The Construction of Smart College Campus under the Background of Big Data

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Abstract: At present, different colleges and universities have different characteristics in the construction practice of smart campus. This paper analyzes the overall construction framework of smart campuses and provides ideas for the active application of technology such as the Internet of Things in colleges and universities. It also provides direction for the construction of smart campuses based on Internet of Things technology.

1. Introduction

At the beginning of its wisdom education program, IBM proposed the five major paths of smart education, namely, students' immersion in technology, personalized and diversified learning paths, knowledge and skills for economical service, globalization of system, culture and resources, and the key role of education in the 21st century economy.[1] With the rapid development of new technologies such as Internet of Things and artificial intelligence, etc., the United States, South Korea, Singapore, and China have all invested in research related to smart education. As the main content of smart education research, smart campus and smart classroom have attracted great attention of the academic community. The so-called smart campus refers to an open educational environment and convenient living environment, which is a concept oriented to personalized service for teachers and students and which can comprehensively perceive the physical environment, identify individual characteristics and learning scenarios of learners, provide seamless interoperable network communication, and effectively support the analysis, evaluation and intelligent decision-making in the teaching process.[2] The construction of smart campus has become a new form of higher education environment construction in the digital age.

At present, although the construction of smart campuses has been constructed one after another, different campuses have different characteristics in their construction practice. On the whole, the purpose of smart campus construction is to promote the construction and application level of informatization through active application of technologies such as the Internet of Things, so as to improve the overall strength and level of colleges and universities. At the same time, the construction of smart campus helps to explore the application of the Internet of Things in small areas as in colleges and universities, and also to accumulate more practical experience for the research and development of various related technologies such as sensor networks and Internet of Things.[3]

2. The Overall Idea of Smart Campus Construction

In the newly issued "Standards for the Construction of Digital Campuses in Primary and Secondary Schools" (hereinafter referred to as "Standards"), it is proposed that the construction of digital campuses in primary and secondary schools should adhere to the basic idea of 'application-deepening, integration and innovation" and should adopt a cloud service model for unified planning and step-by-step implementation, so as to promote the balanced development of regional education and the quality of school education. Through the construction of digital

campuses, the requirements of digitalization of campus environment, interconnection of information systems, improvement of user information literacy, and the innovation of learning styles and educational modes should be realized. Although the "Standards" clarifies that the scope of application does not include colleges and universities, it has, in general, a direct impact on and a referential significance for the construction of smart campuses in colleges and universities.

The construction of smart campuses in colleges and universities is based on the digital campus. Through the introduction of a series of emerging information technologies, it provides various intelligent business applications for teachers & students, and improves the activities of teachers and students in work, study and life.[4] Therefore, the construction of smart campuses in colleges and universities should take into account the smart environment, smart service, smart management, smart decision-making, comprehensive information sharing, and so on. Specifically, the construction of smart environment is mainly based on the development of the Internet of Things, and builds an intelligent hardware environment that meets the needs of teachers' teaching and research, comprehensive management, and campus life of teachers and students; smart service is to provide timely feedback, through various network platforms, on relevant equipment repairing, fault reminding, and comprehensive information in campus life, helping logistics service department to respond quickly to teachers and students' needs; smart management is to pay attention to various business process renovation in smart campus construction, to optimize the comprehensive efficiency of personnel management, educational administration, scientific research management, student management, etc., and to focus more on "handling" but less on "management"; smart decision-making is to provide scientific resolutions for students' "scholarship, subsidy and loan", based on the analysis and digging of the big data collected on the campus, especially those about teacher and student services and campus management; comprehensive information sharing is to consider the needs of all departments and systems on campus to provide resources, information and services that they all can share, so as not to cause "digital Island".

3. The Framework of Smart Campus Construction

Judging from the practice of the constructed smart campus in China, the "cloud network end" should be the core of smart campus construction, which has shaped a new technological form of smart campuses.[5] The smart campus framework of colleges and universities should be composed of client layer, platform layer, application layer and basic hardware facility layer, etc., as is shown in Figure 1.
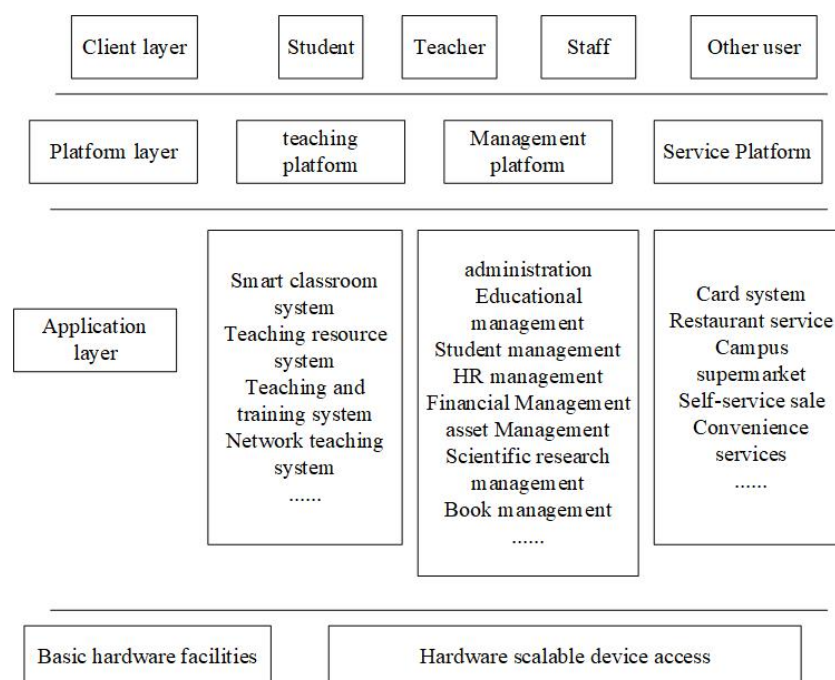

Fig. 1 Framework of Smart Campus Construction in Colleges and Universities

4. Client layer

Students, teachers, staff of various departments and the public can use the unified identification to directly access the smart campus system through PCs, mobile phones, or face recognition. They can perform corresponding operations and have free access to all services and resources that a smart campus provides.

5. Platform layer

The platform layer is the bridge for the user after entering a smart campus. The bridges can lead the user into corresponding teaching platform, management platform and service platform. For example, the management platform covers people, finance, and materials. Typical applications include smart certificates, smart libraries, and so on.[6]

6. Application layer

The construction of a smart campus is to achieve the integration and interconnection of businesses.[7] The application layer is mainly to achieve specific applications of various functions. For example, with the aid of the teaching resource system, the user can visit the content of the school curriculum resources and the scientific research resources on the campus; with the aid of teaching management and application system, functions such as course selection, class adjustment, and classroom borrowing registration can be realized; with the aid of the card system, big data can be collected and monitored from the card use of teachers and students, which can help to identify the situation of poor students, thus achieving "precise subsidy".[8]

7. Basic hardware facility layer

The basic hardware facility layer is to connect all existing hardware facilities to the smart campus system and to use the table and chair pressure sensors and infrared detectors to detect the use of classrooms in each building to maximize the utilization efficiency of the learning space.

8. Conclusion

The construction of smart college campuses is not only a new stage of campus informatization construction, but also a new revolution in the teaching, management and service modes of colleges and universities under the background of the nationwide "Double First-class" construction in colleges and universities.[9] The construction of smart campuses is to solve the problem of "bottleneck" such as non-uniformity and non-sharing of information, and to realize the functions of service integration, seamless service and seamless connection. On a smart campus, any user can access a unified portal interface with any terminal from any end through any portal. Users only need to visit the campus portal to conduct various applications such as graduation, enrollment registration, and faculty demission.

The application of Internet of Things in education has promoted the upgrade from "digital campus" to "smart campus", which enables IoT-based smart campuses to connect the objects on the campus and realize the visualized management of the campus.[10] Therefore, The core of smart college campus construction is the ubiquity and collection of information. The key problem of the construction lies in how to safely and reliably collect and analyze the information collected by various sensors. In the meantime, in the face of a large amount of data collection, whether the network can support the real-time sharing and interaction of information and avoid network congestion is also a problem that must be faced and solved.

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