

Development and Application of University Information Service

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Abstract

The current situation and existing problems in university informationisation was given briefly, with object of university information service development. It proposed the method to develop information service, including both model design and technology realization on basis of main database. A system, which covers the core data resource of the university and implements one-stop information service has been designed and realized. Integrated with R-ABAC, Portal and dynamic reports, it provided comprehensive inquiry and statistical analysis service of all kinds of information for all the teachers, students and all levels of managerial staff, which applied in individual management, business management and decision making, which serves talents training, the basic task of universities.

Keywords: *information service, main database, individual management, business management, decision making*

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1. Introduction

Abundant data resources have been accumulated in the early stage of informationisation development of universities. However, these resources are lack of data mining and need deep development and utilization. For example, information service coverage is insufficient, comprehensive plan from teachers and students' aspect needs to be more thorough, and limited information service can be provided to teachers and students. It is lack of multi-dimension and multi-angle information service integration and presentation with the comprehensive plan guidance as well as inter-departmental and inter-business comprehensive information inquiry service. The integration and management between information resources and information system needs to be strengthened, which would reinforce the data integration, business convergence and process combination between departments and establish the resource management and scheduling system of universities. Supporting data for decision making of the leadership is not enough and the application value of data is not fully realized. Therefore, we need speed up the establishment of data statistical analysis system and make full of the existing information resources to serve the management and decision-making, which supports the innovation of management [1-2].

Nowadays, universities pay special attention to the informationisation-supported education both at home and abroad. They start to develop the comprehensive information service which provides deep support to education processes. With the use of information technology and according to the integrated planning and design of data resource centre as well as the current situation of data resource development, abundant and accurate information resource service can be provided to teachers and students, including comprehensive inquiry and statistical analysis of all kinds of information. The development objectives of information service system are listed as follows.

First, to complete information service model: By analyzing the information service requirements of different users and in terms of teachers and students, complete information service model can be designed, upon which the comprehensive information service system can be established, covering the core data resources of the university and providing one-stop service can be established. The system is able to provide in-time decision-making support

service to all levels of leaders, enabling in-time, complete and accurate information acquisition of users.

Second, to build a flexible and secure information service architecture: With the basis of data resource basic environment and comprehensive inquiry data model, with the help of integrated technology architecture design, the relevance of business and technology can be separated, providing flexible, customized, universal and effective data service to all kinds of users. Various presentation forms of result are allowed and strict visit permission control can be realized according to the role of user, providing secure data protection.

2. Development of Information Service

According to the integrated planning of data resource centre as well as the current situation of data resource development and with the use of information technology, integrated data resource basic environment, complete comprehensive inquiry service model as well as flexible and secure information service technology platform can be established.

2.1. Main Database Construction

The main database is an important component of data resource system and it provides unified shared basic data for all information systems. The main database is consisted of subject database and code database and it extracts and synchronizes data from corresponding information system. Meanwhile, the main database provides data inquiry and search service to other systems or users from the information service platform.

Comprehensive information service is designed according to integrated plan and organized according to subjects. It extract the main and core business data of the university and design the main database including business subject such as public code, teacher subject, student subject, enrolment, educational administration, personnel and etc. Data are then converted and standardized. The deployment and realization of the main database are completed via data share and exchange, which establishes the integrated data resource basic environment.

Extract Transform Load (ETL) is a common terminology used in data warehousing which stands for extracting data from source systems, transforming the data according to the business rules and loading to the target data warehouse. ETL applies to solve data exchange problems among heterogeneous databases with large quantities of data but low requirement for real-time. ETL can be divided into three modules: data extraction, data transformation and data load. ETL process is shown in Figure1.

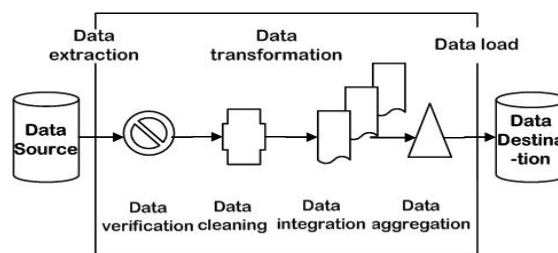


Figure 1. ETL Process

Data extraction is the process of reading data from a specified source database and extracting a desired subset of data. Transformation is the process of converting the extracted/acquired data from its previous form into the form it needs to be in so that it can be placed into another database. Transformation occurs by using rules or lookup tables or by combining with other data. Load is the process of writing the data into the target database [3].

2.2. Technology Platform Construction

The information involved in comprehensive information system is massive and in various forms. Therefore, it is required yet very complicated to control the visit of information.

Robust, effective and secure management mechanism is employed for comprehensive information service, which supports the permission management of multiple types of users and multiple levels of data, guarantees the legal use of data and prevents the illegal information acquisition and demolition.

Closed combination has been realized between comprehensive information service system and the Portal. The Portal is the integrated window for releasing information of the university and the information service system provides background preparation for information release. Comprehensive information service realizes the systematic integration of individual users, R-ABAC [4] and the Portal. According to the requirements of users, useful information can be extracted from the subject database and then released to the user terminal via the Portal as shown in Figure 2.

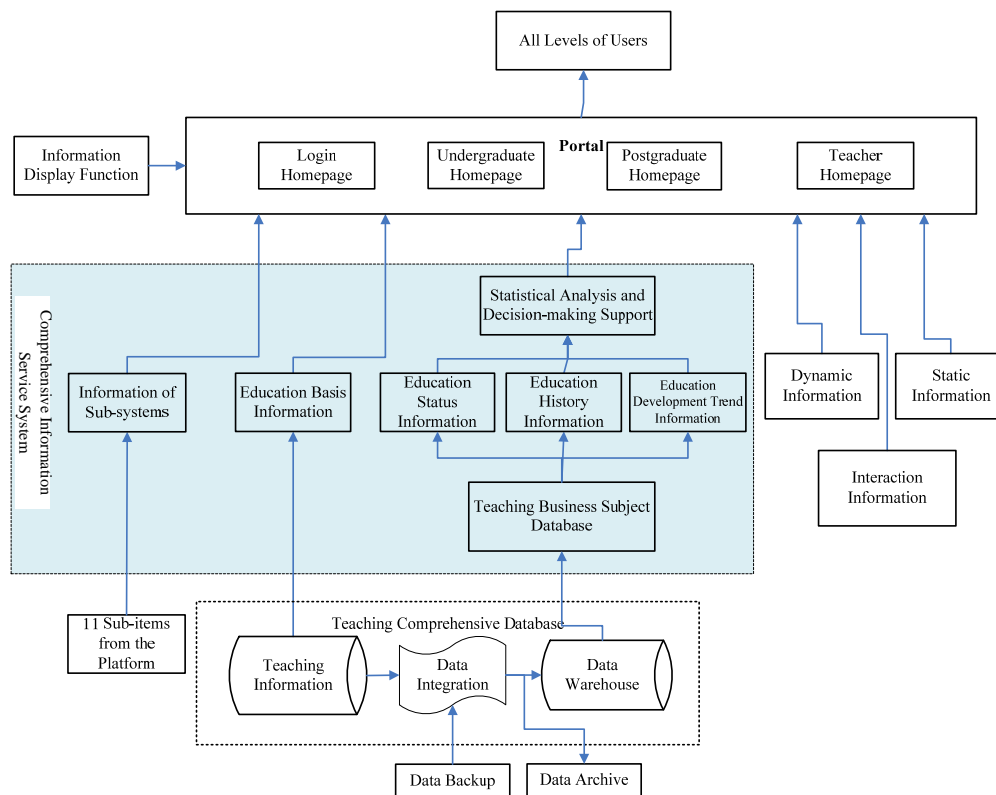


Figure 2. Framework of the Information Service System

As flexible and convenient release function is provided by the comprehensive information system, when basic data resource is ready in the main database, it can provide instant and efficient inquiry and statistic service through dynamic reports, which meets the new requirements continuously proposed by users.

Dynamic reports are created at run time. Each time the report is run, it gathers the most recent data in the OLAP server if the data is dynamic OLAP data, and in the Data Warehouse (SQL Server) if the data is dynamic SQL data.

Only the report definition, which remains the same over time, is stored. Commerce Server does not save completed dynamic reports; however, dynamic report results can be exported to Microsoft Excel and store them there.

Figure 3 shows how a dynamic report is generated: data is stored in the Data Warehouse, cached in the OLAP database when the Report Preparation DTS task is run, and then accessed by client to run a report [5].

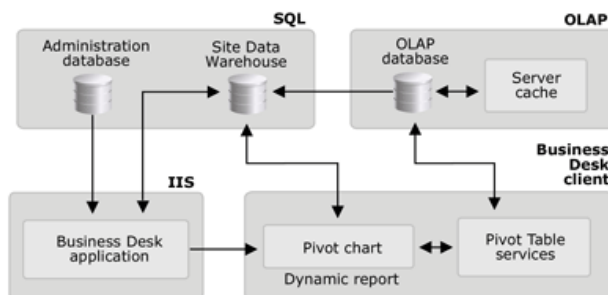


Figure 3. Dynamic Report Process

2.3. Information Service Model Design

Based on information technology including data share and exchange, tree-structure organization, role permission management, information Portal integration and etc., comprehensive information service provides abundant and accurate comprehensive inquiry as well as statistical analysis for universities, departments, schools, teachers and students. These services include data standard release, business subject inquiry, and support for statistical analysis, individual file management and maintenance of user permission.

1) Design and Realization of User Function Model

By analyzing the information flow direction of business activities including educational administration, personnel and etc., the comprehensive information service can figure out the relation between internal organization/institution involved in management business, a whole set of business inquiry, statistical analysis and role permission model is established and complete control of multi-layer user, multi-level data and multi-business subject can be realized, which improve the security of system and data.

Table 1. User Function Model

Roles	Role Function	Information in Resource	Data Permission
University leader	Organize and manage enrolment, education, personnel, research and etc	a) Admission statistic result b) Education statistical result c) Teacher and staff statistics.	All the university
Admission office	Undergraduate enrolment, employment and management	a) All admission information b) Admission statistics.	All the university
Administrative education office	Undergraduate education management	a) All administrative education information b) Administrative statistics	All the university
Personnel office	Management of teachers and staff	a) All personnel information b) Teachers and staff statistics	All the university
School leader	Education and management of relevant school	a) Administrative education statistics of school	Relevant school
School administration and education staff	Undergraduate education and management	a) Administrative education information of school b) Administrative education statistics	Relevant school

2) Individual File Design and Realization

Based on both the teacher and student subject database, the comprehensive information service provides functions for teachers and students to view and maintain all kinds of personal information in the university. Teachers' individual files, as shown in Figure 4, include personal information, position information, education information, research information, financial information, reward information and etc.

Students' individual files, as shown in Figure 5, include personal information, studentship information, cultivation information, social work, payment information, reward information, penalty information and etc.

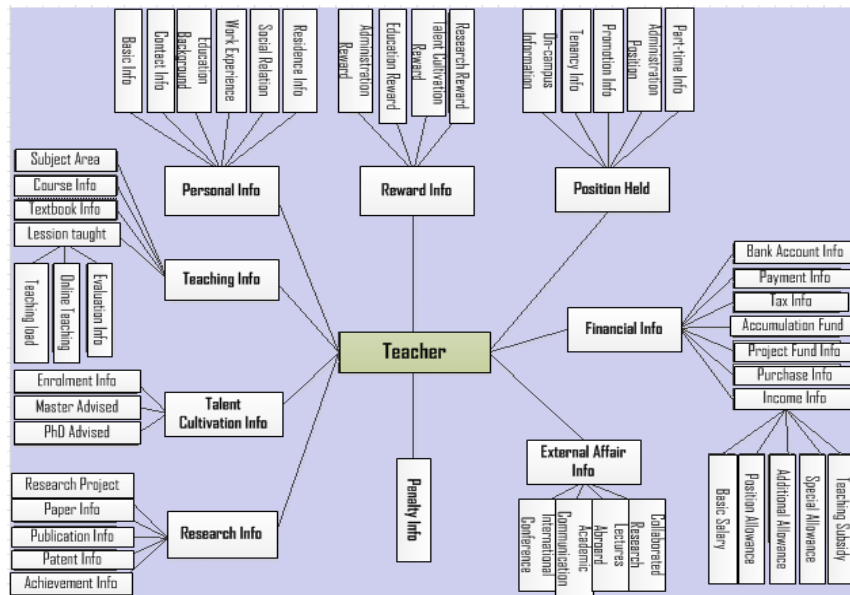


Figure 4. Teacher Digital Files

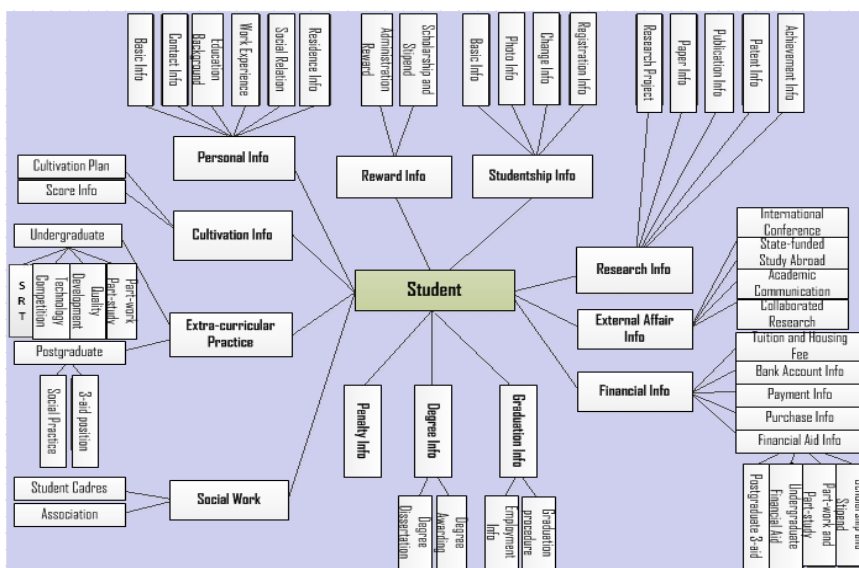


Figure 5. Student Digital Files

Comprehensive information service also provides electronic space for all the teachers and students to save personal photos and upload local files, record events and etc. Meanwhile, publicise teachers' and students' personal information, including personal experience, research information and library record, by integrated with the Portal.

3. Application of Comprehensive Information Service

Comprehensive information service can be applied to individual management, business management and decision making, serving whole university right, such as teachers, students, departments and managers.

3.1 Application in Individual Management

Based on both the teacher and student subject database, the comprehensive information service provides functions for teachers and students to view and maintain all kinds of personal information in the university.

1) Application of Personal File in Individual Management

In individual management, each individual is both the governing and governed. With the use of comprehensive information service, the user can perfect self-guidance and realise self-government. Comprehensive information service provides complete, flexible and humanized service for individual view and arrangement of personal information. Teachers and students can view all kinds of personal information in the university, including study, education, research work that is completed or needs to be completed, publications, achievements, rewards, penalties, social work, part-time jobs, visit and exchanges information and etc., anytime and anywhere. With the help of comprehensive information service, one can check the completeness and accuracy of information anytime and anywhere. Once inappropriate data is found in the record, they can contact the relevant management department to perform examination and correction of problematic data.

2) Application of Personal File in Form Auto-fill

For all the users, it is troublesome to repeatedly fill in forms, especially forms containing personal information. However, one needs to fill in many forms. For example, teachers' professional title evaluation needs application materials, teachers' declaration of research project needs project application, teachers' opening of new courses needs course-opening application, students' scholarship evaluation needs personal statement, students' social work needs personal resume. The personal file feature in the comprehensive information service provides data infrastructure for auto-fill of forms. The integration between the system and the Portal as well as other information systems would provide assistance to fill in forms automatically, which reduces the teachers' and students' work to arrange, copy and paste, speeds up all kinds of work in learning, working and living. Personal efficiency is improved and complexity is reduced while the data accuracy can be strengthened.

3.2. Application in Business Management

The comprehensive information service figures out the data resources of all functions in the university and extracts the main and core business data of the university for standardisation and conversion, which forms the business subject database including education, personnel, research and etc. By providing all kinds of information inquiry and statistical analysis for university leaders, and all levels of users in departments and schools, it plays an important role in management of educational administration, personnel, research, finance and etc.

1) Application in Enrolment and Employment Management

All kinds of data for enrolment and employment over the years are publicized by the comprehensive information service, including inquiry of enrolment data such as freshmen situation and minority nationality as well as enrolment statistics of enrolment quota and admission line from each school and examination district. Users from the admission office can view the aforementioned information with the use of comprehensive information service system to get to know the enrolment situation of each year, each major and each examination district, which can be further used as the reference of enrolment plan and to prepare the class and student ID arrangement, letter of admission, freshmen accommodation, inner-university coordination and digital freshmen welcome activities.

2) Application in Educational Administration Management

Educational administration information inquiry such as teacher, studentship, curriculum and academic statement as well as educational administration statistical analysis including number of students in class, examination result, higher education fundamental statistic table, education quality, are publicised in the comprehensive information service. Academic administration, leadership from departments and education secretary can view the aforementioned information anytime and anywhere by using the comprehensive information service system. They can get to know the learning and changes of students of all grades and all majors and the teaching and academic result of each school and each course, which provides data infrastructure for educational administration management activities including the completion of cultivation, re-enrol course substitution, teaching plan formulation, education work load calculation and etc.

3) Application of Business Inquiry in Personnel Management

Personnel information inquiry including personal basic information, education background, working experience and etc. as well as statistical analysis such as teacher working load and teacher structure of schools are publicised in the comprehensive information service. Personal division, leadership of department, personnel officer users can view the aforementioned information anytime and anywhere with the use of the comprehensive information service system to get to know the distribution of age, education level, professional title of each school to accomplish management activities including the teacher work load calculation of each semester, professional title evaluation, salary payment, routine check and etc.

3.3. Application in Management and Decision-making Level

1) Application in Leading Cadres Report

Comprehensive information service provides flexible and convenient statistical analysis for all levels of leaders. With the help of comprehensive information service system, leaders can prepare and summarize report in higher quality with less time. For example, data of age, professional title and degree of teachers of each school have been established in the comprehensive information system. Therefore, with the use of comprehensive information system, the leaders from personnel department can get to know the situation of teachers' age, professional title and degree before and after inauguration. By comparing these data, they can confirm whether the expected goals of management method and mode revolution have been fulfilled, whether the anticipated effect has been achieved as well as the reason of success and fail of revolutions.

2) Application in Supporting Management Decision-making

The statistical analysis realized in the comprehensive information service is now able to provide data support for the management decision of the university, schools and departments. For example, with the use of comprehensive information service, personnel department user can compare the situation of teachers' age, professional title and degree within 10 years and analyze the reason of change so that deep level historical trend analysis and prediction can be performed and advice on personnel revolution and talent import facing the new situation can be proposed. In addition, the data of enrolment situation of each examination district and each school as well as the study condition of students have been established in the comprehensive information system. Combining placement and business development data after graduation, data mining and correlation analysis can be carried out to consider giving special attention to students with certain characteristics, what cultivation mode to be adopted and what techniques cultivation to be emphasized so that useful impact would come into effect in the business and development degree of students after graduation.

4. Conclusion

Talent cultivation is the fundamental task of universities. Digital campus needs to serve such fundamental task and convert the advantage in running schools into the advantage in the improvement of talent cultivation quality with the use of information technology. Ordered organization and centralized management of data would realise the standardisation, integration and authorization of the management of data resource of universities so that the completeness, consistency, orderliness, sharing and manageability can be guaranteed. By organization and management of all kinds of resources in university informationisation, the comprehensive information service can perform scientific categorization and organization of all kinds for information resources and services. It enables the users to promptly find out the information resource and service needed, allows managerial staff to manage business in a professional manner, provides perfect environment for online information communication between teachers and students, and provide information for users in the most efficient way so that the expected goal has been achieved.

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