

## Laboratory Management Informationization System Design under Network Framework

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### Abstract

*Traditional artificial library management mode is exposed to great impact with the coming of network information era. Many shortages such as low library utilization rate, bad data secrecy, and large workload of management restrict the development of traditional artificial lending management. Based on software engineering's design thought, this paper analyzes the needs in library system; module analysis method is applied to design the four modules of the system: landing, management, maintenance, and setting up. In server - client network framework, this paper designs the whole library informationization system. The whole system improves lending process, reduces workload, enhances safety confidentiality, and strengthens library management.*

**Keywords:** book borrowing, software engineering, network framework

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### 1. Introduction

Software engineering is a subject studying how to effectively develop practical and high quality software. It references to traditional engineering method and principle in building and maintaining software subject. The concept of software engineering was proposed to overcome the "software crisis" in 1960s and 1970s. After decades of development, this subject has made many achievements. Many information system designed and developed by applying software engineering principles have achieved high practicality, high stability, and high quality design goal.

Library is the main source of traditional information resources, but with the arrival of information age, today's society appears "information explosion" phenomenon. The Internet information grows with each passing day, and large quantity of information resources provide us convenient way in obtaining information. Libraries with traditional manual management face more severe situation. Traditional manual management mode has many shortcomings such as low book utilization rate and bad data confidentiality. After a long time operation, it becomes a relatively difficult management problem in search, renewal and maintenance of large number of data [1]. The mutual infiltration and connection of network-centric computer technology, communication technology and information storage technology have formed an all-round information service network. The user's need for information is no longer interested in information containing single carrier. Their need of information is always satisfied through different ways. The user is no longer concerned about information process, but the result they got. They often requires libraries provide a range of information around their concerned information. The users' library evaluation depend on whether the library can provide comprehensive information they need. The dispersion of information resource distribution and the separation state of information technology using highlight the role of library, and integrated library services can focus and get the needed information according to individual character and objective demand under the network environment. Service requires integration is displayed in the following two aspects: one is to provide service of comprehensive and rich network information resources; The second is to meet the information type and information media diversified needs of information users, such as provide various kinds of database: text type, data type, image video type, audio type, software type, etc., [2-4].

Especially, with the continuous development of network technology, our country library resources utilization is also associated with the construction of network electronic system and network resources, convenient change become a new kind of network data resources, therefore, the development of library resources, established in the construction of the network framework and the information of the integration of resources and integration.

In order to reduce the workload of librarians and provide users with fast and accurate use environment, realize accurate and easy management of all books, this paper designs a new type of library information management system software based on the concept of software engineering, performs classification management of library books and reference materials by using information technology, realizes many functions such as fast search, large storage capacity, high reliability, high security, and long life, and greatly improves the efficiency of library information management [5-6].

## **2. Software Engineering**

Software engineering science and technology development as a driving force, the construction of the informatization of our country, especially the library informatization development and integration, has the very vital significance [7-9].

### **2.1. Software Engineering Introduction**

Software engineering belongs to engineering discipline, which mainly focuses on practice, that is software engineering theory and knowledge are used in actual software design and development. The main purpose of software engineering is to design a high quality software system. It learns from mathematical modeling, computer science, management science and traditional engineering science and other disciplines knowledge. By using engineering science design pattern, appraisal cost, weigh the risk, applied mathematical modeling and model and algorithm of computer science structure software system, software engineering draws plan, allocates resources, manages quality and controls cost by using scientific management.

In 1968, the concept of software engineering firstly appeared. Many scholars did researches on development model, development methods and development tools around the concept of software engineering. Over the years, the main achievements include structured programming language development and the present of waterfall model. In recent years, some development cost estimation, development quality management, documentation review tools and methods around software project management are put forward, and software engineering transforms from software system technology research of the initial attention to the management of development process and quality [10-12].

### **2.2. The Composition of Software Engineering**

Generally speaking, software engineering is divided into three parts, namely, software engineering includes the following three process:

1) Project development process. It refers to the process of design and development of software system by developers, including several big contents: customer needs analysis, software system design, coding, system testing and so on. Analogize the production process of traditional mechanical processing in the workshop;

2) Project management process. It refers to the planning of software development process in the early development process by project manager or product manager. And in the development process, control the development progress of the process. Analogize management process in the workshop process of traditional mechanical processing;

3) Project improvement process. It refers to the management and improvement of the above project development process and project management process, including the definition and improvement of development process and project management process to ensure the production process of high quality products.

It's safe to conclude that the three processes of software engineering form a system engineering, and become the necessary base of software industry. But in today's software projects, project development process often gets more attention, while project management process and project improvement process are often ignored. According to practical experience, in fact, the latter two processes are very important, and at some time, their importance is even

more than project development process. With the change of market demand, the requirements of software product are continuously developing. Software scale is more and more huge, and software development will also gradually change from individual development to factory assembly line. The entire software development process will also gradually evolve to the generative process of traditional mechanical processing industry, and product content, product quality, production time, production cost become work contents of project management.

### **2.3. Software Engineering Development Method**

The earlier phase after software engineering's concept was proposed, the main research focuses on software engineering principles. With the development of the research, development method of software engineering gradually arose more attention. Development method of software engineering refers to how to use the basic principles of software engineering to guide the actual software development process. At present, some foreign large software companies and research institutions studied it and put forward a variety of practical development methods, mainly including: structured method, prototyping method and object-oriented method, and life cycle method. The above several popular development methods are introduced below.

#### **2.3.1. Structured Development Method**

Structured development method was put forward by Yourdon and Constantine, and was also known as data flow oriented development method. Structured development method was the most widely used software development method in 1980s. It firstly uses structured analysis method in demand analysis of the software needs, then uses structured design method to overall design the software, and finally uses structured programming method to realize the system. The two typical software structures given by it: transformation type and conventional type, are utilized to make success rate of software development greatly improved.

#### **2.3.2. Data Structure Oriented Development Method**

Data structure oriented development method resolves problems into each part's hierarchical structure expressed by three basic structures. The most typical representative is Jackson method. Three basic structures include sequence, selection and repetition. The three kinds of basic data structure can be arbitrary combined, and finally form all kinds of complicated structures. This method begins from system input and output data structure, gets the whole program's frame structure, then fills in the details, and ultimately gets complete program chart. The method is particularly effective for small and medium-sized system whose input and output data structure are clear.

#### **2.3.3. Object-oriented Development Method**

Object oriented, distributed and parallel is all the most popular terms in current computer industry. Object-oriented development method is in leading position of today's computer industry. Object-oriented technology is a revolution of software development technology, and is of milestone significance in software development history. This method includes three steps: object-oriented programming, object oriented design and object-oriented analysis. Bottom up induction and top-down decomposition method are combined. Object is development foundation. The input and output data structure are considered and all the object data structures are included. This method greatly improves the maintainability of the system based on users' needs through object model.

### **3. Books Management System's Analysis and Design**

The network library construction, mainly involves the library database development, the effective utilization of resources and finishing, library information query and return module, such as development, therefore, in view of the library basic needs and the integration of network framework, in view of the books management system management system to realize the network system design and analysis.

### 3.1. System Management Requirements

System requirements analysis is the foundation of system development. It abstracts customer demands into models and lays the foundation of the development of software system. In this paper, the library management system mainly contains ordinary readers' borrowing and administrator management two parts:

1) General reader: while login system, do not need to enter user name and password, directly access to the information, and can inquire through title, author, press, ISBN Numbers, and other options, knows about if the borrowing books are in the library or not, but the ordinary reader has no right to modify the database information in data bank.

2) Administrator: while login system, need to enter the administrator's password so as to ensure the safety of books management system. The administrator has book information database access power, and the system should provide more perfect database maintenance function, which can be convenient for book management, including new book storage, book circulation, book information modification, book information management, etc. Through these functions, the administrator can perform unified management of all the library books and books lending situation.

In addition, in order to ensure the safety of the whole system, the system also provides the administrator password change right, so the whole system security is improved.

System requirements is to realize the library networking and resources integration module design basic, is to the basic function of the system on the basis of the modular design and analysis.

### 3.2. System Module Design

This system mainly realizes the management of books information and books lending situation. Analysis is carried on in accordance with the above system management needs. The system can be divided into the following several modules: landing module, management module, maintenance module and settings module. System function module chart is shown in Figure 1.

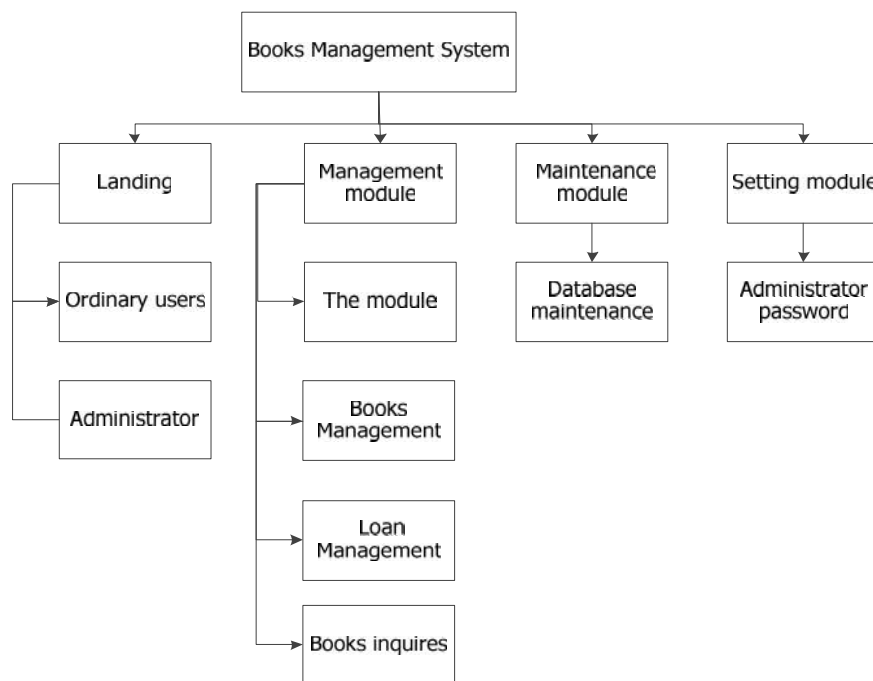


Figure 1. System Function Module Chart

According to the library informatization basic needs, design the library network framework, based on the framework, can carry out the specific function of the modular design.

### 3.3. System Database Design

The system adopts Microsoft net development, and development language uses c#. C# is a complete object-oriented programming language combining the advantages of many advanced programming languages like JAVA, VB and so on. C# has elegant grammar, more robust code, and is combined with Visual Studio's integrated development environment, which makes debugging process relatively simple.

.net platform contains the latest Microsoft database technology---LINQ (Language Integrated Query). LINQ is for a set of technologies. LINQ query syntax is utilized to make developers convenient to perform complicated operation of data source. Compared with traditional SQL statements, LINQ query syntax is the same in semantic or performance, but its equivalent expression is easier to read than written with SQL statements.

From the consideration of security confidentiality, remote database can ensure the safety more than local database, and it facilitates centralized management and has more data storage. This system designs three layers structure. The clients access database through the server's Web Service. There is no direct communication with the database, the server provides Web Service and functions as data exchange agent center, provide function interfaces: data storage, query and maintenance. The three layers framework design can ensure the security of database access process. All the codes of access database are running on the server, and the client just accesses data by server agents. Clients can't perform illegal operation to database.

The whole system's database structure is shown in Figure 2.

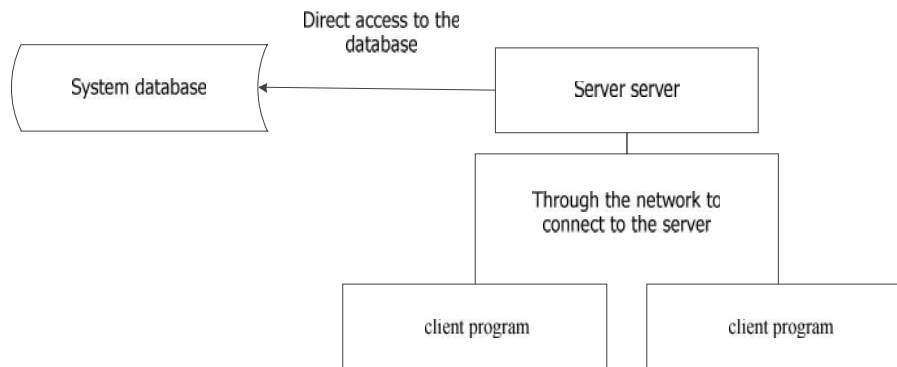


Figure 2. System Database Structure

The library network system database design, is related to library information data flow, and data storage, etc, this is the root of the information integration of library resources, but also for modular design data relations and data transfer function design and implementation of the foundation.

### 3.4. System Process Design

Data flow diagram is mainly used to describe processing mode of system data.

The library network integrated system design process, mainly according to the basic function of the network system, to realize the user needs and system function analysis, on the basis of this system, the realization of the basic needs strengthening and composition, the basic composition of the modular design basis.

Usually this data needs, is related to system integration and network data information resources integration, and so on, this is for the library network system module design to provide basic design basis and resource base, take the storm test or unit test mode, etc., and gradually realize the library network integrated system rationality and authenticity, improve the utilization rate of resources.

According to the data stream data relationship, we can carry out the library of the development of the system function module design, this design mainly consider the function of the library, from the data input to the data information stored in the update, plus data information

query, this is the basic function of traditional library and the role and value, also is in the network development, must abide by and meet the social demand.

According to the design of the modular and data dependency relationship, form the library network integrated system design basis, the basis is to realize unit code foundation, according to this principle, can undertake the program code of the modular writing, but also realize the specific code test and risk control one of the basic modes of, this way is the network of the system of basic function and composition of framework, this way for China to realize the library resources network and the effective utilization of the resources, is one of the basic modes of the library in the future development of the basic mode, based on this, this article has conducted the library network resources effectively integrate and books inquires the way of system design and implementation.

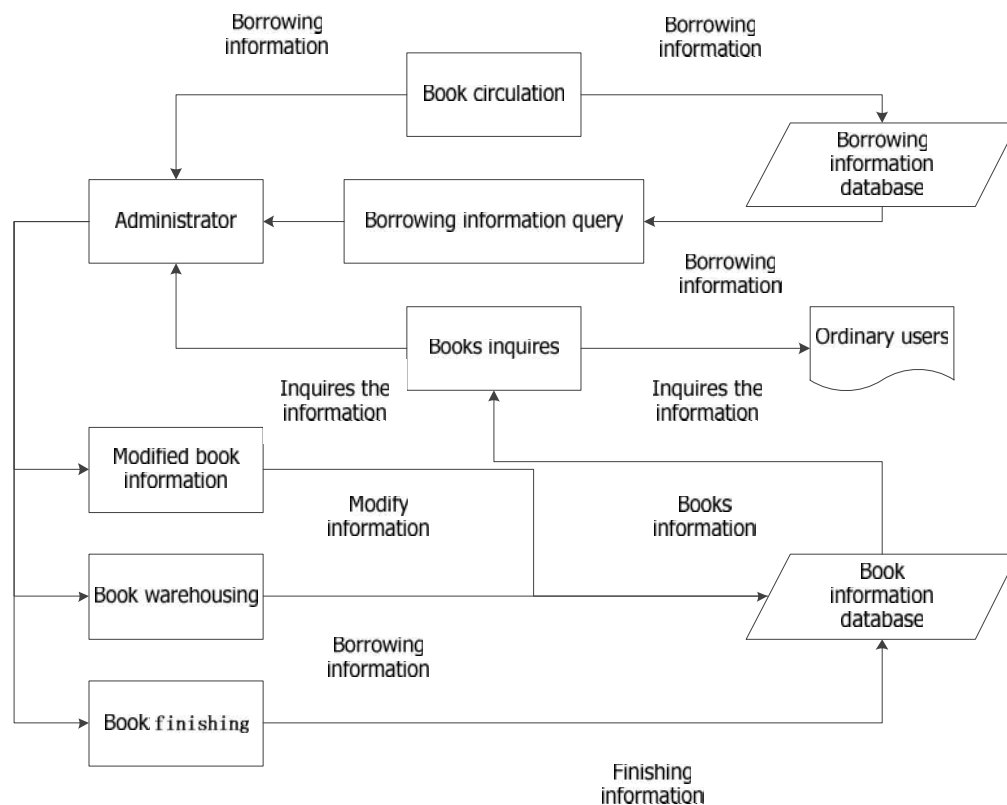


Figure 3. Books Management Flow Chart

#### 4. Conclusion

This system makes use of information technology, realizes traditional library manual management mode by using software, combines all kinds of books management operations into an organic whole, reduces the workload of library management, effectively improves work efficiency, strengthens the safety confidentiality of management, and uses software engineering idea in designing function module on the analysis of demand, and designs system database by using the latest Microsoft LINQ technical. This system has laid certain foundation for library modern management realization.

The network library is the mainstream of future library resources development way, and also one of China to realize the library resources reasonable use and the realization of Chinese library network integration is an important way, this is mainly because the network technology and computer science and technology to develop a decision, but also attract Chinese library development important way, China is the only way to use the library resources.

Therefore, based on the library's development needs and resources utilization, as well as China's people to consult books information demand and information browsing demand, is library information and process development important accumulation.

This article through to the library basic needs analysis and strengthening, promote the rational utilization of library resources, according to China's national reading needs of library network integration needs analysis, and then based on this analysis, the data information of data flow analysis, the design of the relational database, the library and browse relevant model for the effective design and analysis, and the realization of basic module design, for the system module design provides the basis, based on this, the system module coding, realize the basic function of the system.

The network system in the study, from the library needs, integrated data dependency relationship, for the design and realization of the module provides effective reference, but the network system also has some deficiencies and improve, if testing and coding technology optimization, the coding efficiency test, to the integrity and effectiveness of the system function to realize and analysis, which will improve the efficiency of Chinese library network integration, for more provide readers with more effective, more perfect library service.

Network information service is the basic feature of the future, but also guide the future of the information service of the main technology, therefore, the network library system integration and development, is the future development of the network technology and the basic trend, and it's also a leading library informatization development important foundation.

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