The Design and Implementation of Campus informatization in Chinese Universities: A Conceptual Framework

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Abstract: This study aimed to explore the overall situation in implementing campus informatization in Chinese universities, and to design a conceptual framework for the digital campus in order to discover the practical results for Chinese universities applying the conceptual framework. The conceptual framework of the digital campus indicates that the construction mode of multi-participation and open sharing and the development mode of fragmentation, rapid iteration, and collective evolution will become the mainstream modes in the stage of digital campus. The advanced technology applied in Chinese campus informatization was analyzed, the main characteristics of the digital campus were put forward, and a conceptual framework of digital campus in universities was designed. Then, the present study used the one-stop service platform of Southwest University as a case study. The practical results of the digital campus included IC (intelligent card) card services, integration services, one-stop services, wireless networks, and the implementation of the data center. The construction of a "one-stop" service platform has become the main method of reform for the digital campus.

Keywords: digital campus; educational informatization; advanced technology; educational administration; conceptual framework

1. Introduction

The digital campus is an advanced form of development for education informatization. It is a further development of the construction of the digital and information campus. It can intelligently identify campus participants and their individual characteristics, build physical space and digital space on campus, and provide an open environment for teachers and students, thus promoting a dynamic interaction between education and teaching and human resources. It is not limited to the traditional campus environment, and thus provides innovative development opportunities for education.

The new generation of information technology is changing people’s thinking, lives, and ways of learning, and profoundly affecting the development of the world. People’s thinking, learning styles, modes of production, and lifestyles have been changed due to the appearance of the Internet of Things (IoT), big data, artificial intelligence (AI), cloud computing, and mobile Internet. Meanwhile, a term with Chinese characteristics has appeared: "Internet +" is based on an Internet platform that promotes industrial transformation and upgrades or creates new products, new businesses, and new models continuously by the use of information and communication technology and cross-industry integration, then builds a new ecology for the digital campus. The essence of "Internet +" is that it is a disruptive restructuring and reformation of the traditional industry and is based on the concept of the Internet. However, how do Chinese universities make changes according to the development of emerging technologies? Additionally, what is the mode of digital campus in Chinese universities? How is the practice research conducted, and what are the practical results of the digital campus?

This paper aims to analyze the main characteristics of the digital campus and design a conceptual framework, then discover the practical results of the Chinese digital campus.
that applied the conceptual model. Utilizing an explanatory sequential design, the present study designs the conceptual framework of the digital campus by analyzing its core features and construction goals and analyzing development of similar digital platforms based on the literature review. Then, this study takes Southwest University as a case study and explores the results by questionnaire survey.

2. Research Progress of Digital Campus

The present study analyzed the literature at home and abroad about the topic of the digital campus. In the 1970s, the Massachusetts Institute of Technology (MIT) in the United States first proposed the plan of the “Electronic Campus”. In 1990, Professor Kenneth of Claremont University first proposed the concept of “Digital Campus”, and presided over the scientific research project “Campus Computing Project” (CCP), which not only initiated the pace of the informatization construction of universities in the world but also provided much helpful experience [1]. Universities in the United States have always followed the strategic principle of using information technology to promote education reform and development. The development of the electronic campus has experienced a transformation process from infrastructure construction to system application, then operation effect and structural adjustment, and gradually transformed from electronic campus to digital campus and then to smart campus [2]. Countries such as Britain, Australia, New Zealand, and Japan have also developed and implemented a series of education informatization promotion projects: for example, the UK (United Kingdom) has issued the education highway plan; Australia has introduced a digital education revolution implementation road-map; New Zealand has formulated the school digital learning action plan; and Japan has implemented the school network plan [3]. These action plans and strategies provide examples and experiences for other countries to implement the transition from digital to smart campuses.

Under the influence of these countries, the informatization of Chinese higher education has also experienced the development process from electronic campus to digital campus and intelligent campus [4]. Modern technologies used in open ways can offer possibilities to make learning more accessible for everyone, especially during the pandemic [5]. The China Education and Research Internet (CERNET), which was officially launched in 1995, has realized the provincial interconnection of the campus network and laid the foundation for the construction of the e-campus [6]. The national high-speed backbone network (CERNET2) based on IPV6, built in 2004, has realized high-speed interconnection among universities [7]. In 2006 the Chinese Ministry of Education established the “Office of Educational Informatization”, which is responsible for the top-level planning and unified management of the construction of educational informatization at all levels and of all types [8]. In 2010, the State Council issued The national medium- and long-term education reform and development plan outline (2010–2020), putting forward the plan for building education informatization into the overall strategy for national informatization development, strengthening education and infrastructure construction of information networks, and speeding up the construction of a digital campus and consummate education informatization system, thereby promoting the modernization of education content, means, and methods [9]. Zhejiang University in China first proposed to build a “digital campus” as part of the 12th Five-Year Plan of informatization [10]. Chinese universities, such as Nanjing University of Posts and Telecommunications, Tongji University, Tsinghua University, Peking University, Beijing University of Aeronautics and Astronautics, Southwest University, and other universities have also begun planning and constructing digital campuses [11].

The digital campus is an advanced form of university informatization and is a further expansion and improvement in the electronic campus. It makes extensive use of emerging information technologies, such as cloud computing, the Internet of Things, mobile Internet, big data, intelligent perception, business intelligence, knowledge management, and social networks. The digital campus implements a comprehensive perception of the campus physical environment, intelligent identification of teachers and students in study and work situations and their characteristics, and connects the physical and digital spaces of
the school organically to establish an intelligent and open teaching environment and a convenient and comfortable living environment for teachers and students [12]. Changing the modes of interaction among teachers, students, school resources, and environment thus realizes a people-oriented, personalized innovation service, and supports schools to carry out intelligent education [13].

There are four development stages in the digital campus model: In the infancy stage some intelligent technologies are applied in a few business areas; they are isolated from each other and the key characteristics are spontaneity, individuality, and isolation. In the integration stage a variety of intelligent technologies are applied on a large scale in multiple business fields, and interconnection is achieved among them to gain system integration. The key features are organization, scale application, and integration. In the fusion stage there is an in-depth application of intelligent technology in all kinds of business fields. The business and technology are integrated, and the key features are various business areas, deep application, and integration. In the innovation stage, with the support of IT (information technology), the school makes innovations in its education and teaching mode, its scientific research cooperation mode, and its management decision-making mode. The key features of this stage are deep integration and mode innovation [14,15].

In summary, with the deepening of educational informatization and the integration of information technology into education, a new form of teaching and management has emerged. The digital campus is one of the results of educational reform, and it will be established to support the development of intelligent education.

3. Planning and Design of the Digital Campus

The digital campus is an advanced form of college education informatization development, which is the further development of the digital and information-based construction of the campus. Participants can be intelligently identified by the physical campus and digital campus. Thus, it provides an open environment for teachers and students with educational teaching resources. It is not limited to the traditional campus environment. It provides innovative development opportunities for humanities education.

3.1. Core Features of the Digital Campus

The digital campus refers to an intelligent, integrated environment for teachers’ and students’ campus work, study, and life based on the Internet of Things. As a carrier, it integrates environment and teaching, scientific research, management, and campus life with various application service systems. The core characteristics of the construction of smart campuses in colleges and universities are shown in the following three aspects: Firstly, it builds a digital platform for the perceptual environment and cloud service to provide personalized and convenient services for teachers and students. Secondly, the data of modules for teachers, staff and students are analyzed and processed separately or on the same interface. The data are centralized in the cloud data sharing center. Thirdly, the construction of the information platform and intelligent perception environment is a communication port built by school [16].

There are five features in a digital campus, namely: comprehensive perception of the environment; seamless network connectivity; big data support; an open learning environment; and personalized services for teachers and students [17]. To start with, its sensors can perceive, capture, and transmit information about people, equipment, and resources anytime and anywhere. Moreover, it can sense, capture, and share learners’ characteristics and learning situations. The second feature is seamless network connectivity. The digital campus supports the connection of all the software systems and hardware devices, and transmits the perceived information in real time, which is the basis for collaborative learning and collaborative work of users. The third feature is big data support; this means that building models, establishing prediction methods, and conducting trend analysis can be achieved based on big data. At the same time, this feature integrates data, information, and rules of various aspects to make quick and active responses through
intelligent reasoning. The fourth feature is an open learning environment, which expands the resource environment and extends students’ learning beyond textbooks. It supports the expansion of the practice environment; thus, learning can happen both in class and after class. It also supports the evolution of the space environment, and effective education can thus happen in real and virtual situations. The last feature is a personalized service for teachers and students. Based on the concept of customized service, the application of critical technologies is aimed at effectively solving the practical needs of life, study, and work for teachers and students on campus, becoming an indispensable part of real life [18].

3.2. Construction Goals for the Digital Campus

In the context of big data, many colleges and universities in China have begun to build smart campuses, mining and applying high-tech technologies such as the Internet of Things, data analysis, or cloud computing. Through the construction and development of a module system, a data analysis and processing center, unified account authentication, security protection, etc., the data integration and sharing platform and data center can be built to integrate the Internet of Things system so as to promote the organic unification of university education, teaching, and various management work. The construction and development of digital campuses in colleges and universities mainly focuses on the following objectives [19]:

Firstly, building big data exchange and sharing platforms on the basis of traditional campus construction, combined with the development of school construction and resource strength to form a standardized and informatized system, and to integrate innovative management with the educational administration system. This realizes the data exchange and synchronous processing of each system and makes the processing of information management resources in the campus efficient;

Secondly, unifying the certification management. When users log into the campus network their access rights should be managed in a centralized mode. Once they authenticate themselves they can obtain access rights, and then they search for the resources they need to improve the application experience of the campus network;

Thirdly, innovative construction of mobile smart campus environment. Teachers and students can obtain real-time information through the campus network terminal, which reflects the initiative of the campus humanities theme and ensures the efficiency of the campus network;

Fourthly, building a one-stop service management system for the intelligent campuses of colleges and universities and other aspects of service and management work, such as educational affairs, administrative management, student management, technology management, etc. The comprehensive service management system integrates various businesses into different modules, then builds a one-stop information management system. It is a convenient support for managers in making decisions and provides convenient services for teachers and students;

Fifthly, setting up the security goals for smart campus construction. The most basic goal of the construction of digital campuses in colleges and universities is network security. Security design refers to the security system, network management, software and hardware prototype environment, etc. It involves system security, network application security, data flow, and usage security [20].

3.3. Development of Similar Platforms and Systems

In April 2018, the Chinese Ministry of Education released the document Action plan on artificial intelligence innovation in higher education. It pointed out that artificial intelligence is a new engine of economic development and an accelerator of social development and has highly integrated technical and social attributes. The essential requirement of digital campuses in universities is that they are user-convenience-oriented, consisting of one-stop, universal services [21]. Teachers, students, administrators, and service staff can conveniently access information services. Information technology is integrated into subject teaching, thus supporting inquiry learning, cooperative learning, blended learning, ubiqui-
tous learning, and study analysis, etc. Nowadays, scientific research such as collaborative research, scientific research, database research, cross-regional team, virtual simulation, and high-performance computing are supported by information technology [22].


Conceptual papers typically draw on multiple concepts, literature streams, and theories that play differing roles [23]. The presented study took the overall structure of smart campus construction that refers to the National standard Intelligent Campus General Body Frame (GBT36342-2018) and can be designed in combination with the actual situation of the school’s information construction. Generally, the structure of "four layers and two wings" is adopted. The four layers consist of the infrastructure layer, support platform layer, application platform layer, and application terminal layer; the two wings comprise smart campus technical specification and the smart campus network and information security system. Under the general planning of the digital campus, the construction mode of multi-participation and open sharing, and the development mode of fragmentation, rapid iteration, and collective evolution become the mainstream mode in the stage of digital campus. From the perspective of the operational mode, due to the complexity of intelligent campus informatization facilities, which are constantly improving and continuously introducing social information systems, the informatization of the team and operating mode has been difficult to support [24].

4.1. From the Theoretical Perspective of the Digital Campus

The digital campus is an advanced form of university informatization. It integrates the use of cloud computing, Internet, mobile Internet, big data, artificial intelligence, social network, knowledge management, and emerging information technologies such as virtual reality, the comprehensive perception of campus physical environment, and intelligent recognition of teacher and student group learning, working situations, and individual characteristics. In establishing an intellectual and open education and teaching environment for teachers and students, it can change the interaction mode among teachers, students, school resources, and environment. With personalized and innovative people-oriented services it realizes the intelligent operation of schools, and supports schools to carry out intelligent education [25].

A conceptual framework detailing the aspects of the digital campus is abstracted and shown in Figure 1.

![Figure 1. Conceptual Framework of Digital Campus in Universities.](image-url)
The digital campus is a new stage of university information development. It is a solution designed to support the development of university informatization. The digital campus has significant characteristics that differ from the electronic campus regarding information-based business operation, the technical scheme, and the construction operation mode. In information-based business operation the electronic campus mainly focuses on management informatization, while the digital campus pays more attention to the campus information technology and personnel training, scientific research, and social services. It uses depth fusion to create a cross-functional business integration one-stop service, and it attaches great importance to the use of big data support for scientific decision. It is a new educational model based on information technology that restructures the form of the intelligent education platform.

4.2. From the Technical Perspective of the Digital Campus

From the technical perspective, cloud computing, Internet, mobile Internet, big data, artificial intelligence, social networking, knowledge management, and virtual reality are widely applied in colleges and universities [26]. The building of a digital campus is based on big data and complex object modeling with virtual images [27]. In particular, due to the increasing complexity of business and technology it is not realistic for a single enterprise to provide a complete campus information solution. Therefore, it is essential to build an open and sharing technology ecology for the construction of a digital campus. Thus, it is necessary to establish a service framework that supports the open technology ecology and provides flexible technology infrastructure.

The digital campus uses big data technology to comprehensively analyze the virtual image of the campus and fully grasp the operating rules of the physical campus [28]. Through the campus information physics system acting on the physical campus, intelligent interaction among teachers, students, school resources, and environment can be realized. Based on the rules of school operation management it is convenient for people to make scientific and rational decisions with the support of the digital campus, resource scheduling, and business activities. For example, when people want to make a scientific decision using process management, collaborative support, and scene modeling techniques, teachers and students can benefit from the digital campus. For instance, with the digital campus teachers and students realize intelligent talent training, scientific research, social services, and cultural inheritance innovation. Thus, the goal of supporting intelligent education can be achieved by way of digital campus construction.

5. Practice Research of Digital Campus

Big data-driven visual analysis, natural language comprehension, speech recognition, and artificial intelligence capacity are rapidly advancing, and artificial intelligence technology is penetrating and reconstructing economic activities such as production, distribution, exchange, and consumption [29]. In order to speed up the application of artificial intelligence in the field of educational innovation, the intelligent network, personalization, and lifelong education system were developed. Innovations in personnel training modes, teaching method reform, and educational management are supported by intelligent technology. Thus, it can promote balanced educational development and educational fairness. It is an essential means to improve the quality of education, and it is indispensable for realizing educational modernization.

The digital campus has distinctive characteristics in terms of the basic theory of artificial intelligence, and the research and application of critical technologies such as natural language understanding, computer vision, multimedia, and robotics. It has a solid foundation in personnel training and discipline development. Facing the opportunity of a new generation of artificial intelligence development, it enables colleges and universities to further strengthen basic research, subject development, and the advantages of talent cultivation. Colleges and universities can strengthen applied basic research and essential technical breakthroughs. Colleges and universities can continuously improve artificial intelligence
with depth fusion. The digital campus can continuously increase the depth of the artificial intelligence and education integration, providing a new mode of educational reform. In short, colleges and universities can lead the field of artificial intelligence in science and technology innovation, personnel training, and technology application demonstration.

5.1. Modules of the Construction of the Digital Campus in Higher Education

A guide to the construction of the digital campus in higher education is detailed as follows. The infrastructure includes the four main functions of network facility, cloud service capability, intelligent terminal system, and infrastructure maintenance (see Figure 2). The digital campus infrastructure employs cloud computing and cloud service architecture deployment. Cloud computing uses network storage, virtualization, distributed computing, and other technologies to achieve transparent infrastructure cloud services. Then, it provides basic computing and storage for virtual image construction, big data processing, and application services in the host computer in the digital campus. The network facilities comprise the wired or wireless network environment of the school, which can meet the requirements of timely transmission of all kinds of data including high-speed, comprehensive interconnection, and arbitrary application on demand. It provides the broadband ubiquitous network foundation for the digital campus. The intelligent terminal system is the material basis of mass data collection and real-time feedback control of the intelligent campus. It realizes the comprehensive perception of teachers’ and students’ teaching and learning activities, the operation of instruments and equipment, interaction with the living environment, and other functions. In addition, it is necessary to develop a sound operation and maintenance management system and build a reliable operation and maintenance management system to facilitate and efficiently monitor and manage facilities, equipment, network traffic, and system operation [30].

![Infrastructure Diagram](image)

**Figure 2.** Infrastructure Module of the Construction of Digital Campus of Higher Education.

The data and resources include the primary database, business database, data warehouse, educational resources, and graphic resources (See Figure 3). A standardized primary database covering the teaching, scientific research, management, and services of the school should be set up to record and manage the process data and results from data generated in the daily business activities of the school. We are constructing a teaching resource database and the information resource database that can satisfy teachers’ and students’ requirements in carrying out teaching and scientific research activities, as well as the service resource database used for life, entertainment and other activities.

The digital campus infrastructure services platform supports coordination, scientific research, management, and services in various fields and database application systems (See Figure 4). Streamlined business management, flexible customer service, and a “one-stop information portal” are provided by the digital campus infrastructure services platform. In order to provide a solid business operation foundation for the intelligent application of the digital campus, the business support layer should effectively manage all the data of the school. The data basis of the digital campus is used to conduct big data analysis and provide all kinds of intelligent applications.
The innovative applications of the digital campus mainly include various intelligent applications. Thus, the digital campus can realize exemplary management and personalized services on campus and comprehensively improve the situation analysis, and academic performance diagnosis, as well as to support schools on the basis of electronic campus, and to construct a technology-enabled teaching environment.

5.2. Taking Southwest University as a case study

The innovative applications of the digital campus mainly include a variety of intelligent campus information business applications (See Figure 5), such as teaching, scientific research, services, management decisions, and cultural inheritance applications, among others. They are the key to the role of the digital campus and the interface for the digital campus to communicate with users.

The guarantee system includes the organizational guarantee system, the mechanism guarantee system, and network space security. It provides a practical guarantee for the stable, efficient, and safe operation of the digital campus (See Figure 6).
The innovative applications of the digital campus mainly include a variety of intelligent management and personalized services on campus and comprehensively improve school governance. Southwest University is depicted as an example, from “Multiple Management” to the “One-stop Service” platform, as seen in Figure 7.

5.2. Taking Southwest University as a case study

In order to advance school educational teaching reform and develop a digital campus on the basis of electronic campus, and to construct a technology-enabled teaching environment and explore a new teaching model based on artificial intelligence, it is essential to use artificial intelligence and big data to carry out teaching-process monitoring, learning situation analysis, and academic performance diagnosis, as well as to support schools in transforming the organizational structures and management systems through the application of artificial intelligence technologies. Thus, the digital campus can realize exemplary management and personalized services on campus and comprehensively improve school governance. Southwest University is depicted as an example, from “Multiple Management” to the “One-stop Service” platform, as seen in Figure 7.

With the data system (primary data, business process data, and theme data) as a foundation, the one-stop service model is integrated into a big data environment [31]. It is the supporting system-generated form of organization, and it customizes output “process template” business processes based on an extensive data analysis tool, the product of data mining integration with the campus information portal. Then, it achieves the reunification of the user entry access and unified communications management.
The one-stop service hall is a feasible window for teachers and students to access services, offering unified online affairs handling and acceptance, matters of inquiry and service guides, service tracking, comprehensive inquiry, statistical analysis, and other comprehensive services. The construction’s functions include: (1) coordinating the service resources of various business departments, solving the problems of cross-department business collaboration, and innovating the construction mode of business management service; (2) completing the circulation and sharing the data-sharing database, “one-stop” business database, data sharing database, data mining database, and providing data support and data services; (3) providing topic data analysis and decision support to teachers, students, and leadership through horizontal comparison, drilling-through transformation, trend prediction, and other technical methods based on massive business process data and relevant primary data.

In regard to the “one-stop” service model and the business needs of campus users, taking the service center of Southwest University as an example, the service items and structure are shown in Figure 8. There are eleven operational systems shown in Figure 8: the mail system; the student BBS (bulletin board system); personnel talent; the OS (office system); the educational administration system; the scientific research system; the MIS (management information system) system for graduate students; the financial platform; the governing system; the housing system; and the electronic library. Moreover, there are four main categories of service: the process approval service; the data filling service; the comprehensive query service; and the topic analysis service. The data exchange mode provides the data basis for various services and topic analyses. Among them, the process approval service realizes cross-department business collaboration. Users do not need to attend to business process and data flow in the process of business flow. The data filling service is mainly designed to avoid the need for repeated data filling; users only need to fill in the data that need to be supplemented, and the existing data in the database can be loaded automatically. The comprehensive inquiry service mainly queries the information related to individuals themselves, such as personnel information, scientific research results information, financial information, and teaching information, etc. The topic analysis service is mainly based on the accumulation of a large number of business process data and primary data mining to optimize the school management and service.

Figure 8. A one-stop Service Portal for Multi-terminal Access.
Making full use of "Internet +" technology is an ideal path to promote the modernization of the governance system of colleges and universities [32]. From "Internet + government service " to the Internet extension "Internet + the reception service", the general idea is: ‘management of the service, the service in process’, so as to achieve "management in service, and embodied in service management". Its essence is a refined and re-engineered business process. Implementing the process involves changing management ideas and organizational and business models [33].

Business process carding, on the one hand, involves process finishing. In another word, the business scope, job responsibilities, and service contents of all business departments of the school are organized in all aspects. For example, Southwest University carried out the Application of Service Portal–Professional Title Evaluation, which is shown in Figure 9. Teachers are no longer required to submit materials to various departments for professional title evaluation. People can carry out the evaluation through a one-stop service platform. From Figure 9 we can see that the first step is the declaration instructions. The second step is the declaration form information filling; the third step is the declaration form information preview; the fourth step is the external audit form information filling; the fifth step is the external audit form information preview; then, the final application is completed. Only six steps are needed to complete the teacher professional title evaluation. Moreover, we carried out a survey for 4694 college teachers in Chongqing; 44.16% of participants agreed strongly and 39.5% of teachers agreed that the application of service portal–professional title evaluation was helpful to them. Therefore, it is evident that the application of service portal–professional title evaluation is effective.

![Figure 9. Application of Service Portal–Professional Title Evaluation.](image)

On the other hand, services are classified according to different needs. As the service content reported by each department is only limited to the unit’s responsibilities, the overall service is fragmented. The classification is integrated according to the principle of service nature and content, and the business links of each department are closely linked to form a one-stop service chain. If first-year students register for the new semester they need to go to the student department, the academic affairs department, the financial department, etc. However, with the one-stop service portal for multi-terminal access, students can finish all the above steps without running errands. The portal thus achieves the effect of "letting data walk more and people walk less".
The one-card service is one of the most critical applications in the construction of the digital campus. It is a concentrated application of integration, networking, and intelligence. The one-card service improves teaching quality and efficiency and optimizes various process standards of management and service levels. It provides a convenient, efficient, and personalized service for most teachers and students to study and work.

6. The Effective Results of Digital Campus

The modernization of the governance system and governance capacity is the basic project of the modernization of higher education, and the reforming of "delegation, regulation, and service" is an important way to promote the modernization of education governance. The construction of a "one-stop" service based on the combination of online and offline information has become the main form of the reformation of the integration of management information systems in education.

6.1. Discussion on the Key Problem of the integration of Management Information System in Education

China’s colleges and universities are facing the huge pressure of the construction of the "world double first-class university". Accordingly, Chinese universities have to further improve their work style and improve their quality of service. To become a world-class university with world class disciplines, a university should improve the level of school management services. With the development of Internet technology, the government and firms make use of mobile technology such as the Internet to provide citizens with online and offline services. Meanwhile, based on a sound foundation of information construction, university informatization has also undergone rapid development in recent years and the integration of online "one-stop" services has gradually become possible.

In terms of services for teachers and students, they present with the following aspects: Firstly, online services are "scattered and disorderly" with a dearth of centralized platforms. The network services of most colleges and universities are scattered over various business information systems, and many cross-departmental and cross-platform services are fragmented. They are unable to form a unified online process, resulting in a lack of unified service evaluation and other functions. Secondly, there is a dearth of centralized service places offline. Teachers and students need to go to various departments to achieve things. Thirdly, the combination of online and offline services is insufficient. Online and offline services are disconnected or poorly connected. In general, the problems of online and offline services and the combination of the two still need to be resolved.

6.2. Discussion on the Effectiveness of the One-stop Service Platform

An intelligent campus entity is established for teachers and students. A digital campus comprehensive service includes a logistics service hall and financial settlement center, with delegates concentrated in the service hall. Various functional departments provide the school seal, student identification, the graduation process, travel information, employment information, household registration, scientific research, personnel, accommodation, logistics, tuition fees, and financial services. Combined with the unity of the online business hall it provides an online and comprehensive service platform, thus achieving a seamless online service. It is a concentrated reflection of a digital campus integrated service. The integrated service is one of the most exceptional services in the construction of the digital campus. The service form combining the virtual online service hall and the physical service hall effectively solves the problem of "back running" and "circle running" for teachers and students in real life. It was found that 39.92% teachers ‘agreed strongly’ and 37.37% teachers ‘agreed’ that it effectively improved the quality of the school’s comprehensive management and public service (See Table 1).
Table 1. Teachers’ opinions about the construction of digital campus.

<table>
<thead>
<tr>
<th>Agree Strongly</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Disagree Strongly</th>
</tr>
</thead>
<tbody>
<tr>
<td>1754 (37.37%)</td>
<td>1874 (39.92%)</td>
<td>808 (17.21%)</td>
<td>142 (3.03%)</td>
<td>116 (2.47%)</td>
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</table>

The portal website is an essential platform for information release, image promotion, brand display, and service provision of colleges and universities. With advanced design concepts, mature website technology, and a complete management mechanism, the digital campus of Southwest University has built a one-stop service website management system based on a cloud platform. The intelligent website management system in Web 2.0 is an aggregation of various kinds of resources, supporting the site group data service with distributed deployment and background management. It mainly uses a content management system and realizes multiple departments and functional departments with a uniform website standard, unified planning, unified framework, unified distribution, unified management, and unified maintenance-intensive construction, and organizes the portal funds, personnel, management, maintenance, and safety problems as a whole, rendering the site a one-stop management and service model.

7. Conclusions

We aimed to develop a conceptual framework for the digital campus and to determine practical outcomes for Chinese universities implementing this conceptual framework. The presented study examines the overall status of the implementation of a digital campus in Chinese universities. It also examines the presentation of the key features of a digital campus, which includes a comprehensive perception of the environment, seamless network connectivity, big data support, open learning environment, and personalized services for teachers and students.

As for the practical effectiveness of the conceptual framework for the digital campus, the present study used the example of Southwest University as a case study. In the results of the questionnaire survey, most of the teachers agreed that the digital campus effectively improved the quality of campus comprehensive management and public services. The "one-stop" service platform based on the mix of online and offline information had become the main form of the implementation of the digital campus in education.

In summary, with the development of cloud computing, the Internet of Things and big data, the conceptual framework for the digital campus has developed based on a new generation of information technology such as mobile Internet. It mixes together technical, business, management and service, and security systems as the design elements. It aims to build a personalized and intelligent “one-stop” campus platform that can realize intelligent learning, teaching, scientific research, the application of intelligent management, decision making, intelligent services, etc. The “one-stop” smart campus platform is the inevitable trend of the development of educational informatization.

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