



Design of Educational Management System for College Students Based on SaaS

Si Li^(✉)

School of Mathematics and Statistics, Xiamen University of Technology, Xiamen 361000,
Fujian, China
chuangsit4416@163.com

Abstract. With the rapid development of science, information technology has become more mature and perfect, and has been widely used in various fields, including education, which has accelerated the pace of information development in China's education field. The application of information technology can effectively improve the teaching quality and efficiency. Based on this, this paper analyzes the system requirements, and then takes SaaS technology as the core to develop a college education management system with good performance and sound functions, so as to provide support for better university education management.

Keywords: SaaS technology · College students · Educational management system

1 Introduction

Under the background of informatization, in order to improve the level of education management, universities in China have started to build corresponding education management systems. The application of education management systems can break the time and space constraints, thus promoting the development of the whole education management and helping students learn more theoretical knowledge. However, after an in-depth study of the existing education management system, it is found that there are still some defects, such as some missing functions and poor system security, which lead to the limited practical application value of the existing education management system. Therefore, it is of great significance to develop a better education management system, which can further improve the teaching effect.

2 Demand Analysis

When designing the education management system, it needs to have the following functions: (1) manage the basic information of students, such as adding, adjusting and deleting students' information; (2) to manage the students' grades, such as displaying the information of students' grades, and giving tips for retaking and making-up exams; (3) Students choose courses independently. Students automatically choose elective courses

in the system according to their own specific conditions; (4) Teaching evaluation. During the teaching activities, both teachers and students can evaluate this teaching activity in the system; (5) After entering the system, students who are about to face graduation employment can browse the recruitment information and communicate with their tutors through the system, so as to guide the thesis design; (6) Course arrangement and adjustment. In this system, the school leaders can arrange and adjust the curriculum. After entering the system, teachers can inquire about the course arrangement of the whole semester; (7) Performance management [1]. Teachers can input students' daily performance and final exam results into the system. In addition, the system should have high security, strengthen the storage of internal data, and prevent problems such as information leakage from causing interference to universities and students.

3 System Design

3.1 Overall Design

The system consists of four layers, namely: (1) the application layer, which is at the top of the whole system, can call the lower layer according to the operation requirements of the system, so as to construct the corresponding interface at the user end, provide various functional services to users, and ensure that users can operate the system orderly; (2) Man-machine interface layer. It is mainly developed by ExtJS tool, which is located below the application layer and contains all the controls and elements required by the application layer. (3) In the middle business layer, under the man-machine interface, through middleware technology tools, Spring Framework is selected as the core framework, and applications are connected into the system to complete various business processing work; (4) Data access layer. Connected to the database, data can be stored, extracted and modified. DBC is a data access model of J2EE application, which can browse the information stored in relational database. As shown in Fig. 1.

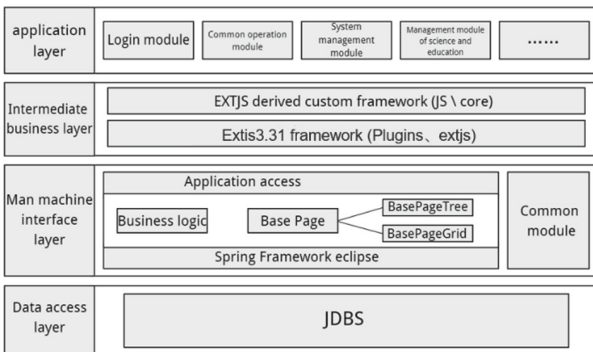


Fig. 1. Overall system structure diagram

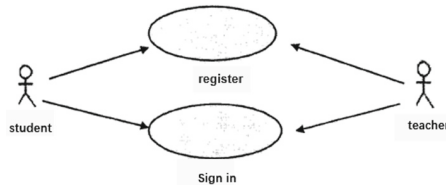


Fig. 2. User management use case diagram

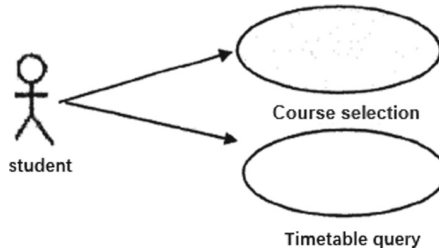


Fig. 3. Use case diagram of students' course selection

3.2 Functional Module Design

3.2.1 User Management

This module consists of three parts, which are used to manage students, teachers and schools. In the front interface of the module, learn how to talk with teachers, use their own identity information to register the corresponding account and password, and you can use the account and password to log in to the system. Students and teachers can enter different interfaces according to the different permissions of the account password. For example, as shown in Fig. 2.

3.2.2 Students Choose Courses

After entering this module, students don't need to choose major courses, which are automatically assigned by study; And students choose corresponding elective courses according to their own specific conditions. For example, as shown in Fig. 3.

3.2.3 Management of Teaching Evaluation

After entering this module, according to the courses that students need to learn, the corresponding lecturers and students will automatically show their teaching performance, and the teachers will be graded, with the lowest score being 0 and the highest score being 100. After all students evaluate or evaluate, the system will automatically calculate the average score. For example, as shown in Fig. 4.



Fig. 4. Evaluation use case diagram

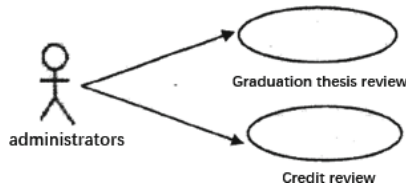


Fig. 5. Graduation management use case diagram

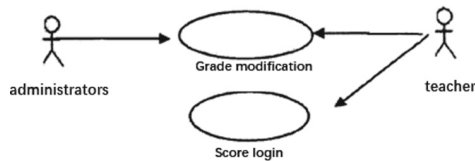


Fig. 6. Use case diagram of achievement management

3.2.4 Graduation Management

After logging in to the system, the system will evaluate the student’s identity and authority. If the student is a non-graduate, he can’t enter this module. After entering this module, graduates can communicate with the corresponding tutors, get the tutors’ evaluation of graduation design, and make corresponding modifications. Within the time specified by the school, students will upload their graduation designs to the transmission system, and the teachers will grade them according to the content of graduation designs as stated by the institute. If they fail to upload their graduation designs within the specified time, they will be given 0 points. Finally, the system calculates the final graduation score according to students’ daily performance, graduation design score, etc., and on this basis, compares it with the standard score stipulated by the school. If the graduation score is above the standard score, students are allowed to graduate. For example, as shown in Fig. 5.

3.2.5 Performance Management

After entering this module, teachers can manually enter students’ scores into the system. Once the score is entered, the teacher cannot modify it again. If it needs to be modified, it should be reported to the administrator, who will modify it. After students enter this module, they can show the examination results of each semester through semester screening. For example, as shown in Fig. 6.

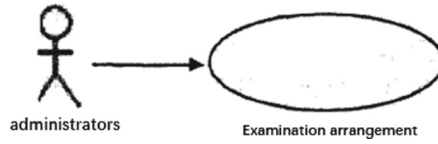


Fig. 7. Exam management use case diagram

Table 1. Student Achievement Database

number	field	kind	explanation
one	Stu-id	Char(50)	Student ID
2	Stu-name	Int(10)	Student name
three	Stu-sex	Int(2)	Students' gender
four	Stu-birthdate	Int(2)	Student's birthday
five	Stu-family dress	Char(100)	Student address
six	Stu-telephone	Int(10)	Contact information
seven	Stu-class	Char(50)	Class
eight	Stu-school	Char(100)	Faculty and department

3.2.6 Examination Management

After entering this module, you can arrange the examination time, examination room location and invigilator according to the school teaching plan and the number of students and teachers. If it's an elective course, only the number of elective courses will be used to arrange examination-related matters. For example, as shown in Fig. 7.

3.3 Database Design

In the education management system, my SQL database is adopted, specifically, it mainly consists of the following categories (parts):

Student database. Used to store students' basic information, as shown in Table 1.

(2) Database of teachers. Used to store basic information of teachers, as shown in Table 2.

Table 2. Teacher database

number	field	kind	explanation
one	Tec-id	Int(11)	Teacher ID
2	Tec-name	Char(50)	Teacher's name
three	Tec-sex	Char(1)	Teachers' gender
four	Tec-title	Char(28)	professional qualifications
five	Tec-birthdate	Int(11)	Teacher's birthday
six	Tec-family dress	Char(100)	Teacher's address
seven	Tec-telephone	Int(11)	Teacher contact information
eight	Tec-class	Char(50)	Teacher's class
nine	Tec-school	Char(100)	Teachers' departments

4 System Implementation

4.1 Hardware Environment

The hardware of the system mainly includes: (1) CPU, whose signal is Intel Xeon E5504; (2) Memory, with a capacity of 8G; (3) Hard disk with a storage capacity of 500g.

4.2 Software Environment

In the aspect of software environment, it mainly includes: (1) development framework, My Rclipse framework and Exut JS framework are selected; (2) Programming language, Java language is selected; (3) Server, the Web server with Tomcat-7.0.23 is selected; (4) Database, SQL database with the version of Server 2010 is selected; (5) Operating environment, Windows-i7-12700k system is selected.

4.3 Realization of Functional Modules

4.3.1 User Management

This module mainly manages the information of students and teachers. For each user, whether it is a teacher or a student, a corresponding number will be generated, and each number is unique, so the information of the corresponding user can be directly queried through the number. In the aspect of student information management, new information can be added, existing information can be adjusted or deleted, and information can also be queried. Among them, when adding information, Insert Student function is adopted; Use the Deleteby ID function when deleting information; When information is adjusted, the Updateby ID function is adopted; Select function is used when querying fumigation.

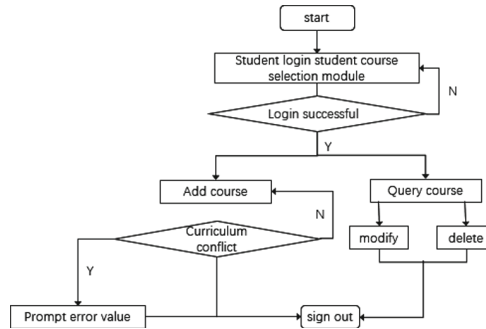


Fig. 8. Flow chart of student course selection module operation

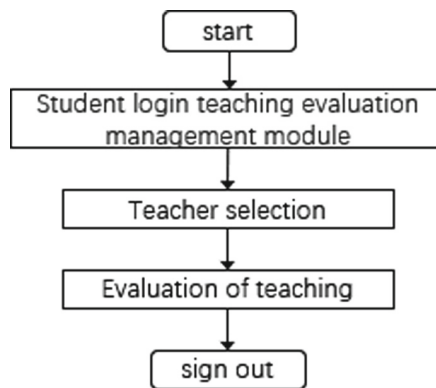


Fig. 9. Operation flow chart of evaluation module

4.3.2 Students Choose Courses

In this module, students can choose their own professional courses according to their own specific conditions. When adding courses, use the Insert Student Class function; Use the Select Student Class function when querying the course; When deleting a course, use the Delete Student Class function. The operation process of this module is shown in Fig. 8.

4.3.3 Management of Teaching Evaluation

In this module, teaching activities are mainly evaluated. After entering the module, students first choose their own teacher, and then make corresponding evaluation on the teacher according to the specific situation of teaching activities. In this process, Submit Teacher Evaluation function is mainly used. The specific process is shown in Fig. 9.

4.3.4 Graduation Management

This module is mainly aimed at graduating college students. After college students have written their graduation thesis, they can transmit it to this module, where the

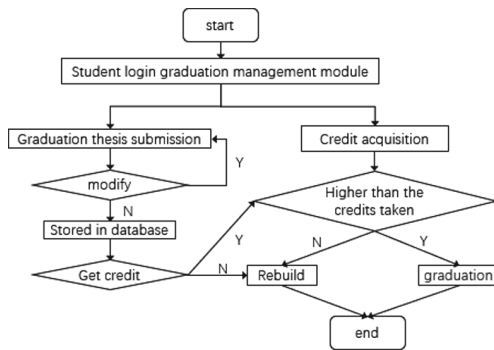


Fig. 10. Operation flow chart of graduation management module

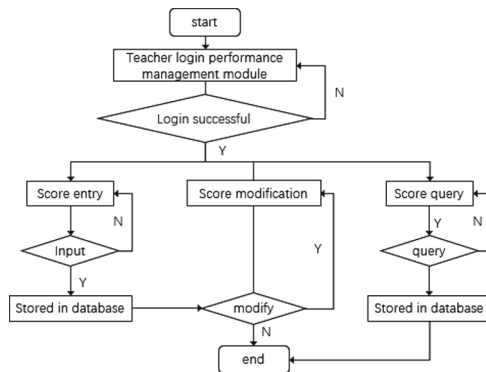


Fig. 11. Flow chart of performance management module operation

tutor can read the students’ thesis and make corresponding comments. According to the tutor’s comments, students constantly revise the thesis in this module, and then get the final graduation thesis, which is automatically stored in the system. At the same time, in this module, students can also browse their graduation results. Among them, the Submit Student Paper function is adopted when the paper is submitted; When browsing graduation scores, the Select Student Scores function is used. The specific process is shown in Fig. 10.

4.3.5 Performance Management

In this module, teachers can enter, adjust and delete students’ course scores; Students can also inquire about their grades. Among them, the Add Student Grade function is used when the scores are entered; When deleting the grade, the Delete Student Grade function is used; The Update Student Grade function is used to adjust the grades. The function of Select Student Grade is used to query the results. In the calculation of grades, the Calculate Student Grade function is used. The specific operation process is shown in Fig. 11.

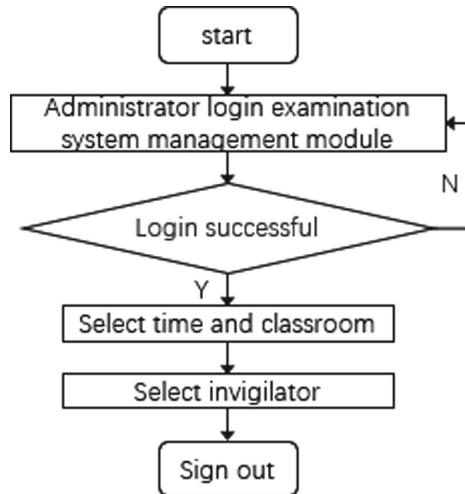


Fig. 12. Operation flow chart of examination management module

4.3.6 Examination Management

In this module, it mainly completes the work related to students' examination management, such as examination room arrangement and monitoring. Among them, when the invigilator arranges, the Select Teacher Number function is adopted; Select Romm Number function is used in the arrangement of the examination room. The specific operation process is shown in Fig. 12.

4.4 Creation of Database

Code for creating database file is as follows:

```

BEGIN
CREATE DATABASE Manage
On-create a data file
(
NAME = Manage_Data,
FILENAME = E:\Database\Manage_Data.MDF',
FILEGROWTH= 10%
)
LOGON-Create a log file
(
NAME = Manage Log,
FILENAME = E:\Database\Manage_Log.LDF',
SIZE = 1MB,
FILEGROWTH= 10%
)
RAISERROR (database [Manage] created successfully',
0,1) WITH NOWAIT
END
GO
CHECKPOINT
USE Manage
GO
  
```

5 System Test

5.1 Test Methods

During system design, in order to verify whether the system meets the expected requirements, it should be tested. Specifically, it mainly includes two links. One is unit testing, that is, after each function is developed, the functional module should be tested to determine whether the functional module can run normally. The second is comprehensive testing, that is, after the research and development of the whole system, the whole system is tested to ensure the normal operation of the whole system [2]. Through detection, the defects in each functional module can be found in time and optimized to improve the application effect of the system [3].

When using the LoadRunner script, at the same time, the tool software of this script is used to test the login of the test user as follows:

```
vuser_init()
{
web_url("mercuryWebTours",
"URI=https://10.56.64.3:8080/",
"Resource=0",
"RecContentType=text/html",
"Referer=",
"Snapshot=t6.inf";
"Mode=HTML",
LAST);
//User login process
lr_start_transaction("login");
web_submit_form("login.pl",
"Snapshot=t2.inf",
ITEMDATA,
"Name=username", "Value={user} ", ENDITEM,
"Name=password", "Value={pwd}", ENDITEM,
"Name=login.x", "Value=43", ENDITEM,
"Name=login.y", "Value=3", ENDITEM,
LAST);
lr_end_transaction("login", LR_AUTO);
return 0;
}
```

In this study, two detection methods are adopted, and two test cases are designed for each method, specifically: (1) Within 1 s, based on one user, users will gradually connect with the system. When the total number of users increases to 3,000, the system records will be browsed. (2) Within 1 s, based on 3 users, users will gradually connect with the system. When the total number of users increases to 3,000, the system records will be browsed. (3) When the system is running, access 300 users at the same time, and then browse the system records; (4) When the system is running, access 1500 users at the same time, and then browse the system records.

5.2 Analysis of Test Results

Through the analysis of the above test cases, it can be found that: (1) At the initial stage of the system operation, with the increasing number of online users, the pressure on the

system is increasing, and when the number of users reaches 3,000, the pressure on the system begins to remain stable. At about 40 min, gradually reduce the number of users' access until the number of users reaches 0. Therefore, the maximum carrying capacity of the system is 3000 people at the same time. (2) In terms of response time, the more users connected to the system at the same time, the slower the response speed of the system, and the longer it takes. When the maximum carrying capacity (3000 users) is connected, the slowest response speed takes about 3.0 s, which shows that the response time of the system completely meets the requirements [4].

In addition, for each functional module, after testing, it can be found that each functional module can normally complete the expected operation: in the user management module, user information can be added, adjusted and deleted; In the elective module, major courses can be automatically generated, and students can choose elective courses independently. In the teaching evaluation management module, students can evaluate teachers at will; in the score management module, teachers can automatically enter relevant information, and students can browse the information; in the graduation management module, non-graduates can't enter, and graduates can upload graduation thesis and calculate graduation scores normally. In the examination management module, the positions of invigilators and students' examination rooms can be arranged automatically.

6 Conclusion

To sum up, based on SaaS technology, this paper has developed an education management system that integrates user management, course selection management, teaching evaluation management, achievement management, graduation management, examination management, etc. Through system testing, it can be found that the system meets the requirements in terms of performance and function, and it can be applied to practice.

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