

Analysis and Design of the B/S based Dynamic Management System for the Budgets of University Scientific Research Projects

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Abstract

Budget of university scientific research project mainly includes budget preparation, budget execution, budget adjustment, budget control and budget performance evaluation. By managing and the budgets of university scientific research projects using a management information system, the technical director of projects can make full use of the budget in scientific research based on reasonable budget setting. The scientific funds can therefore be effectively utilized. In this research, the series of functions such as source management, budget management, expenditure management and inquiry statistics are realized using B/S frame and NET distributed framework, and Visual Studio 2005 is taken as development tool and SQL Server2005 as background data management system. Therefore, the practical and effective dynamic management and planning of funds and budgets for university scientific research projects are realized.

Keywords: B/S; Scientific Research Project; Fund budget

1 Introduction

1.1 BACKGROUND OF SYSTEM DEVELOPMENT

With continuous development and progress of science and technology, as well as further developing reform system of scientific research, universities in China have increased investments in scientific research project. Meanwhile universities are receiving increasing scientific research funds from central government, provincial, local financial departments and enterprises. They pay increasing attention to management of scientific research funds. At present, there are many problems in the management of scientific research project funds, especially budget management. Most of scientific research projects present problems including unreasonable expenditures; budget amount does not conform to the management requirements of affiliations with projects and overspending. Those problems seriously influence the utilizing effects of scientific research project funds. Therefore, design and development of the B/S based dynamic management system for funds budget for university scientific research projects only also facilitate to the financial management department and the scientific research management department to effectively perform dynamic management and supervision for scientific research project funds and also effectively guide the project director to make the best of funds, in this way, the application effects of scientific research funds can be fully ensured.

1.2 SIGNIFICANCE OF SYSTEM DEVELOPMENT

For a series of problems existing in appropriation budget of university scientific research project, design and

development of dynamic management system for development of B/S based dynamic management system for the budgets of university scientific research projects is of significance to improve management level of university scientific research funds budget, and enhance connection and communication of financial management department, scientific research management department and project director of scientific research project.

- 1). For unreasonable budget expenditures of scientific research project, the universities' financial management departments and scientific research managements departments can review and manage budget expenditures using this system. Besides, they can propose corresponding comments and suggestions for unreasonable expenditures and require project director to modify it again.
- 2). When the budget amount of exceeds the proportion according to the funds management document stipulated by project affiliations, the system proposed can be effectively to solve this problem. For instance, some affiliation requires that fees for management labour use and consultation shall not exceed 5% or 10% of total amount of project funds. This system can set a percentage for expenditure items of different affiliations with projects in the initialization process of expenditure items. If project director makes a budget that exceeds the preset percentage, the system will give an alarm, the budget cannot be saved.
- 3). The financial management department and scientific research management department in uneasily can effectively enhance management and supervision in the

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utilization of scientific research project funds using the system. The project director is required to set an annual using plan of funds in advance of making a budget of scientific research project in this system. In the utilization of project funds, the system will indicate a warning if the items spent does not comply with the annual use plan of funds. Hence, the project funds can be used definitely according to funds.

- 4). Dynamic management for the expenditures of scientific research funds can be realized using the system. In the research process of scientific research project, the project director of one scientific research project may adjust the funds budget due to the changes such as scientific research methods and research conditions, etc. Through using the system, the project director can apply for adjustment of scientific research funds budget with corresponding reasons. After approved by relevant management personnel, the budget adjustment shall be

made and submitted to corresponding management personnel for approval.

1.3 SYSTEM DEVELOPMENT ENVIRONMENT

The system was developed using B/S structure and ASP.NET technology and designed via Visual Studio 2005 integrated development environment by Microsoft using SQL SEVER2005 as database. B/S structure enables the users accessing the system via general browsers without developing a special client program for the users. Generating dynamic page was generated by using the ASP.NET technology under Visual Studio 2005 integrated development environment. This can make that the page files are safer, more reliable and extensible [1]. By a database management system which has been widely applied widely, SQL SEVER2005 shows the functions [2] of usability, scalability, and data warehouse, etc.

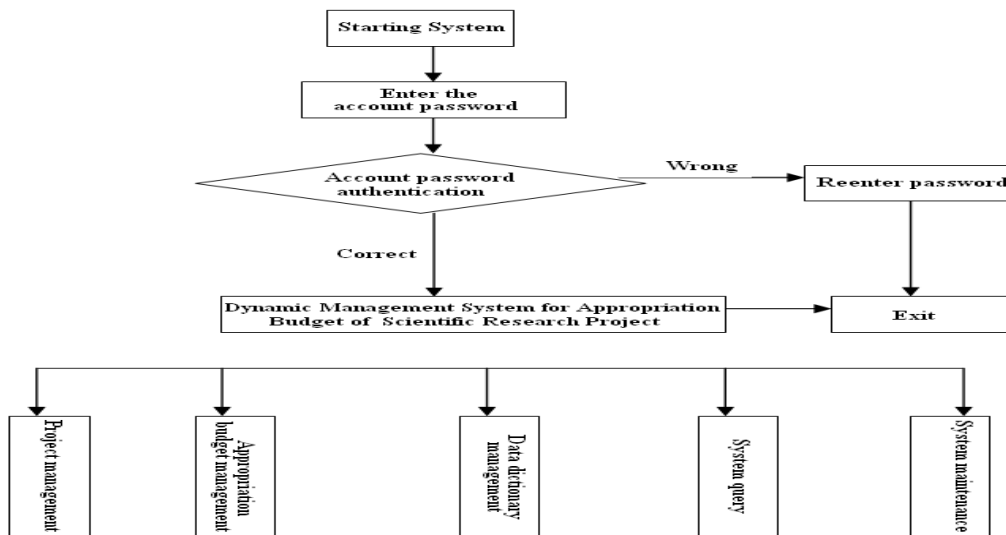


Figure.1 Structure Chart of Functional Modules of Dynamic Management System for Appropriation Budget of Scientific Research Pr

2 Overall Functional Requirements of System

According to relevant requirements of the management evaluation for university scientific research project funds and functional requirements of each department, especially financial management department and scientific research management department, the system functions are planned in a practical view. The system is applied by different persons through the organization mode of functions set. The persons who play different roles are provided with different assess authorities of using different sets of functions. Flexibly setting access authority can adjust functions sets of different roles. This system is quite convenient and efficient in application. According to overall functional requirements of the system, level 1 module of the system should include the sub-modules such as registration management, funds budget management, data dictionary management, system query, and system maintenance of scientific research project.

See Figure 1 for structure chart of functional modules of dynamic management system for appropriation budget

of scientific research project

2.1 FUNCTIONAL REQUIREMENTS OF PROJECT MANAGEMENT SUB-MODULE

Scientific research project management sub-module realizes business flow for whole information management of scientific research project, see Figure 2 for its functional requirements diagram.

The sub-module system mainly realizes registration, review and modification for relevant information of scientific research projects which have been set up as well as conversion for state of scientific research project. Registration management of scientific research project is mainly to meet the needs of persons in charge of project to register relevant information of scientific research projects and save it after registration, at this point, project state is unapproved. Management personnel of science and technology department will log in the system to check if there are projects needing review, if any, the management personnel will review the project information and the project state will convert into “approved ” if passing the

review; the project state will be “unapproved” if failing to pass the review. The person in charge of scientific research project will log in the system again to check if there are projects which fail to pass the review, if any, project information shall be modified and saved according to review comments, at this point, project state will be “modified” and hereby submit it to the project management personnel of technology department for review. Through the list of scientific research projects, aperson in charge of scientific research projects can realize

query for all scientific research projects registered by himself and view relevant information of registered scientific research projects and project review state and can view the review comments of management personnel of science and technology department for unapproved project. Through the list of projects, the management personnel of science and technology department can view all projects which have been registered, approved, have not been approved, have not been reviewed and have been modified.

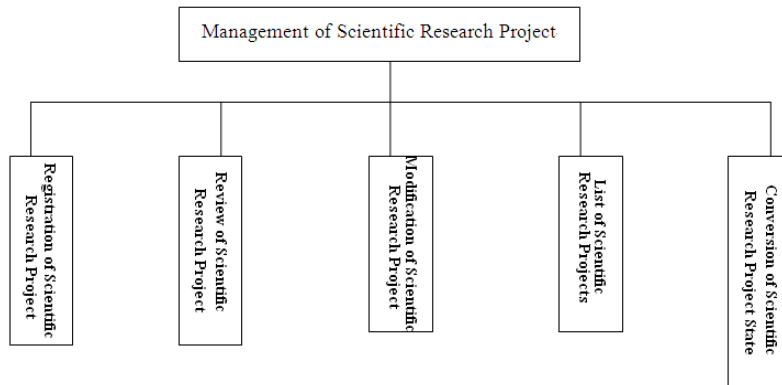


FIGURE. 2 Functional Chart of Project Management Sub-module

2.2 FUNCTIONAL REQUIREMENTS OF APPROPRIATION BUDGET MANAGEMENT SUB-MODULE

The scientific research project appropriation budget management sub-module mainly realizes the business processes of appropriation budget preparation, budget review, budget modification, budget enforcement, budget adjustment, budget state conversion, etc. See Fig. 3 for its functional requirements.

Through the module, the person in charge of scientific research project can realize scientific research appropriation budget preparation, save and submit it for review of relevant management personnel of science and technology department and financial department, if failing to pass the review, it can be modified by the person in

charge of scientific research project. If it is necessary to make an adjustment for project appropriation budget due to some reasons, a person in charge of project can apply for budget adjustment through the appropriation budget adjustment sub-module. With the approval of relevant personnel, the person in charge of project can modify the project appropriation budget and save and submit it for their review. Appropriation budget enforcement can let the person in charge of project, management personnel of technology department, financial personnel, etc. timely understand budget enforcement situation of relevant project, namely budgeted expenditures of the project which actually happen in the process of research, the amount of expenditures here shall be imported from financial data, and the content in the sub-module system is only for query of relevant personnel and can't be modified.

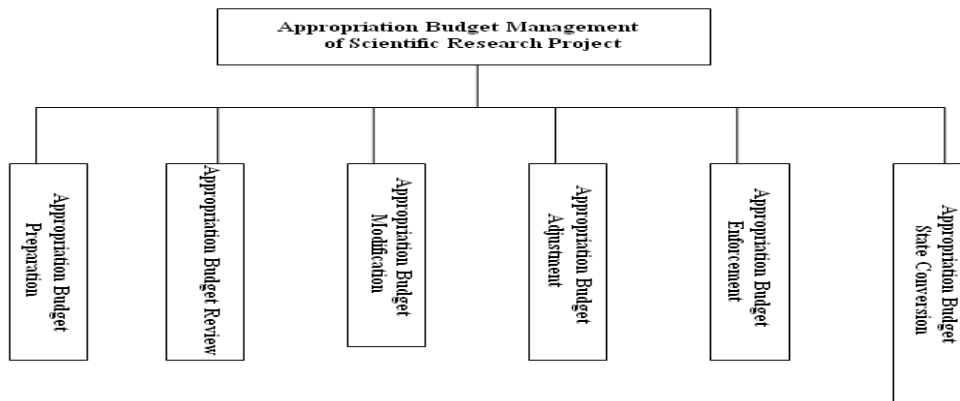


FIGURE 3. Functional Chart of Appropriation Budget Management Sub-module

2.3 FUNCTIONAL REQUIREMENTS OF DATA DICTIONARY MANAGEMENT SUB-MODULE

The sub-module mainly realizes initialization of all data and information of the whole system. Main information flow definitions in the data dictionary shall include the names such as department information, personal information, scientific research project information, and define its data structure for each information flow, for instance, scientific research project information=project name+project No.+person in charge of project+project source+project level+project appropriation +approval data+research period. In addition, a certain limits can be given to data length, size and scope through the data dictionary, for instance, in budget item information, we can prescribe a limit to budget item "labor fee" which shall not exceed 10% of total appropriation of project, so when the person in charge of project make an appropriation budget, if "labor fee" budget exceeds the percentage, it will give a warning and a hint "labor fee exceeds 10% of total appropriation and the budget can't be saved, please modify !" at the same time of saving the budget, thus to ensure the appropriation budget is normative and reasonable and complies with corresponding percentage requirements. The sub-module involves relatively large data size, which makes the system have relatively large initialization workload at the beginning of use, however, correct and reasonable initialization will make subsequent operation and maintenance of system become very convenient and effective.

2.4 FUNCTIONAL REQUIREMENTS OF SYSTEM QUERY SUB-MODULE

The module mainly realizes the functions such as

personnel query, scientific research project information query and appropriation budget query. In the query module, query function can be realized through different data and information, taking scientific research project information query for example, query under single condition or multiple conditions can be realized through name of person in charge of project, project source, project level, project No., etc. Through project information query results, user can view all information of project, including appropriation budget inspection, etc.

2.5 FUNCTIONAL REQUIREMENTS OF SYSTEM MAINTENANCE SUB-MODULE

The module mainly realizes maintenance and management in system user role, password management, department management, personnel adjustment, etc.. The module can be used to add or delete user role, assign different system management authorities for different roles ,add or delete personnel for corresponding role, add or delete department and modify password, etc.

3 System Design

3.1 CONCEPTUAL STRUCTURE DESIGN OF DATABASE

The essence of database conceptual design is to analyze system requirements and abstract the system requirements obtained through analysis as the process of information structure[3]. The result of conceptual design is to obtain a database conceptual model, i.e., E-R Diagram. The system's database conceptual structure design will be expressed with E-R diagram, as shown in Figure 4.

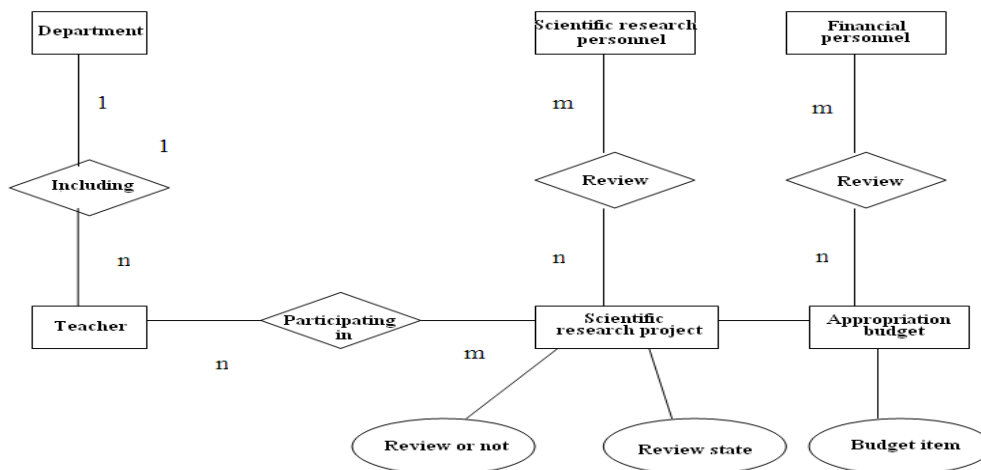


FIGURE 4. E-R Diagram of Database Conceptual Structure Design

3.2 CONNECTION AND OPTIMIZATION DESIGN OF DATABASE

We all know that it requires several operations to access the database resources, namely to create connection, open connection and close connection, this series of operation processes require exchanging information with the database server for many times in order to pass authentication, therefore, consumed database resources are relatively more. In .NET adopted by the system, a "Connection Pool" is provided, which can greatly improve

the influence[4] of database open and connection on system performance. When using the connection pool, the system can place database connection into the connection pool, which is taken out only when it is needed. The connection pool will be withdrawn when the database is closed, so as to wait for next connection request. ASP.NET can rapidly execute dynamic web page, however we can make web page's execution speed become more faster through tightening code and database connection. The system uses SQL SERVER 2005 database management

system. When connecting database, it can use ODBC system and DSN file to connect the database and also can connect the database by using very fast OLEDB technology [5]. In contrast, it is more convenient to connect the database by using OLEDB and when WEB file is moved and it is not required to modify connection setting of database, the former shall be used. OLEDB is located between application and ODBC layer, and we can call ADO to directly connect with OLEDB layer. OLEDB is used to access SQL SERVER according to the following grammar:

```
ConnString
="Provider=SQLOLEDB.1;Password=mypassword;" & _
    "Persist Security Info=True;User
ID=myuid;" & _
    "Initial Catalog=mydbname;" & _
    "Data Source=myserver;Connect
Timeout=15"
```

And meanwhile, explicitly create a connection object to establish a database connection, as implicitly using the database connection can not use the mechanism of buffer pool. Code is as below:

```
Set conn=Server.CreateObject("Adodb.connection")
conn.open ConnString
```

On the other hand, a series of operations for database such as creation, query, modification, update and deletion can be completed by using storage procedure. The storage procedure is a set of pre-compiled SQL statements stored on the server, similar to batch file, which has a function of database immediate access and has very fast data processing speed. Storage procedure is stored on the server, running on the server side independent of .NET procedure, which can greatly reduce transmission of database operation statement [6].

As considerable resources will be consumed if calling ADO from .NET to access the database and the longer SQL statement runs, the longer the system resources will be taken up. We shall try to use the optimized SQL statement to reduce code execution time, avoid using a sub-query statement in a query statement and make the best of index to speed up database query when we write database operation code[7].

3.3 SEVERAL PROBLEMS NEEDING ATTENTION DURING CODE DESIGN PROCESS

1) The variable stored in the "session" object holds single user information and is available for all pages in an application. Thus it can conduct user authentication at any time in the process of user access to check if the user has the authorities to carry out relevant operations. Assuming code of user login interface is as below:

```
. . . . .
<input type="text" name="myname"
size="20"/><br>
<input type="password" name="mypassword"
size="20"/>
. . . . .
```

The code in the authentication page can be as follows:

```
. . . . .
username= trim(request("myname")) 'Get the user
name entered by the user
password= trim(Request("password")) 'Get the
password entered by the user
. . . . .
if username=rs("name") and
password=rs("password") then 'Judge if the user name
and the password are correct

session("myname")=rs("name")

session("mypassword")=rs("password ")
. . . . .
```

By storing user login information in variable of object "Session", when a user requests to access a page, the variable can be called at any time to verify if user account is valid and has relevant access authority to the page.

2). Page output caching service

Asp.net includes page, user control, server controls (HttpHandlers and HttpModules) and contents generated by them [8]. If Asp.net page is used to output the data such as html, xml and mgae to generate the same output content with code for each request, it is very necessary to consider output caching via page. The content is cached in network resources, when client side requests the content again, it will not be got from source server any longer, but directly from cache.

If output cache via page, we only need to add the following code in the page:

```
<%@ PageOutputCache VaryByParams="none"
Duration="60" %>
```

3). Establishing user authority setting mechanism

With popularization of network, network security has arosed increasing attention. Therefore, in development and design of the system, user authority settings needs to be highly stressed. The system is designed by comprehensively considering database, server and application. different authorities and initialization menus [9] require to be set according to varied users in the dynamic management system for funds budget of scientific research project. In the system, database security is mainly realized by its access control mechanism. So, operation authority of various users shall be firstly defined, and then database login is defined. Finally, the login user are taken as corresponding roles according to the user authority list. When an user logs in after verification, the system reads the user's authority level and store it in the variable of the "Session" object and then enters the page which is authorized to access.

For authentication and authorization of users, a configuration file in the standard XML format is established and named as Web.config under the root directory of the website. Authentication mode can be implemented by setting modevalue of Authentication [10]element. Four optional values of "Windows, Passport, Forms and None" can be set for the modeattributes. The authorization can be completed by using the following codes.

```

<location path="checkData.aspx" // Formulate the
page to be authorized
<system.web>
  <authorization> // Designate access authorized or
denied user
  <allow verb="GET" users="#" /> //“#” refers to to
all identity users
  <deny verb="POST" users="?" /> //“?” refers to
anonymous user
</authorization>
</system.web>
</location>


```

4. Conclusions

The B/S based dynamic management system for fund budget of scientific research project can relieve workloads

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