Discussion on the Construction of Smart Campus under the Background of Big Data in Sichuan University of Arts and Science

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Abstract

With the rapid development of information technology, the country vigorously advocates the development strategies of "Internet +", big data, artificial intelligence, etc., which provides strong technical support for the informatization construction of colleges and universities, thereby promoting a new model of campus construction and management----Smart campus. The smart construction of the campus has become an important direction and inevitable trend for the future development of the school. This article analyzes the current status of the school's informatization construction. Through the construction of a smart campus, it is possible to "make data run more, teachers and students run less errands". Realize service management informatization and education and teaching informatization, and then to the application of big data and artificial intelligence technology to achieve high-level informatization. While providing a good educational environment for the teachers and students of the school, it promotes the better development of the school.

Keywords

Smart campus, Big data.

1. Introduction

With the rapid development of information technology, the continuous improvement of the level of information technology, the wide application of new information technologies such as cloud computing, Internet of Things, mobile internet, and big data, education informatization has proposed a new model-smart campus. The smart campus uses a variety of front-end intelligent collection equipment, fast network transmission, and customized application software to transform various data and information of individuals and events in the campus from passive reception in the digital age to active perception collection, transmission, monitoring and rapidity analysis. The smart campus can meet the multi-functional needs of teaching, scientific research, management, life and service, and provide teachers and students with interactive communication and mutual inductance platforms, personalized character services, and create a new campus development environment to ensure that the school has all Teachers and students can obtain timely and accurate information resources related to school development, which promotes the innovative development of the management system and teaching system [1]. Promoting the construction of smart campuses has had a significant impact on the sustainable development of the school and has become an unstoppable trend.

2. Connotation of Smart Campus

The smart campus is based on the Internet of Things, cloud computing, mobile internet, virtualization,big data,intelligent perception and other new information technologies to build a resource-sharing, intelligent and open education and teaching environment to achieve comprehensive environmental perception,seamless network interoperability,and an open learning environment Personalized services with teachers and students,so as to provide strong

intelligent support for the scientific and efficient operation of learning,business management and public services [2].The construction of a smart campus uses key technologies such as cloud computing technology, big data technology, Internet of Things technology, and mobile internet. In the process of building a smart campus, technologies such as cloud computing and big data should be taken as the foundation, and the educational system, scientific research system, and personnel System, academic system, etc. are integrated. By building a smart campus, it can effectively improve the overall service and management level of the school, and promote better development of the school.

3. Background of Smart Campus Construction

3.1. Vision of Smart Campus Construction

Use information technology to change the traditional working mode and use the advantages of the Internet to achieve "Let data run more, teachers and students run less errands" (teacher and students do things, run at most once). Through construction, the realization of service management informatization and education and teaching informatization, and then to the application of big data and artificial intelligence technology, realizes high-level informatization, and then makes decision-making scientific and precise.

3.2. Analysis of the status quo and needs of school informatization construction

At this stage, Sichuan University of Arts and Sciences has built and used systems such as "UF Financial System", "New Cape Card System", "Eprag Scientific Research System", "Golden Window Educational Administration System" and other systems. However, with the gradual deepening of applications and the intensification of management refinement, the existing information system of our school has gradually exposed some problems. Compared with domestic universities with a higher degree of informatization, there is still a big gap, the information system is scattered, and the data quality The problem is outstanding. Mainly manifested in:

3.2.1. Lack of better normalized data sharing methods

There are many data in the school data business system, and only part of the data from each department participates in the sharing. The cross-departmental coordination of many data requires high communication and maintenance costs, and lacks normalized data service methods. With the development of school informatization, through the construction of smart campus projects, more and more comprehensive data normalization methods will be needed to gradually realize a unified data sharing and service platform, and establish a unified entrance to the school's smart campus normalization sharing mechanism.

3.2.2. Data security risks

With the rapid development of informatization construction in universities, more and more application systems have been put into use. The current way of data exchange is partly realized through database connection, and partly through API interface to push data to each demand side. In the process of data transmission and storage, there is a lack of better protection and traceability measures at this stage. How to store the full amount of data and how to share the data has become a huge risk node. Once a loophole causes data leakage or even tampering, normal management of the school will be imposed. , Data security and personal privacy security bring huge risks and risks. In terms of management policies, as business departments' requirements for data management continue to increase, related data security work has also reached a new level of demand. The previous centralized data security management mechanism was not perfect, and some information system data authorization management was not strict, which may cause data abuse and privacy data leakage. In order to solve the above

problems, it is necessary to carry out tailor-made and refined security configuration and management for each data resource in the data resource center, and implement relevant policy guarantees through the operation of security supervision and system to achieve the security requirements of the data resource center .

3.2.3. Unclear data quality responsibilities

There have been some management contradictions caused by data quality problems in the current management process. The main reason is that the operation and use of business systems by the operators of various departments is not standardized enough, the data is not entered in time, or the necessary information is not fully entered, or some functions The module is not used. However, many departments have insufficient awareness of this, lack of awareness of data quality responsibility, and lack a clear consensus on the boundaries of data responsibility. When there is a business problem, people often think that data quality is the responsibility of the data center, and they are less aware that only when each department guarantees the data within the scope of their own responsibility, can the equipment collect high-quality data and send it to other The downstream department provides qualified data.

3.2.4. Data quality is not high

In the early stage of school information system construction, there is generally a situation of "focusing on functions and not data", and lack of overall school data standard planning. Even if data problems are found, there is no verification mechanism, which causes problematic data to be deposited continuously, which affects the timeliness and accuracy of report data statistics Sex, seriously affecting the decision-making analysis of school leaders. For example, the incomplete information of students and teachers in each system makes it difficult to accurately count some data.

3.2.5. High pressure on operation and maintenance

In the smart campus environment, the rise of a large number of mobile applications and microservice applications has led to an exponential increase in the pressure of data messages and data file exchanges, which has brought a heavy workload to technical departments with limited establishments. In addition, the threshold of data exchange technology is too high, and it is difficult for business personnel to conduct data exchange management operations, and it is difficult to realize data "who generates, who maintains, and who is responsible".

4. Smart Campus Design

Through this project, the school will build a complete, unified, technologically advanced, comprehensive, in-depth application, efficient, stable, safe and reliable smart campus, eliminate the four islands of information islands, application islands, data islands, and management islands, and realize inter-departmental services The benign service closed loop of collaboration, management coordination, and data circulation provides all-round, ubiquitous, personalized, one-stop, and integrated services for teachers and students to improve work efficiency, service levels, and management efficiency. Make scientific decisions, improve resource utilization, improve core competitiveness, improve the overall goal of the school's teaching, scientific research, management, and teacher-student services, transform the school's information level from digital to smart, and comprehensively improve the entire school's teachers Student satisfaction.

4.1. Smart campus overall architecture design

The primary task of building a smart campus is to build an "application support layer" on the basis of the existing "IT infrastructure layer". Through the data integration of "business applications", the sharing and exchange of information resources on smart campuses is realized. It also supports the application integration and development of the smart campus on the basis

of information integration, and realizes the "comprehensive service display" of smart campus information through WEB integration service portals, mobile clients, text messages, and emails. At the same time, it is necessary to build an "information standard and safe operation and maintenance system" for a smart campus. The overall architecture design of the smart campus is as follows:
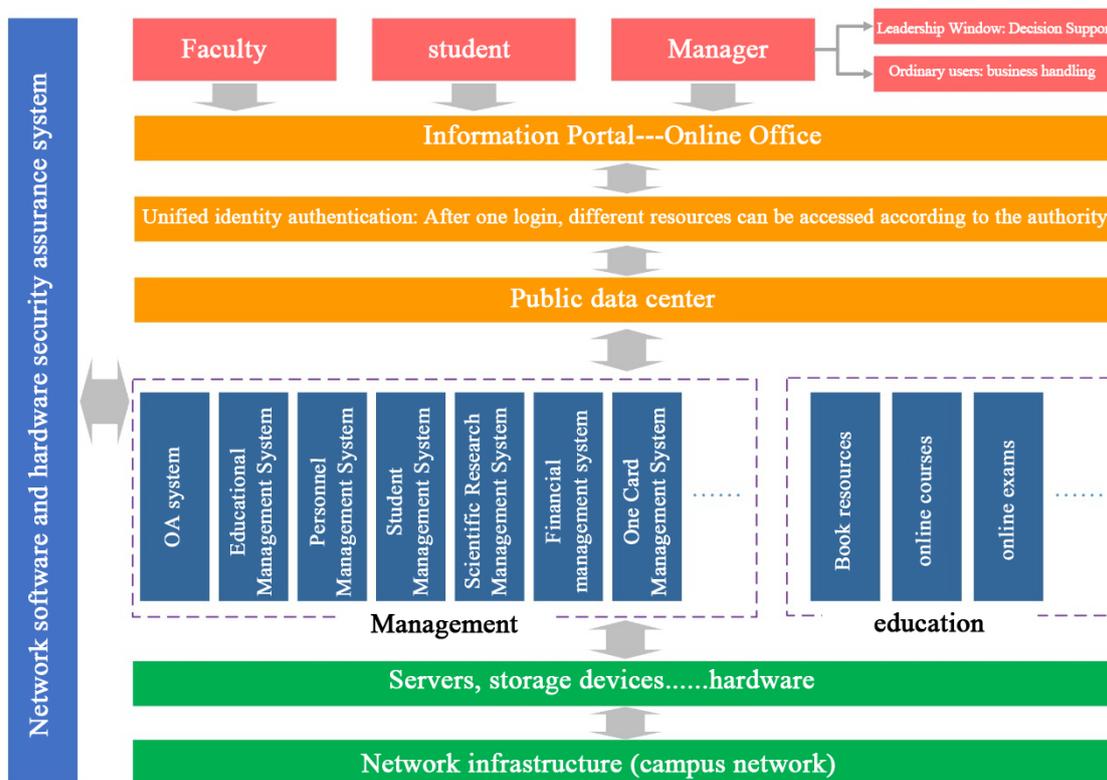

Figure 1: The overall structure of the smart campus

4.2. Data service platform design

The data service platform provides the data access interface of various business systems to realize the organic combination of data exchange, data analysis services and various information systems, and realizes automatic data extraction, data conversion, and data transmission with unified data models, data quality standards and interface specifications , Data verification, data audit, etc., while supporting data synchronization, historical data migration, etc. And use the existing big data platform data warehouse of our school to jointly form a landable information resource catalog, in a "unified standard", "unified processing", "unified exchange", "guaranteed quality", "transparent and open" approach, A platform that provides services for data exchange between different business systems, different databases, and different data formats.

The data service platform solution is composed of data management services and data service platforms. The data service platform is composed of data warehouse, data exchange, data management, data analysis, and data publishing modules. The overview description of each module is as follows:

4.2.1. Full data warehouse

The data warehouse construction of this project uses the big data platform and database resources to upgrade the construction. The overall data warehouse is divided into the original library (historical library), standard library, RAW layer, MODEL layer, and theme library.

4.2.2. Data exchange

The data sharing and exchange module is a prerequisite for breaking information barriers and eliminating information islands, and serves as a bridge hub. After the business system of the whole school is managed, the smooth, real-time, and batch transmission of business data between different business systems can be conveniently realized through the data resource catalog.

4.2.3. Data governance

Manage school data items, data elements, numbers, codes, and resource catalogs, and realize the conversion of data standards to resource catalogs through the platform, and collect, clean, convert, and map school master data , Integrated process management, standardize basic data, provide data integration and other functions. Manage the testing methods, testing scripts, testing plans, etc. applied to different data items, and provide data quality reports to display data testing results for different data content.

4.2.4. Data analysis

Through the integration and upgrading of big data platform functions, it provides full-text retrieval, data preprocessing, model training, algorithm call and other data mining features for the full data warehouse, and provides visual task management, visual modeling, and visualization Core functions such as data preprocessing.

4.2.5. Data release

Graphical release of data through integrated visual analysis tools. The release tool is seamlessly connected to the full data warehouse. Users can perform data analysis and statistics on the tools through authorized resources in the resource catalog. Provide necessary support for school daily data analysis and report filling.
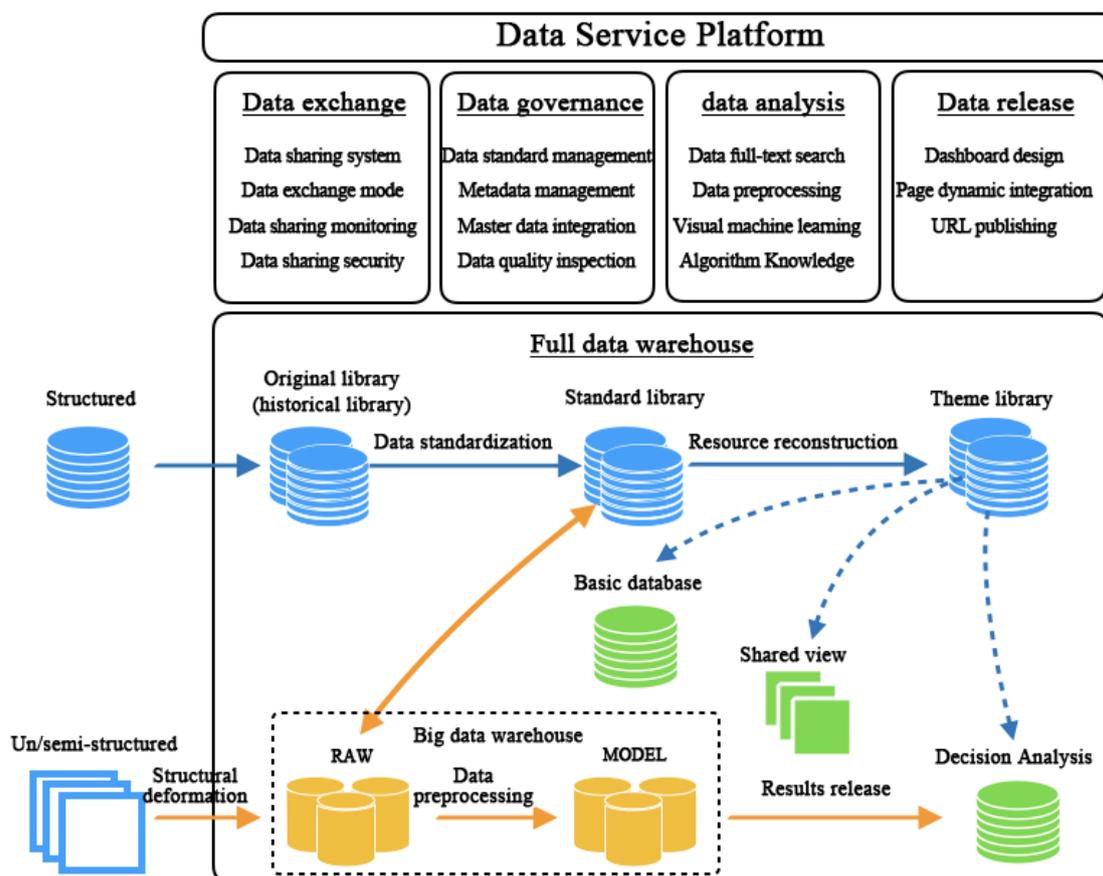

Figure 2: Data processing on the data service platform

5. Smart Campus Construction Support

5.1. Unified information standards and security system

The information standard system defines unified standards for each system, including information standards, coding standards, management standards, implementation standards, maintenance standards, etc. It provides daily operation and maintenance services and is a supporting system that guarantees the standardized and reliable operation of campus information systems.

Establish a comprehensive security management system for campus informatization to ensure overall security in terms of physics, network, system, information and management, and it is a supporting system to ensure the safe and reliable operation of campus informatization systems.

5.2. Operation and maintenance guarantee system

The operation and maintenance guarantee system includes system monitoring, system management, project management, maintenance services, etc. It is an important support system to ensure the safe and reliable operation of campus information systems.

5.3. Infrastructure platform

The IT infrastructure platform mainly includes basic hardware equipment such as integrated wiring system, integrated pipe network weak current system, wireless network system, server host, storage, and cloud computing platform. In addition, the data aggregation and operation support environment of the smart campus application system composed of database systems, application servers, and directory servers also belong to the category of infrastructure.

5.4. Application support platform

The application support platform does not provide independent business applications alone, but serves as a support for the school application layer. The platform adopts component-based and service-oriented design ideas, and provides technical interfaces, component modules, and application services for various application systems to realize application reuse and integration.

5.5. Comprehensive service display

Comprehensive information services for teachers, students, leaders, and administrative personnel. Through information portals or mobile information portals, the information interaction service process between various application systems of the information campus and users is realized. It is a window for information display of smart campuses and can provide information interaction, collaborative communication, Services such as resource sharing and cross-school exchanges.

5.6. Information Application Center

5.6.1. Comprehensive Student Management

The management around the whole life cycle of students runs through all the management applications of students before entering, during entering, during, leaving, and after leaving school, which can include enrollment, orientation, residential management, academic work, educational affairs, leaving school, etc. application.

5.6.2. Comprehensive teaching management

Comprehensive teaching management mainly centers on the school's teaching business, constructing a collaborative learning environment for knowledge, resource sharing and collaboration, and providing various applications of management and services.

5.6.3. Comprehensive personnel management

Personnel management is aimed at university faculty and scientific research personnel, providing the management process of the whole life cycle from entering to leaving school, and realizing the integrated management of selecting, cultivating, employing and retaining talents. The platform will be divided into personnel recruitment, entering school, professional technical position evaluation, appointment, mentor selection, party member management, cadre management, assessment, leaving school, etc. according to the different stages of faculty entering, entering, and leaving school. .

5.6.4. Comprehensive financial management

Comprehensive financial management should aim at cost comprehensive optimization, make best use of materials, reduce school operation and maintenance costs, and maximize asset benefits.

5.6.5. Cooperative Application Service

Collaborative application services mainly revolve around the school's two core business contents—teaching and scientific research. The main content is positioned on "collaboration services" and "process support". Through the informatization of the interpersonal collaboration process, it aims to improve the school's teaching quality and scientific research capabilities. service.

5.6.6. Decision support

The decision support application is based on the school's public data model and adopts multiple methods such as horizontal comparison, development trend, statistical analysis, indicator display, etc., to meet the comprehensive display of global data, achieve a comprehensive display of school conditions, assist schools in improving business processes, and cover schools Core business scenarios such as teaching and management.

6. Smart Campus Construction Requirements

6.1. Realization of self-service account registration management center

Combining the actual management needs of the school and meeting the needs of students and teachers for convenient Internet-based account management, the account registration center provides independent registration of user accounts, and at the same time verifies the user data in the central library. If the two are unified, users can be autonomous according to their habits Registering an account (including third-party account association) is convenient for users to use, and it is also convenient for new students to understand the true and accurate information of the school before entering the school, and improve the school's enrollment rate.

6.2. Realize dynamic authorization management of school-level unified roles

Configure dynamic role groups through user identity, post tags, custom user data items, etc., and provide specific function modules and columns for dynamic permission assignment operations, fine-grained permission assignment function: user access permissions are through dynamic roles Group to control, a user can have multiple dynamic roles, later only need to adjust personnel attributes in personnel management to dynamically adjust access permissions. The user's management authority is associated with the standard post through the authority role tag. A user can have multiple standard posts. Later, only need to adjust the personnel attributes in the personnel management to dynamically adjust the management authority. The user's approval authority is associated with the standard post through the approval role label. A user can have multiple standard posts. Later, only need to adjust the personnel attributes in the personnel management to dynamically adjust the approval authority, without adjusting the approval node of the approval flow.

6.3. Achieve a personalized access mode based on identity

The foreground menus of users with different identities display the menus owned by the user with that identity. Users of different identities display different operation menus on the front end. The administrator can configure the mode in the background, and supports scene switching of different modes of the same identity. The time effect of the mode can be set according to the needs of the scene. For example, at the time of orientation, only the content related to the orientation is displayed to new students, and it will automatically switch to the school mode after the orientation is over.

6.4. Open layout and tool configuration and personalized theme management

Built-in different styles of themes for all users to switch in real time, and can also be customized according to users' preferences to meet the needs of different users. In the layout configuration management, the user only needs to select the corresponding plug-in or tool and drag it to the specified position to adjust the page layout. This operation method makes the system more friendly and user-friendly, and the user is simple and easy to use Get started. At the same time, each plug-in or tool provides personalized settings that can be edited in real time, such as: text style, background style, border style, etc.

The platform's plug-in library and tool library later support the upload of plug-ins and tools to meet the needs of integrated portals at different stages and facilitate schools to reduce the problem of multiple secondary development of the portal in the subsequent construction.

6.5. Build a school-level integrated middle station to lay the foundation for building a smart campus ecology

Establish an informatization construction standard that meets the needs of big data for sustainable development in the school. Build a school-level integrated middle station including data middle station, basic identity middle station, and business middle station, and integrate campus business systems through top-level design to form an integrated informational overall structure. Give priority to solving the problems of data islands and process fragmentation caused by the establishment of information systems, and break through the information barriers of various departments. It forms data sharing and intercommunication, unified identity authentication, unified role management, dynamic association of permissions, overall planning and management of services, centralized information, and personalized display.

6.6. Build a school-level business center to realize process reengineering and personalized service

At this level, based on the school-level integrated middle station, it sorts out and establishes various business services for various dynamic roles in the school, establishes a transaction processing platform, and according to different services, transforms the existing business processes in the school, and opens up various business departments and applications System, forming an overall, unified business integration and process integration. Provide high-quality, university information services for teachers and students on campus.

6.7. Build a school-level capability open platform to support the school's information development in the next 10-15 years.

Based on the integration of Zhongtai completed the construction results of the school's management integration, business integration, and data unification, and realized the opening of capabilities, the overall information system architecture of the school was comprehensively upgraded and transformed in a modular and componentized manner to create an open New ecosystem of smart campus. It not only meets the needs of school personnel for informatization, but also facilitates the introduction of external service providers, the access of external

technology and external services, and maximizes the connotation and coverage of campus informatization.

7. Conclusion

The campus is the main place where student learning takes place. The construction of the campus directly affects the efficiency and quality of the entire campus system. In the context of big data, every school regards intelligence and intelligence as an important factor in enhancing the comprehensive strength of the school. Smart campus construction builds a unified data center for colleges and universities, integrates information sharing, system integration, business collaboration, and resource management, breaks the boundaries of traditional management models, and establishes a college information system that is compatible with smart campuses, based on cloud computing and big data technology Information services are integrated into all areas of the campus, realizing information interconnection, collaboration and sharing [3]. At the same time, speed up the pace of comprehensive informatization of college education and further enhance the core competitiveness of colleges and universities. In today's era of rapid development of information technology and the Internet, the intelligent construction of campuses is an important direction and inevitable trend for the future development of schools. Schools should sum up experience , Strengthen the construction of smart campus, while providing a good educational environment for the teachers and students of the school, promote the better development of the school.

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