate system for tuition fee

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payment; a separate system for recharging the campus card; a separate system for course management; freshmen can not be registered to use the relevant systems before enrolment; graduates do not even have a professional system to leave the school, and they are still mostly in the stage of paper-based, manual input results. Therefore, there is a strong demand for optimising and integrating the various sub-systems. Through system integration and unified identity authentication, one-stop aggregation and authentication of teaching management, financial system, personnel system, office system, etc. can be realised, so as to let 'information run more, teachers and students run less', and to provide a smarter and more efficient education and teaching service environment.

3.2. Promote data circulation and realise algorithmic 'decision-making wisdom'

In the structure of the smart campus, when each module adopts the unified principles and standards and realises the efficient interoperability of data, the managers will be able to make multi-dimensional accurate and comprehensive enquiries on all departments and disciplines of the whole university with the help of big data technology, import and export various reports within their authority, and provide data support for the formulation of school policies and the direction of future development. For example, if the college wants to know how the teaching situation of a certain discipline is, it can directly query through the platform, and the system will automatically present line graphs of the results of previous students, so as to timely identify problems in teaching and facilitate teachers to make dynamic adjustments. Compared with the current cumbersome and inefficient process, it is not only more convenient and efficient, but also saves the cost of resources and allows the algorithm to help us quickly analyse.

3.3. Help achieve efficient control of energy and improve the safety of campus life

We often see cases of explosion and fire due to improper use of electrical appliances in the news, and these problems are also lurking in our dormitory life, although the school and the hostel management have repeatedly stressed, and even tirelessly warned us to stay away from prohibited electrical appliances, but some students are still holding on to a sense of fluke and ignore it. Therefore, if we can achieve the campus water and electrical appliances and related equipment through an Internet of Things (IoT) platform, the IoT control, and timely treatment of abnormalities can reduce or even eliminate the occurrence of accidents, not only greatly save the cost of manpower and material costs, so that the energy control norms are highly efficient, but also able to teachers and students to create a safer and more harmonious campus environment.

4. Framework Design Model for Smart Campus Construction

4.1. Basic Model Design of Smart Campus

Based on the conceptual sorting and construction practice of smart campus, design the smart campus construction framework based on the application service layer, support platform layer, infrastructure layer and goal-oriented layer around the management goal and construction idea of smart campus.

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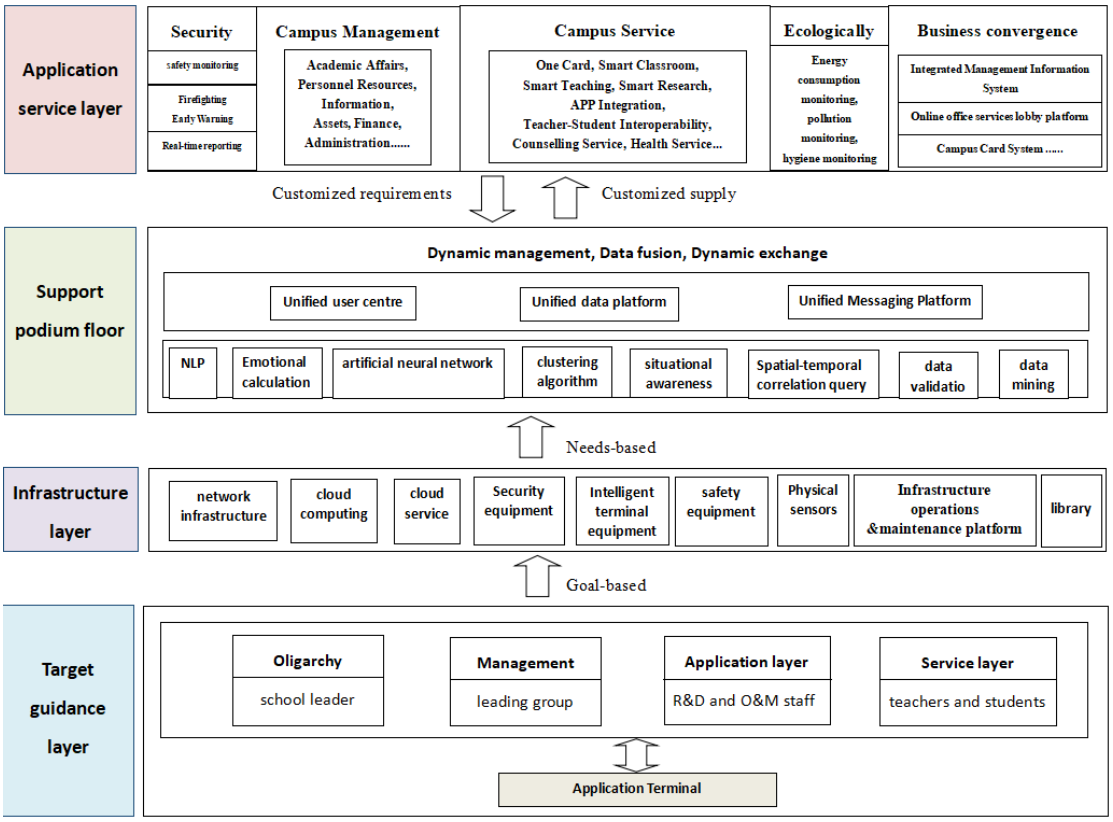

Figure 1 Framework diagram of smart campus construction

4.2. Smart Campus Shared Data Centre Model

Due to the lack of unified data standards between the systems of the previous smart campus, they could not realise the function of data exchange, and therefore had to rely on manual or semi-manual transmission when used across departments. In addition, when new business application systems need to be incorporated into the smart campus system, due to the lack of clear data exchange interfaces between systems, it is often difficult for the new system to be quickly integrated into the existing system, which greatly slows down the on-line process of the new business application system. In order to solve this problem, we need to establish a set of unified data sharing specifications and mechanisms, and build a data centre to provide campus-level unified data API services to help break down the data barriers between smart campus systems and achieve data sharing and collaborative development.

5. Construction Ideas of Smart Campus

The idea of building a smart campus should be centred on the three core areas of information technology, intelligence and humanity. First of all, it is necessary to clarify the construction objectives and conduct demand research to ensure that the programme is close to the actual needs. Subsequently, a high-speed and stable network infrastructure is built, a cloud computing data centre is established, and IoT devices are deployed to provide a solid foundation for the smart campus. On this basis, integrated application systems are developed, such as academic affairs management, teaching resources platform, campus one-card and smart security system, to simplify management processes, promote resource sharing and enhance campus security. At the same time, data fusion and intelligent analysis are strengthened to mine data value and optimise decision-making through big data analysis, artificial intelligence and other technologies. In terms of information security, a multi-level security protection system is established to ensure data security and privacy protection. In addition, technical training should be strengthened to create a smart campus culture of openness, sharing and innovation,

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and encourage the participation of teachers and students. Finally, the construction of a smart campus also needs to emphasise sustainability, establish a flexible and scalable system architecture and an evaluation and feedback mechanism to ensure that it can continue to be iterated and optimised as technology advances and educational needs change, providing inexhaustible power for educational modernisation.

6. Conclusion

General Secretary Xi Jinping said at the Fifth Collective Study of the Political Bureau of the 20th Central Committee in May 2023 that the digitisation of education is an important breakthrough for China to open up a new track of education development and shape a new advantage in education development. As an important part of 'Digital China', the digitalisation of education needs to make full use of the education dividend brought by digital technology, and contribute to the digital power for accelerating the construction of a strong education country. As an integral part of education digitisation, smart campus requires close cooperation and joint efforts of experts, scholars, teachers and students. Looking ahead, the construction of smart campus is a continuous iterative and optimisation process, we believe that with the continuous development of artificial intelligence, big data, cloud computing and other technologies, the level of intelligence and personalisation of the information management and information system will be further enhanced, which will create a richer and more diversified, efficient and convenient learning environment, promote the high-quality development of education, accelerate the construction of a strong education nation, and develop a new quality of productivity.

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