

# The Government Procurement Management System Based on .Net Remoting Technology

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**Abstract.** this paper presents a design of the government procurement management (GPM) system to improve the problems that may occur during the purchase process, such as unscientific technical recommendations, unclear purchasing procedure, slow process and complicated analysis of statistical data. The system sets up with the C/S three-tier architecture software and .NET Remoting technology to build a scientific, effective and informationized GPM system mode. By adding three functional modules i.e. budget management, Short Message Service (SMS), supplier evaluation management, which could make the processing time shorter, the statistical data more clear and the search of procure schedule, financial statement more convenient. In this way, the working efficiency of the GPM is improved greatly.

## 1 Introduction

Nowadays, as the network technique getting more and more familiar by people and the widespread use of the computer science, information system management becomes an important part of many public agencies' routine management, which is replacing the traditional management mode gradually. The technique of the information system management can represent every step of the real-time procedure accurately. It is known that increasing the working efficiency and improving the service quality are the key to build up the core competitive strength and also important for realizing the improvement of market competitive strength and sustainable development [1].

Government procurement is defined as the procurement of goods, services or constructions on behalf of a public authority by law, which is a very complicated series work. It is not only indicates the details of the purchase process, but also includes the procurement policy, procurement procedures, procurement processes and procurement management. There are some problems exist in the traditional GPM system mode, for example, unscientific technical recommendations, unclear purchasing procedure, slow process and complicated examination and approval procedures. Especially, the traditional one can not support the expanded scale of the construction purchases of governments and it is very hard to increase the efficiency and reduce the basic cost to satisfy the purchase requirement.

Government procurement information system can not only regulate the procurement procedures program, uniform the service data entry, realize fine-grained management of all kinds of procure data, real-time research, increase the working efficiency and quality, reduce quantity of the work, but also make the government procurement procedure more clearly to show the doctrine of fair, just and open. In order to archive these targets, it is very important to design a scientific, high-efficiency, informationalized government procurement management (GPM) system.

## 2 Key technologies

### 2.1 C/S three-tier architecture

C/S three-tier architecture mode is deployed according to the functional partitions, which mainly includes Presentation Tier, Application Tier and Data Tier. Presentation Tier occupies the top level and displays information related to services available on a website [2]. Application Tier is also

called Logic Tier, it controls application functionality by performing detailed processing. Data Tier houses database servers where information is stored and retrieved, data in this tier is kept independent of application servers or business logic. Comparing with C/S two-tier architecture mode, C/S three-tier architecture mode allows the Data Tier maintained as an independent module on a separate platform to increase expansibility, flexibility, security and reusability. C/S three-tier architecture mode allows any one of the three tiers to be upgraded and replaced independently and each tier can do the data exchange through the set-up of the object mode interface.

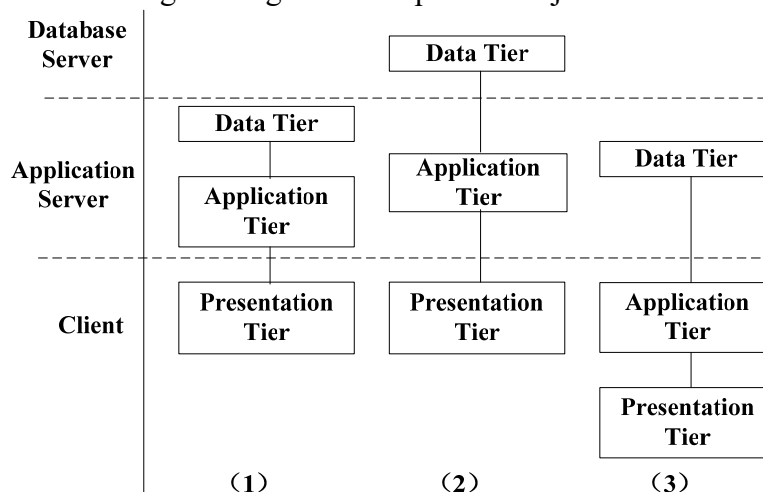


Fig.1. Different Set-ups of C/S three-tier architecture mode

C/S three-tier architecture mode has three different kinds of set-ups as shown in figure 1. In this paper, the second C/S three-tier architecture mode is applied for the design of government procurement management (GPM) system. From the figure above, one can see that different tiers lay on different platforms. In this way, the Logic Tier of the software connects closely with the hardware to speed up the performance of the database.

## 2.2 .NET Remoting

.NET Remoting is a Microsoft application programming interface for interprocess communication. This technology uses the agreement outside SOAP to communicate, which means on the client end, the users can access the application server without considering the agreement, however, the operation between the application server and client is similar[3]. .NET Remoting manages the act of serialization and signal path of objects across the client and server appdomains[4]. Signal path is used to solve the net communicating problem and serialization is responded for the analysis of objects and data processing.

.NET Remoting technology is used to achieve the seamless connection among different applications and provides a framework that allows objects to interact with each other across application domains. It also builds up a closely coupled relationship between the client and server to share the same objects' type, in this way, all the sources can be shared by the information data processing.

## 2.3 Oracle database storage management

Oracle is fully scalable relational database architecture and is often used by global enterprises, which manage and process data across wide and local area network. Oracle database storage management simplifies the relationship between database and storage to ensure the best I/O performance for database workloads while significantly reduce storage costs and complexity. It can be considered as a function or a program of the database with the benefits of high efficiency, low costs and no data loss [5].

The system uses the technology of Oracle database storage to encapsulation the co-operating data, monitor routine and event logic, and also hide the details of the storage, provide the uniform calling interface and limit the interface access authority to speed up the database application development, guarantee the security and integrity of the data, enhance the implement efficiency and maintain the developed application easily.

### 3 System design

#### 3.1 Overview of the design

According to the analysis and restructure of the government procurement process, the steps of government procurement process are those listed below:

- Procurement planning and strategy development
- Procurement requisition processing
- Solicitation documents preparation and publication
- Bid/proposal submission and opening
- Requirement identification
- Contract award recommendation
- Project arrival check
- Requirement check
- Payment and management

And figure 2 shows the details of the government procurement process.

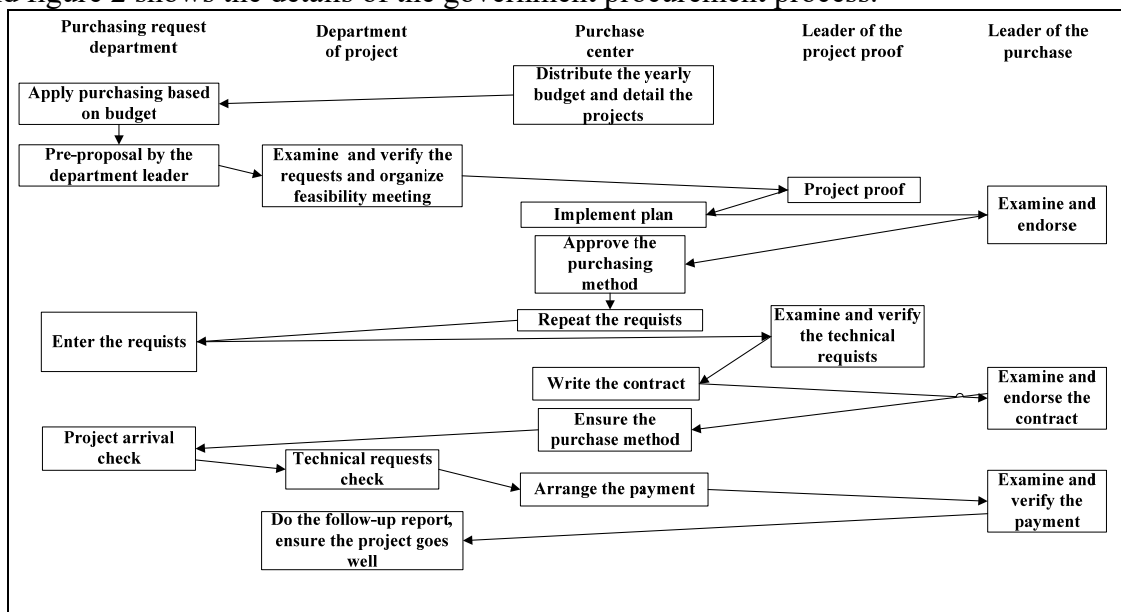


Fig.2. Government procurement flow chart

During the government procurement, the purchase center distributes the budget to different departments and details the purchase projects; the applicant reports the purchase application to the leader of the department based on the requirements and the budget, after examine and verified by the department leader, the purchase application will be reported to the project management department. During the project feasibility analysis stage, the purchase project need to go through a scientific feasibility analysis to proof its rationality, feasibility and maneuverability and ensure the project is scientific and reasonable. When it comes to the stage of acceptance check of the technical target, the project needs to pass the goods check and target check process before goes to the payment process to guarantee the technical target; Once the purchase steps finished, the follow up work also need to be recorded to see if the project authentic and valid.

#### 3.2 Detailed design

##### 3.2.1 Function design

The process of the government procurement is complex, tightly knit structure and involved different departments. In order to devide the work clearly and make the operation simple, the GPM system is equipped with 11 sub-system functions, which is shown in figure 3.

Each sub-system function in the GPM system is matched with each purchase step, in this way, the service data processing would be clearer, make the operation and the control of the authority more normative and assist the cooperation of different departments. For example, the purchase projects application sub-system is matched with the application process, the applicant can select the type of the project from the list and do the process. All the sub-system must work together to build

up a good GPM service data processing system and make the purchase process in an orderly manner.

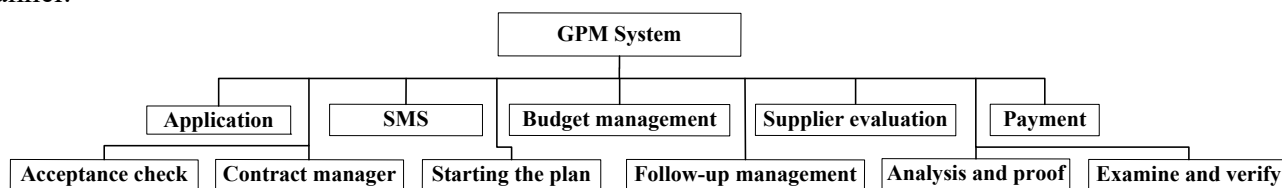


Fig.3. System functions model

### 3.2.2 Key functions analysis

In the design of the GPM system's functions, other than the traditional functions, three characteristic functions also added i.e. budget management, Short Message Service(SMS), supplier evaluation management to reach the goal of multi-layer support, high expansibility and enrich the functions and applications of the GPM system.

#### (1) Budget management

The definition of capital budget management is the planning process used to determine whether an organization's long term investments are worth the funding of cash through the firm's capitalization structure. It is an important part of the GPM system. In order to get rid of the complex capital budget management, realize the real-time data statistics and enhance the implement efficiency, the budget management model is added to the GPM system.

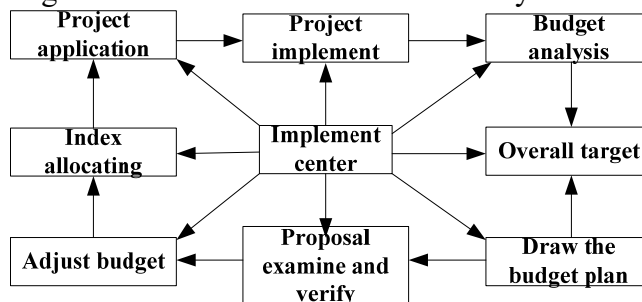


Fig.4 Budget management process

Figure 4 shows the on-line process of the budget management. The implement center of the government procurement draws the overall plan based on the target budget of the whole year. Once the plan passed the examine, the budget of each project will be detailed. The purchase request departments will follow the instructions to do the purchase process. The implement center of the government procurement can do the real-time control of the purchase projects' process situation and do analysis and evaluation of those projects. The budget management model can guarantee the accuracy of the budget data by avoiding the mistakes that may be made by manual work. And also, this model can finish the overall budget target of the year and enhance the standardization and timeliness of the budget management tasks.

#### (2) Short Message Service(SMS) application

Short Message Service(SMS) becomes widely used as a communication method due to its user friendly, easy operation and real-time synchronization. Short Message Service(SMS) is also a part of GPM system, and has two function models:

##### a. One-direction message notice model

When it comes to the key steps of the government procurement, the system will send short messages to the number that leaves by the applicants at the beginning of the application to notify the process and other important information. The one-direction message model can push the purchase process smoothly and shorten the purchase time.

##### b. Bi-direction information research model

The system provides message communication platform for the initiative research, the applicants can send the purchase number or the name of the project to the communication platform of the system to get the indicated project's process, monetary limitation and other related information.

Short Message Service(SMS) is mainly applied by build up SMS server to connect the GPM system, get the related purchase data directly, fetch purchase process information, come out with the

standard short message form. Those data will be sent to the telecom operators through a special-purpose communication link and then the applicants will get the messages from the telecom operators.

#### (2) Supplier evaluation management

The function of supplier evaluation management in the GPM system is mainly open to the merchandise suppliers and after-sale suppliers. In this function, the suppliers' aptitude and the evaluations from applicants are considered together to get the final marks of the supplier. The government procurement implement center can setup a supplier evaluation database based on the suppliers that provided by the applicants. And may ask for the evaluations from the applicants periodically. The applicants fill out the request forms to do the evaluation and the system will generate the final marks automatically based on the input information

The function of supplier evaluation management can objectively show the quality of suppliers' products and service to help the purchase center and applicants making the final decision. In a way, this function could avoid some purchase problems that may occur due to the suppliers and after-sale service.

#### 3.2.3 Database design

According to the analysis and research about the GPM system, the relationships among 28 data substances, such as new extend project, device information, proof report, contract and so on, are formed and exchanged to the list structure of the database that needed by the GPM system. The system database design uses Oracle database to store complex relational data and set up view surface, index to speed-up data research. Apply trigger and storage technique to encapsulation logic event and prestore sub-system to increase the completeness and security of the system's back-end data.

### 4 System realization and test

Due to the design of the GPM system process involves multiple departments and roles, the whole system divided into 11 sub-system. Every department or person could only access the part of the system that authorized based on the scope of official duty to achieve the goal of ensuring purchase data accuracy and security.

The development of GPM system applied both software and hardware. On the software aspect, C/S three-tier software structure, Microsoft Visual Studio 2005 development tool, C# language and .NET Remoting technology to realize the seamless connection among different servers, build up tight coupled relationship between client and server, which make the client and server share same type of objects; COM is also used to finish the documents process. On the hardware aspect, application server and database server are building up through the C/S three-tier software structure. Application tier and data tier are placed on application server and database server, respectively. The combination of software and hardware makes the system more efficiency.

Many tests are done to check the GPM system, such as unit tests of method functions, integration tests of sub-system and overall tests. The simulation tests of the GPM system is also did to figure out and solve problems, make the system goes to service.

### 5 Conclusions and outlook

This paper presents a design of the government procurement management (GPM) system to improve the problems that may occur during the purchase process, such as unscientific technical recommendations, unclear purchasing procedure, slow process and complicated analysis of statistical data. In order to solve these problems, this paper comes up with a new GPM design. The system sets up with the C/S three-tier architecture software, C# and .NET Remoting technology to build a scientific, effective and informationized GPM mode, which make the processing time shorter, the statistical data more clear and the search of procure schedule ,financial statement more convenient. By adding the three functional modules i.e. budget management, Short Message Service (SMS), supplier evaluation management, the functions of GPM system are more plentiful

and used more widely. But how to realize the remote work by adding the cell phone and Weixin functions will be the research direction in the future.

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