Researches on the Construction of the Smart Campus System with respect to the Higher Vocational Colleges in the Information Age----Taking Dalian Vocational and Technical College as an Example

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Abstract. This paper analyzes the foundation and feasibility analysis of the construction of the smart campus system in higher vocational colleges, such as Dalian Vocational and Technical College, in the information age, including the existing problems and deficiencies. It proposes the specific framework and concept of conceive for the smart campus from the four levels, the sensing and the network layer, the data analysis layer, the application and service layer and the security maintenance layer. The smart campus aims at serving the teachers and students of the higher vocational colleges and related school-enterprise cooperation enterprises. The construction of a smart campus has far-reaching guiding significance and practical value for higher vocational colleges.

1. Research Background
Our life has changed dramatically with the rapid rise of next-generation information technologies such as the Internet, the Internet of Things, cloud computing, and artificial intelligence and the popularity of smartphones, tablets, and wearable devices. Higher Education under the wave of the information age, led by Zhejiang University, first proposed the idea of establishing the smart campus. On June 7, 2018, Tsinghua University and other more than ten universities and technology companies jointly drafted the national standard "Smart Campus Overall Framework", which was implemented on January 1, 2019.

As one of the higher education institutions, higher vocational colleges have the responsibility to cultivate the technology application talents needed for the country's future development and construction. It also should be the place where the development of science and technology is leading. The construction of smart campus should not only be popularized in undergraduate colleges, but it is also imminent in vocational colleges.

2. Analysis of the status quo of smart campus
2.1 The Foundation and Feasibility Analysis of the Construction of Smart Campus
Take Dalian Vocational and Technical College (short for DLVTC) as an example. The construction and application of digital campus has begun to take shape as of January 2019. It is comprehensively convenient for teaching, research, management, student life and so on. Firstly, the Xiajiahe campus and Nanguanling campus of DLVTC have achieved full coverage of wired and wireless networks. Secondly, Complete the construction tasks of school informationization standards revision, public basic database, unified portal platform, unified identity authentication platform, data exchange platform, etc. Thirdly,
In terms of campus management and services, the college has strengthened the construction needs of personnel, educational affairs, scientific research, campus cards and other business systems, and carried out the construction of various digital resources and digital books, which is gradually enriching the construction of various digital resources in schools. Lastly, mobile devices and networks serve as the carrier of emerging media and information, they are also effective positions for educating people and services in the campus network. The development of various WeChat public accounts and small programs such as “Dalian Vocational College” and “Nan-Xia Impression” are bringing great convenience for teacher and student life.

2.2 Current problems and deficiencies
There are still many problems to be solved, although the foundation of campus information construction is good. Firstly, the unified and standardized database construction of students and teachers is imperfect. The information island phenomenon exists, while the communication and coordination of various departments of the school are not smooth, and the basic data statistics work has been repeated many times. Secondly, lectures, activities and other news channels are single, which are all from the campus official (campus network, official WeChat public account, etc.), and lack of timeliness. Thirdly, the sharing of quality resources between teacher teaching and student learning is still insufficient. Nowadays, universities both abroad and home have used the Internet to establish a high-quality learning platform for undergraduate students and postgraduates, such as Chinese University MOOC, Netease Cloud Class, Coursera. However, there are relatively few excellent course resources for vocational students, and they lack systematic and authoritative. Lastly, school-enterprise cooperation, integration of production and education has always been an important way for the development of vocational education. The communication, demand, supply and training of many schools and many enterprises can not keep pace with the times.

3. The basic framework of smart campus construction

3.1 Improve infrastructure including sense tech layer and network layer
Improve the collection and the speed of sensing technology. Accelerate the development of network and information technology and step into the information infrastructure, so that seamless integration of Internet of Things, Internet, campus network and other networks will be realized. In short create a high-speed, stable and comprehensive campus network environment.

3.2 Smart Campus System Data Source, Integration, Analysis, Feedback in Data Analysis Layer
Analyze data sources, use big data analysis and related mathematical algorithm analysis. Then smart campus unify information interfaces and information formats, identity authentication methods. It also share data centers, which provides unified standards for smart campus systems instead of fragmented information data. In the end, achieve efficient information resource sharing and improve office efficiency.

Clarify the business needs of various functional departments and teaching institutions and clear data processing process in the business cross-process of each department. Standardize the process, avoiding the phenomenon of data islands, and reducing the large-scale, complicated and repeated data statistical analysis work. It lays a good foundation for the post-process reengineering, collaborative office construction and improving the management efficiency of the campus.

3.3 Smart campus system construction lying in the application and service layer
The construction of the smart campus system will integrate the daily activities of students, faculty and staff in various aspects such as teaching, learning, research, management, and life. Provide users with personalized information and applications through scientific data analysis technology. In the end, the system serves students, teachers, administrators, school leaders and social enterprises, and can also benefit other neighboring universities. It will realize the sharing of quality resources, promote mutual
learning and common development between teachers and students in enterprises and higher vocational colleges. While the integration of production and education and school-enterprise cooperation is more efficiently.

(1) **Smart learning**
Main clients: students and teachers.
Cooperation platform: NetEase cloud classroom, Chinese university MOOC, etc.
On the smart learning application module, integrate and optimize the pre-campus construction quality courses to provide comprehensive and authoritative teaching resources, such as courseware, audio, video and other materials.

On the basis of the traditional classroom, teachers can more standardized course construction and class management using modern emerging technologies to build a network resource platform on the smart campus system. Students can interact remotely with teachers at any time, regardless of time or space. Cloud classrooms, virtual classes, discussion groups and forums, and many other network resources can also promote mutual discussion and communication between students. The platform not only can provide rich resources for the students of the whole school to choose to study, but also provide the faculty and staff with the opportunity to continue their education and study, which fully realize the teaching and learning.

(2) **Smart life**
Main clients: students, faculty and staff.
Based on the principle of serving the teachers and students of the whole school, we integrate the life service resources, especially around the campus, and provide students and teachers with comprehensive and thoughtful campus information life services.

Improve the perception system. Continue to expand and integrate mobile client, fingerprint and face recognition system, unified service identity authentication platform and other functional service platforms. Thus a card, a fingerprint, a face or an account campus life can meet all the services the user needs.

Through data integration and analysis, we will promote campus dynamic news, course information, academic lectures, campus activities, transportation, food and other information around the school for campus teachers and students.

(3) **Smart research**
Main clients: faculty and staff. Cooperation platform: China National Knowledge Infrastructure, database system of wanfang, etc.
Smart Campus is no longer a simple service to provide data search, paper downloading, etc. Through intelligent analysis, it will play an important role in project declaration, scientific research, project completion and many other aspects, bringing great gospel to scientific researchers.

During the reporting period, through the support and analysis of the system platform data, smart campus push recommendations, and recommend cooperation staff targeted research and recommendation for the scientific research workers. Integrate information, when the researcher fills in the application documents, the system automatically fills in the basic information to make the project declaration quick and convenient.

In the process of scientific research, the smart campus system can synthesize researcher's research direction, application materials and other relevant information, and push appropriate research materials and research tools to researchers in a targeted, accurate and fast manner. Otherwise, it provides a platform for cooperation and exchange, facilitating convenient and smooth communication and discussion between partners.

At the conclusion stage of the scientific research project, the system summarizes, integrates and statistically analyzes the data, projects, papers and other data that researchers have studied preferred. It facilitates the successful completion of research tasks and provides strong data support for future research.

(4) **Smart management**
Main clients: campus management organization.
Educational Administration: the smart campus system includes student electives, classroom control, school calendar enquiries, course enquiries, exam information, grades and many other educational activities. It can be divided into three clients: teaching, teachers and students to facilitate the integrated management and use of the school's educational activities. The information is comprehensive and standardized, and the use is simple and convenient.

Admissions and Employment Management: Summarize and analyze the information on geography, gender, specialty and other majors through data on student enrollment and employment over the years. It provides timely and reliable data assurance and scientific decision-making guidance for the school's enrollment plan and employment plan for the coming year. The construction of the student work management system enables the student work management personnel to understand the current situation of the students and give the students correct guidance and necessary management in a timely manner. Provide strong decision support for relevant personnel at last.

Financial management: Use function of smart campus to categorize and analyze complex financial data. It will simplify a large number of manual labor and make data processing simple and precise. The result leads to provide technical support for financial decision-making of schools and make financial management more open and transparent as well.

In addition, personnel management, file management, training management, and internship management can also be managed through the smart platform. Using scientific management methods to change the shortcomings of the traditional office model, making management more transparent and efficient. In short, the intelligent office automation system provides an easy-to-use, efficient, convenient, safe and reliable office environment for the entire school staff.

(5) Smart decision
Main clients: school leaders, secondary colleges leaders, and functional department leaders.
Campus management has entered the information age. However, the information island phenomenon makes the information of each department isolated, just like the data are not connected to each other and the communication between various departments are not smooth enough. There are phenomena such as repeated or missing decision-making information.

The Smart Campus System covers the entire campus data information resources and provides the school leaders with the most concise and comprehensive data. According to big data, cloud computing and other information-based means, scientific and objective analysis reports are proposed to lead the decision-making.

(6) Smart sharing
Main clients: Inter-school and cross-regional students and teachers.
On-campus services, taking the vocational college as an example, establish an information sharing platform for the three campuses of Xiajiahe, Nanguanling and Puwan. Share timely consultation information on learning and life. Shorten the gap between regions and facilitate convenient and smooth communication between campuses. On the other hand, cooperate with other higher education institutions in and outside the province to jointly establish information, data, and learning resources. Provide a communication platform for students to study, employment, and further studies.

(7) Smart school-enterprise cooperation
Main clients: students, enterprises, school-enterprise cooperation related departments.
The platform opens a channel for school-enterprise cooperation to promote efficient communication between enterprises and schools. On the one hand, enterprises provide talent requirements in a timely manner, arrange appropriate talents to enter school training, and provide opportunities and positions for internships and learning of vocational students. On the other hand, according to the requirements of the enterprise, the school will update and formulate training programs in a timely manner, and output high-skilled talents that meet the standards of enterprise personnel.

3.4 Smart campus system maintenance in the security maintenance layer
Providing a safe, stable, high-speed campus network environment and a highly intelligent early warning system, which is the basis for the intelligent operation of the campus system. Maintain the data of the
client and server, especially the school financial information, academic qualifications, scientific research data and other related information security, which is the premise of the intelligent campus system can run in an orderly manner. Using a reasonable authentication method to build a stable and secure defense system is an effective way to ensure account security and campus system security.

4. Far-reaching meaning
SMEs at home and abroad are studying intelligent services brought about by emerging information technologies such as the Internet of Things, the Internet, cloud computing, and big data, including BAT (Baidu, Alibaba, Tencent) and other information technology leading enterprise. This is also the technical support needed for the research of the smart campus system. Research methods and research concepts are adapting to the development needs of the information age. The major universities across the country have also gradually proposed the concept of smart campus construction. But how to integrate and manage the smart campus platform has not yet formed a unified scale. There is still many problems in design and technology.

The construction of a smart campus in higher vocational colleges will break the space and time constraints of students, teachers, management institutions and cooperative enterprises in higher vocational colleges. Realize the barrier-free communication and connection between people and people, people and things, people and campus, and fully share school resources. Use big data research methods to rationally plan and push school resources and provide reliable information. Therefore, the entire campus will benefit from the scientific and efficient information service brought by the smart campus from students, teachers, management departments, service departments and school leaders. Create a convenient and advanced lifestyle for the entire school and even the national college teachers and students. The level of education informatization will be raised to a new level.

5. Conclusion
This paper is based on the core concept of the emerging development concept & information technology & public demand constitutes. From comprehensive infrastructure, platform data analysis and smart campus system services, we will conduct a systematic and comprehensive study of the entire smart campus system from multiple perspectives. The smart campus platform system will be built to serve students, teachers, campus administrators and social enterprises. It has important theoretical guiding significance and practical value for the reform of higher vocational education.

Funding project
This thesis is supported by the funding from Liaoning Province education science “13th Five-Year Plan” annual issue in 2017(Project number: JG17EB057).

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