Information Management System of University Education Based on Big Data Analysis

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Abstract—With the increasing advancement of information technology (IT) and the universal application of the Internet, the global society and economy have undergone profound changes, and it can be clearly seen that universities have both opportunities and challenges at this stage. The current informatization of colleges and universities is deepening, based on big data, Internet and other platforms, the classification and integration of personnel records, academic affairs, students and other management systems, realizing real data sources, real-time data collection and data information sharing, the school's education and teaching data information has been effectively integrated, greatly improving the efficiency of teaching management, providing talent training, quality analysis, management decisions and so on for colleges and universities(CAU) The scientific basis of this paper is the adoption of big data(BD). The innovation of this paper is to design the information management system of college education by using big data analysis technology, which is developed by java language and is efficient in data processing and integration compared with other types of information management systems(IMS). In this paper, the performance test of the system gets that the response time of static page and dynamic page request is 8.4s and 19.7s when the amount of users is 2000, and then the number of defects appearing during the use of the system is found by the defect test, and the designers are guided to solve the system design defects, and the test and implementation results of the system verify that the system can meet the users' use.

Keywords- Big Data Analysis, Education Informatization, Performance Testing, Defect Testing

1 INTRODUCTION

The IT provides a new space for reform and innovation of universities, and also brings many challenges such as the diverse needs of society for talents and the innovation of education and teaching management structure and working methods. Therefore, universities should use the advantages of BD and IT to coordinate informatization construction and education teaching management activities, so that their education quality can be guaranteed and their working efficiency can be further improved to cultivate more pillars of society.

The research on informationization management of university education is progressing smoothly and has achieved good results. For example, a scholar has built a digital learning platform with "cloud application" as the core, and the scholar pointed out that the construction of such a platform is not only conducive to innovative teaching methods, but also conducive to the construction of a new talent cultivation mode, thus providing a strong boost to the development of education informatization (EI) [1]. Some scholars have studied the specific application and practice of IT in educational management, arguing the feasibility of the operation of cloud services, C/S and B/S models, and dissemination systems in educational management, as well as the existence of advantages and disadvantages, pointing out that when any school carries out the construction work of the teaching and learning system, it must create the system platform according to its actual situation, and not rigidly imitate others [2-3]. China has both strengths and weaknesses in higher education, and at this time, in order to achieve further development of higher education in China, it is necessary to optimize and improve the current higher education mechanism.

First, introduces the concept of education information management, analyzes the non-functional requirements of education IMS, then describes the architecture of designing the system and the application of BD analysis technology in the system, then designs five functional modules of the system and introduces their modules, and finally tests the system performance and analyzes the system login implementation process.

2 BASIC OVERVIEW

2.1 EI Management

EI management is a series of activities carried out in the process of realizing EI, including organization, planning, control and coordination. The purpose of EI management is to improve the efficiency of EI management, and the function is to effectively use the rights of the state endowment [4]. In order to keep up with the pace of global EI, we should play the role of management of diverse subjects and carry out informative and autonomous educational management mechanisms. Specifically, in the management process, with the help of IT, the use of scientific management tools, and through the organization and coordination within the education system, we can reasonably and effectively save management costs and maximize management benefits in order to achieve informationization in education [5].

Education management is a complex and systemic system engineering, and through systematic analysis of the management process, it can achieve scientific and effective prediction and control to improve the effectiveness of education management. Education management system is also an open system, which is part of the whole social system. Informationization of today's society, various aspects of this social subsystem of the education management system are subject to change [6-7].

2.2 System Non-Functional Requirements Analysis

(1) System security

The education IMS is a system with high security requirements, which involves the modification of a large amount of important information and data. Therefore, the system must ensure that these operations can be run in a safe and reliable system environment. So as to ensure the realization of system security, for the operation of different operations of the system, the loggers with corresponding rights are required to carry out, which prevents the confusion of data, so the system should have a complete set of roles and user management system to realize [8-9].

(2) System reliability

The system is an educational management system, for the management and maintenance of student information often involves some relatively important data, the system in operation because of some kind of software or hardware error will inevitably be wrong, the system is particularly important to respond in a timely manner after the error, and to backup the data to ensure that the data will not be lost [10].

(3) System shareability

As an educational IMS, the system often needs to share data with the Education Bureau or other schools, so the system must be secure and accurate in terms of data sharing.

(4) Maintainability

Because the system is an education IMS, when the education system is adjusted, the system function must also be adjusted and optimized accordingly, and a system with good maintainability has obvious advantages when maintaining and improving the system function.

3 DESIGN OF UNIVERSITY EDUCATION IMS BASED ON BD ANALYSIS

3.1 System Architecture

The system is developed based on java and forms the basis of technology development with the support of database platform MYSQL. The support platform of software, system function expansion, application system development, etc. all adopt unified development tools and database to form a unified overall platform, which reduces integration, compatibility and management risks brought by repeated construction and procurement, etc. To achieve the goal of complete and unified overall system architecture, high integration of service functions, close articulation, fast and effective deployment and development; low investment in hardware and software, distinct maintenance and development levels, simple and effective management, and low overall realization cost [11-12].

3.2 Application of BD Analysis Technology in the System

The system uses BD technology, site management, CMS (content management system) and other key technologies to provide users with multi-level integrated data analysis technology and self-service site construction technology, unified management and distribution of data through

the use of a variety of data storage technologies, and the establishment of various thematic databases based on basic data for deep data analysis; start a variety of technologies for system operation, maintenance and security The system's operation, maintenance, and security logs are monitored and secured by various technologies; the system integration and integration of data and functional services by enabling the feature of website cluster management provides strong support for the overall coordination and linkage of the system platform. In addition, for the security of the system, this paper proposes an encryption algorithm, namely MD5 algorithm, which can encrypt the login password of the system users, and the four non-linear functions of the algorithm operation are as follows.

$$f(x, y, z) = (x \& y) | ((\sim x) \& z) \qquad (1)$$

$$g(x, y, z) = (x \& z) | (y \& (\sim z)) \qquad (2)$$

$$h(x, y, z) = x \wedge y \wedge z \qquad (3)$$

$$k(x, y, z) = y \wedge (x | (\sim z)) \qquad (4)$$

where x, y, and z variables are independent and uniform, "&" stands for "yes" and "~" stands for "no ".
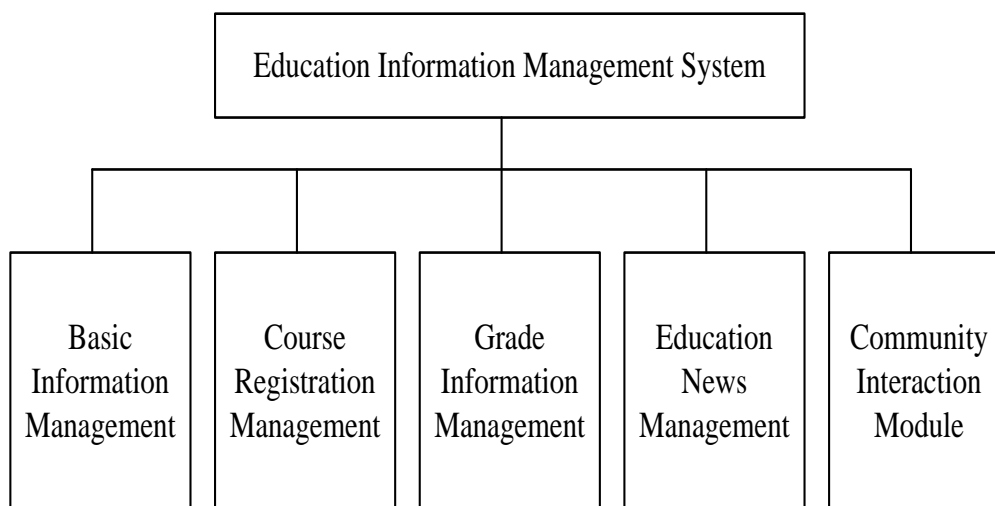
3.3 System Functional Module Design

Figure 1. System functional modules

As shown in Figure 1 is the module structure of this system, the functions of each module are described as follows.

(1) Basic information management

When the user enters information, the system can provide a calendar plug-in for the user to enter the correct information format and insert it into the database so as not to cause errors caused by conflicting formats. The system should also provide mailbox format judgment in text input, input character length and type of qualification, such as the length of the ID card number and character type of qualification, in the system to the background when submitting data, there should be a corresponding confirmation and warning of the prompt function, the operation results return, there should also be a corresponding prompt message.

(2) Course registration management

The purpose of course registration management module is mainly to facilitate administrators to select courses for students and register them for courses, and administrators to select courses, in which administrators need to select majors and courses for students. The system should be able to show the students who are eligible to take courses and ask them whether to take courses, and then register them for courses after getting their answers. There are two types of eligible students, those who have not registered for a course and those who have registered for a course but have a grade of less than 60, and both should be marked accordingly, the former as new students and the latter as old students. The security aspect of the module should also be taken into consideration, so that when there is an error in the system, such as when the system finds students who are not eligible to register for a course, it should make a judgment and block the illegal registration accordingly to ensure the security of the data.

(3) Grade information management

This module is mainly for the management of students' grades and real-time tracking of students' grade information to ensure that students complete the corresponding course registration and can graduate successfully. The question of course selection is similar to the course selection in the course registration module, and the query results are displayed. The query results for candidates who must have registered for the course, the grade column should have two output forms of scores and unrecorded, the administrator can enter and modify the student grades, and the user can also restore the initial data at once.

(4) Education news management

News management as the management of news announcement information - a function, the design of this function directly affects the system home page display effect, so the function in the interface requirements are very high. After entering the system, the system administrator selects Add News in News Management, and the system returns a news release page to the user after being requested by the user. At this point, the user can edit and publish the news announcement, and after successful submission, the system will persist the news announcement information into the database through layers of calls.

(5) Community interaction module

This module provides a platform for information exchange and online services for students, parents, teachers and other audiences, and enables them to get relevant help through the online service system. It enables schools and families to form a synergy in education and teaching, and achieve the purpose of resource sharing and information interaction. The column function can set interactive information content such as blog group, forum, online Q&A, office guide,

recruitment application, online Q&A, principal's mailbox, and consultation hotline. The online service module can set up both information release function and online interactive function and resource service function.

4 SYSTEM TESTING AND IMPLEMENTATION

4.1 System Testing

(1) Performance test

Performance testing refers to the testing of all functional parameters of the system by automated testing techniques in general, maximum value and special load environments. There are two different approaches to performance testing: load testing and stress testing, and they can be used simultaneously. After load testing, the performance state of the system under different workload conditions is understood, with the ultimate goal of testing the changes in each functional parameter of the system under increasing load. Stress testing is a test to find the system's gateway, that is, the insurmountable performance value, so as to get the highest service level the system can reach.

The specific test situation is the average response time of the static and dynamic pages of the system. The performance test table is shown in Table 1.

Table 1. System performance data

	Static pages	Dynamic pages
500	0.8	1.2
1000	2.2	6.5
1500	4.6	11.3
2000	8.4	19.7

The test results show that each functional subsystem of the education IMS works well, with an average request time of 8.4 seconds for static pages and 19.7 seconds for dynamic pages with 2000 concurrent connections, and the timeout time for page connections is within the specified range when adding or reducing hosts.

(2) Defect testing

From the test report, the education IMS has completed the proposed requirements and design in terms of functionality. The testing process was performed through IBM Rational Clear Quest for defect management. Therefore, the occurrence and repair of defects can be well tracked. The defect discovery statistics of the system platform from 9:00 am to 16:00 pm in 3 days are shown in Figure 2.
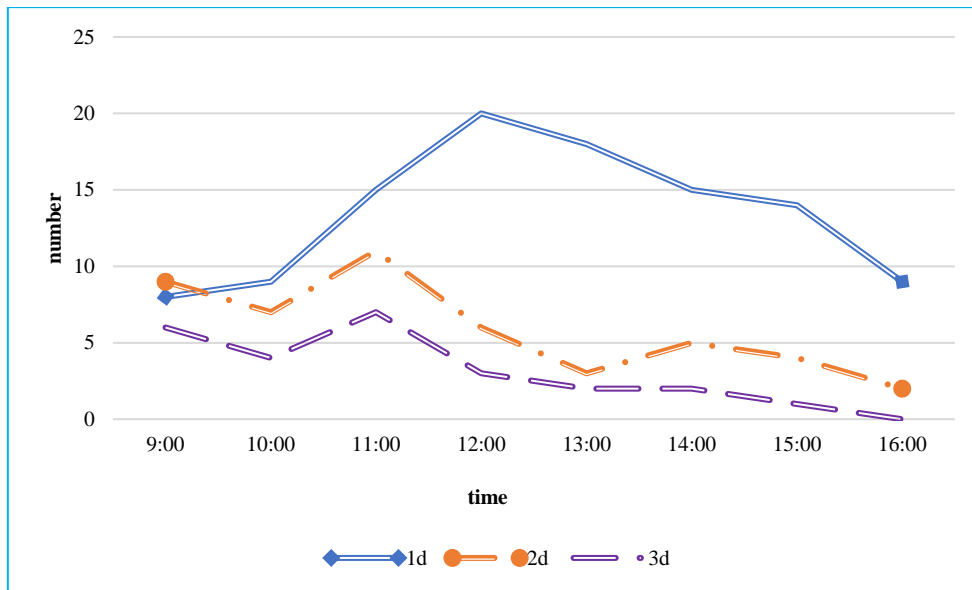
Figure 2. System defect discovery statistics

With the deepening of system testing, the number of errors or defects found by testing is proceeding in a decreasing trend. Test-oriented design and development can effectively control the various risks brought by changes in system requirements, further ensure the actual implementation of the system is consistent with the requirements design, and reduce the cost of later maintenance, testing and management inputs.

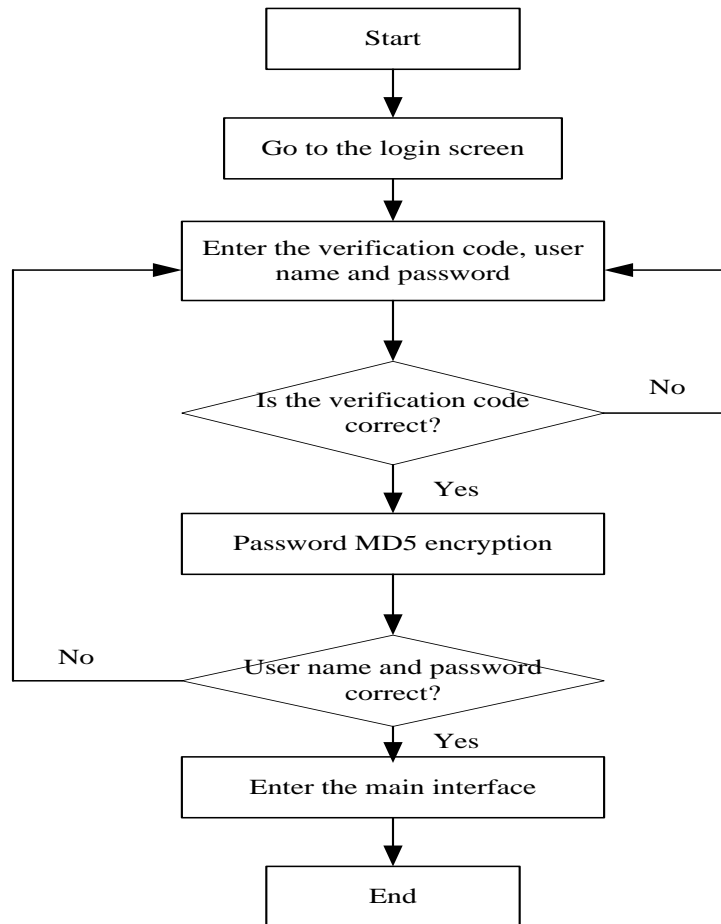## 4.2 System Implementation

Figure 3. System login process

For the system designed, the user login process of the system is analyzed. In Figure 3, the system login flow chart is shown. First, the user enters the login screen and enters various verification information, such as user name, password, system verification code, etc. Then the system automatically verifies whether the information is correct, and if it is correct, the system uses MD5 algorithm to get insured the user's password, so that prevent password theft and also make the system remember the user's login information. If the user needs to change the password, he/she needs to enter the original password, the new password and confirm the new password, then the system will perform MD5 on the password again. when the password entered by the user is consistent with the password saved by the system and conforms to the rules, the system accepts the user to enter the main page. If it does not match, the user needs to re-enter it.

5 CONCLUSION

The informationization of education management in CAU is of great significance in promoting the efficiency of school operation. This also makes the process of teaching reform in CAU accelerate, and the management mode has a big breakthrough. Too much data and reports are generated during education management, and the way of manual processing of information can no longer meet the demand, so CAU change their management mode and strengthen the application of BD analysis technology in EI management. Compared with other management modes, BD technology has unique advantages for information acquisition and organization, which can effectively realize the integration of teaching resources and diversified information sharing, as well as improve efficiency and avoid repetitive work. The use of IT for education information management will lead to a more perfect and excellent teaching system, which in turn will achieve further enhancement of teaching standardization and substantial improvement of students' learning efficiency, so that schools, teachers and students can all benefit.

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