Design and Implementation of a Construction Cost Management Information System based on MVC

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Abstract — **This paper first introduces the construction project cost information system related theory and development situation at home and abroad, and their system development platform and strategy. The paper then: i) analyzes the feasibility and requirement, ii) the requirement analysis is completed by using UML business modeling activity diagram and use case diagram, iii) realize dynamic modeling system by class diagram and state diagram method. For the overall system design, the function in the system is divided into six modules: i) the engineering project cost information module, ii) template module, iii) bidding quotation module, iv) cost estimation module, v) project management module and vi) system maintenance module. The B/S three layer model is then used to: i) complete the system design and the system database, ii) system maintenance module, iii) bidding quotation module and iv) cost estimation module for the detailed design and implementation, and show the main effect of the system module.**

Keywords - MVC technology; construction cost; B/S system structure; information management system; UML Technology

I. INTRODUCTION

In 1970s, most of China's construction project has been the implementation of information management, especially to achieve a certain breakthrough in the project cost, project cost with the popularization of engineering cost information system, a set of information has become a powerful need urgently cost field construction tools. Market is an urgent need for information management system, which can manage the entire construction project cost control. It includes: the amount of statistics, engineering intelligent building materials, engineering budget calculation and decision-making data management, unified planning and management of the whole construction process management. In the construction project management, relates to the project budget part may say is a project management most important link. The other is the amount of influence in the current big data market, the cost will also be market fight, and the relevant information will be related to the cost of the whole construction project schedule, fair balance. How to improve the cost management system of construction project and the efficiency of project cost is the goal of our system design. After 1980s, many projects have adopted the information management model [1]. There is a local building service system in the British family history project construction, data collection and storage data collection management for days after the project to provide data analysis. The United States Bechtel company has established a series of complete engineering data library, which includes artificial, material, mechanical dosage, and price analysis data to determine some of the columns. The University of Lyon in France a construction economist and an international is a complete computer system design and production cost of this system is according to the time of artificial materials long and other social resources comprehensive on the whole project cost

information management reasonable, mainly for cost management practice, it will all of the project cost information keep crude and a variety of data analysis and provide an interface to use the query. The construction industry is the main pillar industry of the national economy construction, for the industry, in order to adapt to modernization, should change the industry level of science and technology, can be faster and better for the modernization of power. A complete cost of the main significance of the project is as follows. (1) theoretical value: a set of good construction project cost system can be completely consistent with China's goal of building information technology, strengthen the process of information technology, and improve the whole industry of scientific and technological, scientific management model. At the same time enhance the standard process of the industry to intensify the implementation of the industry. So that people have a deeper understanding of information management. (2) practical significance and practical value: accurate and comprehensive implementation of the project cost management is complete system engineering, information technology; interactive strong, we must fully grasp the market information, and make accurate engineering judgment, so that the whole building cost work orderly. The construction project is a long time development projects, and now the market is full of competition, change constantly market, enterprises in the project cost management in a large amount of data should be timely and scientifically follow social change [2]. With the development of modern electronic information technology, enterprise information management system can reduce operating costs; improve efficiency and anti-risk ability in the operation of social enterprises. With the development of social production, development and opening up of the construction market, the project cost management in a large amount of data need

timely, scientific and accurate decisions, the extensive application of computer and network technology and the unprecedented development of multimedia in the construction field of a high degree of penetration and integration, to provide a solid platform for change the project cost management mode and means of modernization, as management information system of construction engineering cost. Construction cost management information system for project cost management has opened up a broad prospect. Project cost management software such as budget software development has now reached a very high level, thus establishing and running the information system has laid a solid foundation. With China's accession to the WTO, the rise of e-commerce and the approaching of economic globalization, project cost management information system will increasingly show its great vitality. This paper mainly around the construction cost management information system design, discusses its composition, design content, cost management information system module and its functional characteristics of the more detailed planning. The project cost information provides the basis for the costs of the project and the determination of the overall cost of control, the government must make full use of project cost management to obtain cost information effectively and improve the overall level of the project cost management; establish the project cost and the index system is to perfect the management system of engineering cost in China under the market economy required. The construction project cost control throughout the project life cycle, due to the different stages of the life cycle in the construction of the project cost is not the same [3], so we must establish a set of overall construction project cost control system according to the actual situation of design solutions for each stage of the different. This set of cost control system must be in different stages involved in the project summary information, such as project contract information, equipment information, project information and project material project design information, and the cost control system and other information systems to connect, share the overall information, eliminating information island. This system can be based on the project data information to create the necessary cost analysis model, through the statistical analysis of the data to obtain the actual cost forecast, and guide the project to modify the cost according to the forecast. In summary, the project cost information management system designed in this paper is collected, the use of information technology information on the various stages of the project, according to the processing result established analysis model, analysis of project cost forecast and decision support for the implementation of the project, and the related information of the use of other information system for storage. The system can also assist the office, the project implementation process of repeated tedious work by the computer to complete, greatly improve the efficiency and reduce labor costs. In short, engineering cost management information system based on information technology and advanced computer technology to project the data collection, processing, statistics, analysis, according to the analysis results of auxiliary cost management, the development of this system has important significance for

the construction industry. Construction cost management information system schematic as shown in Figure 1, a typical project cost management system as shown in Figure 2.
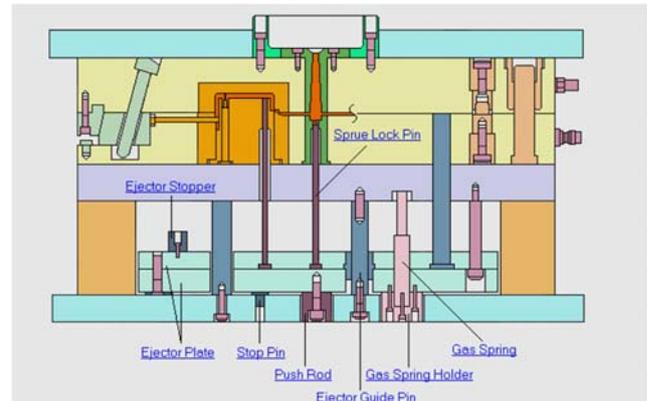

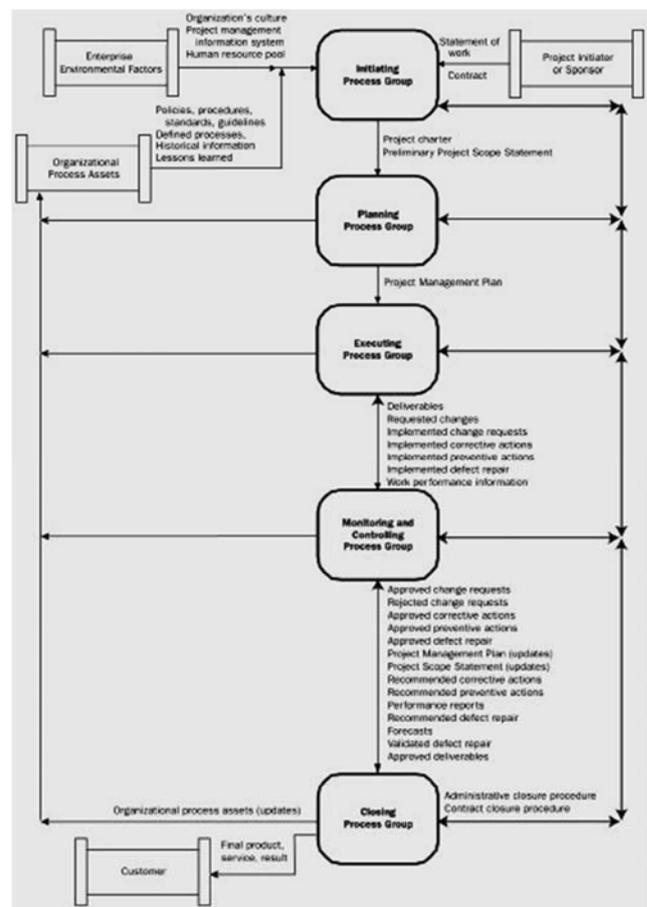Figure 1. Schematic diagram of the project cost structure

Figure 2. Engineering cost logic diagram

There is a serious phenomenon of human demand in our country's construction project bidding, the owners in order to reduce the construction cost by the market for more than ask for price, lead to the accurate estimation of the actual price of the project, to determine the cost of the project cost of the whole project leads to price distortion in the bidding process,

unable to estimate the project cost price and price. Unified management departments to effectively monitor the implementation. The lower price cannot guarantee the quality of construction projects, which may cause huge security risks. The construction project consists of two parts, one is the construction of the project activities, one is the management of the project activities, both of which are necessary, including engineering project management for unified treatment of problems in the process of building, if there is a problem management process is the process of building is bound to be a problem, so the management process directly determines the success of the project construction, so we must strengthen the effectiveness of management activities, designated construction system, to strengthen the research of cost management, to control the whole construction project cost effectively. Project cost management is an important subject, with the rapid economic development, must ensure the quality of the premise of reasonable cost control, so the cost management of the project is essential [4].

II. KEY TECHNOLOGIES INVOLVED IN THE SYSTEM

A. MVC framework

MVC is a model of (model) - (view) - view controller (controller) for a software design model, a business logic and data display interface, tissue isolation method code, business logic will be gathered in a component inside, and improvement in customization interface and user interaction at the same time. Do not need to write business logic. MVC is uniquely developed for mapping traditional input, processing, and output functions in a logical graphical user interface structure. MVC is present in desktop applications, M refers to the business model, V refers to the user interface, C controller is used, and the purpose of MVC is to achieve code separation of M and V, so that a program can use different forms of expression. For example, a number of statistical data can be used to represent histogram, pie chart. The purpose of C is to ensure that M and V synchronization, once the M changes, V should be synchronized update. Model view controller (MVC) is a software design pattern invented by Xerox PARC in 1980s for programming language Smalltalk - 80. Later recommended as Oracle's Sun Java EE platform design patterns, and more and more use of ColdFusion and PHP developers welcome. Model view controller mode is a useful toolbox, it has many benefits, but there are some disadvantages. A view is an interface that a user sees and interacts with. For the old Web application, the view is composed of a HTML element in the new interface, Web application, HTML is still in the view plays an important role, but some new technology including Adobe Flash and they emerge in an endless stream, like XHTML, XML/XSL, WML and Web services. MVC and some other markup language is good it can deal with many different views for the application. There is no real processing in the view, whether the data is stored online or an employee list, as a view, it is only as a way to output data and allow users to manipulate. Framework, design patterns of these two concepts are always confused, in fact, there is still a

difference between them. Framework is usually code reuse, and design pattern is design reuse, architecture is between the two, part of the code reuse, part of the design reuse, and sometimes analysis can also be reused. There are three levels of reuse in software production: internal reuse, i.e. in the same application can use the public abstract block; code reuse, is universal modules into a library or tool set can be used for multiple applications and in the field; application framework reuse, which provides general or ready-made basis structure for the special field, in order to obtain the highest level of reuse. Although the framework and design patterns are similar, they are fundamentally different. Design pattern is to appear repeatedly in some environment problems and describe the solution to solve this problem, it is more abstract framework; framework can be expressed in code, can be directly executed or on mode multiplexing, only instance to use code representation; design pattern is smaller than the frame elements [5], one or more design patterns often contain a frame, the frame is always for a particular application, but the same pattern can be suitable for various applications. It can be said that the framework is software, and design patterns are software knowledge. Struts have a set of mutually collaborative classes (components), Servlet and JSP tag lib composition. Struts architecture based on Web applications basically comply with the JSP Model2 design standards, it can be said that MVC design patterns of a change type. Based on the above description of framework, it is easy to understand why Struts is a web framework, not just a combination of tag libraries. But Struts also includes rich tag libraries and utility classes that work independently of the framework. Struts have its own controller (Controller), while integrating some other techniques to implement the model layer (Model) and view layer (View). In the model layer, Struts can be easily combined with data access technologies, including EJB, JDBC and Object Relation Bridge. In the view layer, Struts can be combined with JSP, Velocity Templates, XSL, etc. These presentation layer components. The schematic diagram of the MVC framework is shown in Figure 3.
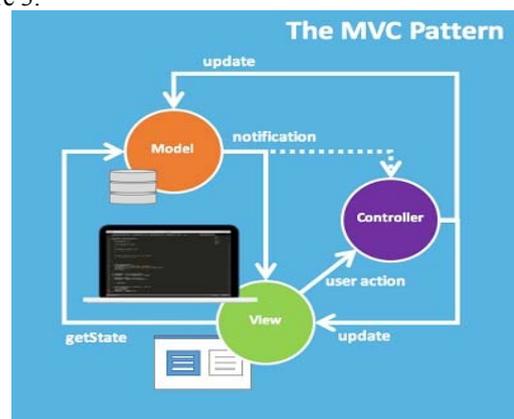

Figure 3. Schematic diagram of MVC frame

B. B/S Model

B/S structure (Browser / server mode), is a WEB after the rise of a network structure model, WEB browser is the most

important client application software. This model unifies the client, concentrates the core part of system function realization to the server, and simplifies the system development, the maintenance and the use. On the client as long as the installation of a browser, such as Netscape Navigator or Internet Explorer, the server installed SQL Server, Oracle, MYSQL and other databases. Browser through Web Server data interaction with the database. Because of the various problems of Client/Server structure, people put forward a kind of application system structure browser / server (Browser/Server) structure with three layer mode (3-Tier) on the basis of it. Browser/Server structure is an improvement of Client/Server structure with the rise of Internet. In essence, the Browser/Server structure is a Client/Server structure; it can be regarded as a special case of application of a model consists of two layers of Client/Server structure and the development of the traditional mode of three layers Client/Server structure on Web. Browser/Server structure is mainly used to mature Web browser technology: combining multiple browser scripting language and ActiveX technology, using a standard web browser to achieve the original need powerful special software to realize the complexity, while saving development costs. B/S biggest advantage is that you can operate anywhere without installing any specialized software, as long as there is a computer can access the Internet, the client zero installation, zero maintenance. System expansion is very easy. More and more use of B/S structure, especially by the demand to promote the development of AJAX technology, the program can also carry on partial processing on the client computer, thus greatly reduce the burden on the server; and to increase the interactivity, can carry on the partial refresh. Currently, the improvement and upgrading of software systems become more frequent; B/S architecture products clearly reflect the more convenient features. On a slightly larger unit, system managers if needed in the hundreds or even thousands of computer running back and forth between efficiency and workload is, as can be imagined, but only need B/S software management server on the line, all the client browser only, this need not do any maintenance. Regardless of size, number of branch will not increase any maintenance workload, all the operation only for the server; if it is remote, only need to connect server network can realize the maintenance, upgrading and remote sharing. So more and more thin client, and servers increasingly fat is the mainstream direction of future information development. In the future, software upgrades and maintenance will become easier and easier to use, which will save users' manpower, material resources, time and expenses. Therefore, the way to maintain and upgrade the revolution is "thin" client, "fat" server. Because the B/S architecture management software installed in the server (Server), network management personnel only need to manage server on the line, the user interface in the main business logic server (Server) terminal through WWW browser, little business logic in front (Browser), all the client only browser, network management personnel only need to do hardware maintenance. However, the application server operation data of heavy load, once the server "collapse" and other issues, the consequences is unbearable to contemplate. Therefore, many units have a database storage server, just in case. Schematic diagram of B/S mode shown in Figure 4.
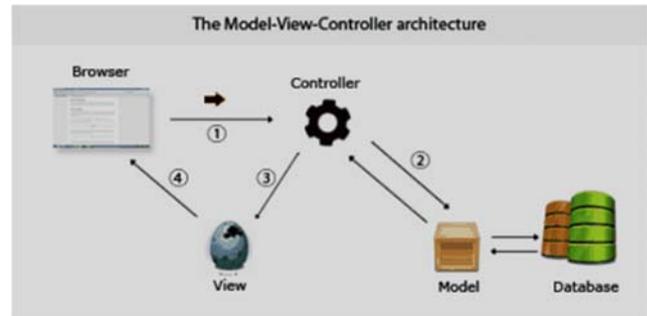

Figure 4. Schematic diagram of B/S mode

C. UML Technology

UML is also called the unified modeling language is a standard modeling language, began in 1997 with a OMG standard, it is a graphical language support model and software system development, support model and visualization for all stages of software development, including the demand analysis to the specifications, to construct and configure. The development of object oriented analysis and design (OOA&D, OOAD) method in the late 80s to 90s appeared a climax, UML is the climax of the product. It not only unifies the representation methods of Booch, Rumbaugh and Jacobson, but also makes further development, and finally unifies the standard modeling language accepted by the public. Grady Booch methods for describing object sets and their relationships. Object modeling technology of James Rumbaugh (OMT). Ivar Jacobson includes the use case method [6]. There are other ideas also played a role in UML, UML is Booch, Rumbaugh, Jacobson. UML has been accepted by the object management organization (OMG) as the standard, the organization also developed generic object request broker architecture (CORBA), is the leader in distributed object programming industry. Computer aided software engineering (CASE) products suppliers also support UML, and it has basically been recognized by all software development product manufacturers, including IBM and Microsoft (for its VB environment). UML is developed on the basis of object-oriented methods such as Booch, OMT, OOSE and many other methods and data. The UML representation focuses on different graphical representations, eliminating any confusing, redundant or rarely used symbols, while adding some new symbols. The concept comes from many experts in the field of object-oriented technology. UML from the different perspectives of the system, the use case diagram, class diagram, object graph, state diagram, activity diagram, sequence diagram, collaboration diagram, component diagram, deployment diagram, such as 9 diagrams. These diagrams describe the system from different sides. The system model integrates these different sides into a consistent whole to facilitate system analysis and construction. Although UML and other development tools also design many derived views, these diagrams and other supporting documents are the most basic constructs that

software developers see. UML simplifies the modeling method; it abandoned the Booch, OMT or OOSE in the method of the dross, but the essence of other methods. UML generally does not introduce new concepts and symbols, only in the absence of existing solutions can learn from, UML developers are considering adding new concepts. The developers of UML in the design of a language (though only a graphical language), it must be concise (all elements are represented by squares and text) and complex (individual symbols for each element of the trade-off between). Nevertheless, some new elements such as derivation and extension mechanism are added in UML, because these elements have proved very useful in the practice of other modeling languages. The goal of UML is to describe any type of system in an object-oriented graph, with a wide range of applications. One of the most commonly used is to establish the model of software system, but it can also be used to describe software systems, such as mechanical systems, enterprise or business processes, as well as the complex data processing information system, with real-time requirements of industrial system and industrial processes, etc.. In short, UML is a general standard modeling language that can model any system with static structure and dynamic behavior. In addition, UML applies to the different stages of the system development process from requirements specification description to system completion testing. In the requirements analysis phase [7], you can use case to capture user needs. Through use case modeling, describing the external role of interest to the system and its functional requirements for the system (use case). The analysis phase focuses on the main concepts in the problem domain (such as abstract, class and object) and mechanism, which need to identify these classes and their relationships, and describe them with UML class diagrams. To implement a use case, collaboration between classes needs to be described using the UML dynamic model. In the analysis phase, only to the problem domain objects (the concept of the real world) modeling, without considering the technical details of the definition of system software classes (such as the processing of user interface, database, communication and parallelism problem). These technical details will be introduced at the design stage, so the design phase provides more detailed specifications for the construction phase. Programming (construction) is an independent stage whose task is to convert the class from the design stage into the actual code using the object-oriented programming language. When analyzing and designing models with UML, you should avoid considering converting the model into a specific programming language. Because in the early stage, the model is only a tool to understand and analyze the system structure, premature coding is not conducive to the establishment of a simple and correct model. UML model can also be used as the basis of testing stage. The system usually needs unit test, integration test, system test and acceptance test. Test different groups use different UML diagrams as a basis for testing: unit test class diagrams and specifications are used; use the component integration testing diagram and collaboration diagram; system test use case diagrams to verify the behavior of the system; user

acceptance testing, system testing to verify whether the results meet the requirements identified in the analysis phase. Schematic diagram of UML structure shown in Figure 5.
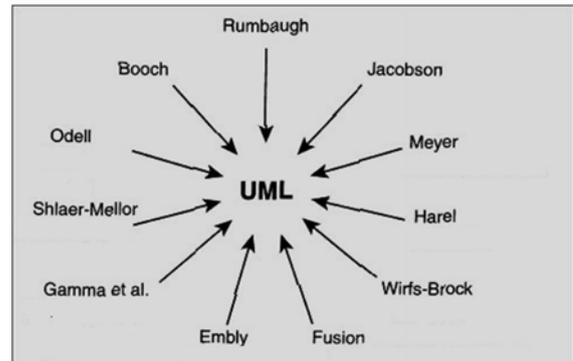

Figure 5. Schematic diagram of UML structure

III. SYSTEM FEASIBILITY AND REQUIREMENT ANALYSIS

A. System feasibility analysis

System feasibility analysis is from the system development technology, maintenance cost requirements, the use of operational feasibility analysis of three aspects. The development of any system must first carry out sufficient social investigation and technical analysis to avoid investment mistakes, cost control and project development cycle control. This section will analyze the feasibility of project cost management information system from three aspects: development technology, development cost and operational feasibility. Technical feasibility analysis is whether the current information management system development technology can complete the system needs, rather than the developer's technical ability for evaluation. Current information management system has two modes: C/S (Client/Server) structure, B/S (Browser/Server) structure. No matter which kind of model is a "performance - layer - data layer" structure for information system construction. In the system architecture, C/S structure and B/S structure can complete the system design. In the aspect of software, the client browser (Client), (Browser) software development has reached a mature stage, the Visual Studio.Net platform Microsoft 2005 can complete the software design of the presentation layer end. At the same time in the database aspect SQL database development platform may process the massive data, has the flexibility, the security and so on merit. In hardware, the computing speed of the computer is faster and faster, the server equipment which can work for a long time, high stability and reliability has been able to be configured in various enterprises. In server equipment, IBM vendor's server fully able to protect the hardware system continues to run. In summary, the existing technology can meet the development of engineering cost information system software requirements. The project cost information system is technically feasible. After using the project cost information system, it will make the construction design work become simple, no need to redesign the template, just use the existing template of the system to create. The responsible person can inspect the process information

through the system, supervise the whole construction process, and make decision according to the engineering information, engineering cost and engineering progress. Project cost management can be calculated by using the system information and system cost needed for the template to the project cost, the project cost information will cost comparison is stored in the computer for the day after. The supplier can use the system through the network, to create a supply of materials and equipment, can also be on the existing material, the price of the equipment was modified, the price will be stored in the database for the estimation of project cost to provide data support. The project cost in the premise of system development to meet customer needs, focus on the customer experience, the system interface is simple and friendly, the operation has friendly prompt function, users do not need special training does not need to have a lot of professional knowledge of computer can very good use of the system, when an error or user wrong operation, system can detect and give error and steps to guide the user to correct operation [8].

B. System Requirement Analysis

Construction cost is usually divided into three parts: unit cost, single cost and total project cost, involving the construction budget, budget and final accounts. The project cost system is calculated using the budget. This is also the general project cost evaluation of the main way, according to the tender documents, project contracts involved in the cost of the summary calculation of the overall project cost. The construction cost is generally believed that the construction phase cost is the highest, so the project cost estimates are also concentrated in the construction stage, but through research and analysis, in the cost control before the construction cannot be ignored. The first project investment decision-making stage is the foundation stage of the whole project, also determines the cost of the project, it is because of the neglect of the basic stage of the project there are three super phenomenon in the decision-making stage often estimate is low, and the construction stage in order to ensure the quality of the project is not without additional investment, budget over budget, final accounts the budget, so the need for full analysis of the project in the early stage, a large number of data collection and related engineering, to ensure full and reliable data sources, using data analysis to ensure accuracy of investment forecast and economic analysis. In the early stage of the project cost control is very important, not only to the actual situation of the investigation and Analysis on the market but also with the project of the project cost in the premise of ensuring the quality control, comparative analysis of selecting the optimum design scheme of different schemes. The aim of this paper is based on the existing solutions to the construction project cost system and research, aiming at the existing problem of improvement, put forward a complete solution and develop the corresponding cost management system. System requirements analysis is based on the user's requirements for detailed investigation and research, extracting the functional requirements of the system, describing the system needs to achieve the function. In the process of system analysis, the

unified modeling language can be used to model the functional requirements of the system. This chapter uses the use case diagrams and activity diagrams for requirements analysis modeling. The use case diagram is a static graph describing the function of the system. The activity diagram is a dynamic diagram describing the process of the system. The whole process of project cost information system is the fundamental idea from the project design stage to the completion of the project phase of the project cost tracking management. In each stage, the technical personnel can complete the information sharing, the information renewal and the efficiency enhancement through the cost management information system. The project cost information system functional requirements are analyzed and configured according to the needs of system users. The management information system of construction engineering cost of the users are divided into seven categories: engineering design personnel, engineering template approval of personnel, materials and equipment suppliers, cost estimation, project management, personnel tracking and management system of enterprise decision. The following are based on system staff to introduce the system functional requirements. 1, template designers: such personnel work is based on the characteristics of the construction project design corresponding project cost template. Functional requirements should be able to new cost templates, query template information, modify templates, etc. 2, the template approval: template audit staff work is submitted to the audit templates in the design of personnel, will review the audit by the cost of the template, template in the project cost information system template database, will return not through the template for template designers. So the template audit personnel in addition to the authority of the audit submitted cost template, but also query the database template information, the corresponding engineering information, in order to achieve the purpose of reasonable audit. 3, material equipment suppliers: engineering construction cost management information system internal personnel cost control, need to complete the engineering materials, equipment purchase, sub project bidding. So the outside material equipment suppliers can quote the bid of bill of material relevant equipment through the information management system, but such user permissions only browse the tendering information announcement list, material and equipment list, submit quotation list, modified from the quotation list. Cost estimation, engineering staff of 4: the main working staff is estimated according to the cost of project cost, bidding quotation, supplier template social price information, fees and taxes and other categories. In the course of the project [9], but also need to coordinate with project managers to adjust the project cost. Completed in the stage of project estimation, still need to analyze the actual cost, balance etc. 5, and engineering management personnel: this kind of personnel's work is mainly to complete the project in the cost management, control cost consumption, and update cost demand. Due to the long cycle of construction projects, and the price market is changing, as well as unpredictable accidents in the project accident, early cost estimates may need to be adjusted. So engineering

managers need to track the actual cost of consumption and cost estimates ratio, compensation price library management, accident claims registration, on-site visa management, completion of settlement, etc.. 6, corporate decision-makers: corporate decision-makers login system can use the engineering module, project cost module, basic information, view the progress of the project can be used, you can view and edit the project module, and to design and apply to determine the cost and cost adjustment. 7, system administrators: such personnel in the login system, the system can all types of users to add, delete. Can export data in the system, data can also be introduced into the system. He can also make a backup of the data in the system. The staff in the highest privilege. The whole process of project cost information system business process diagram as shown in Figure 6.
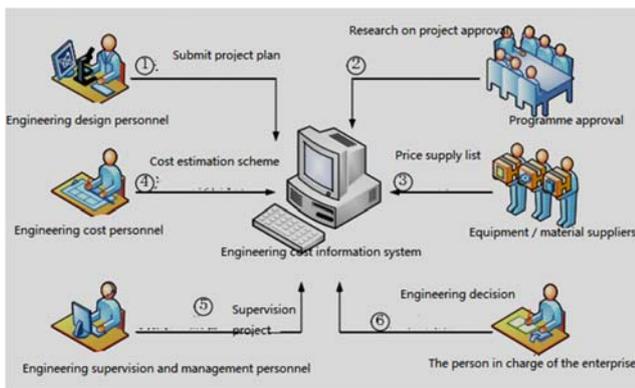

Figure 6. Schematic diagram of system requirement analysis

C. Business modeling model

In the demand analysis phase of the construction cost management information system, the functional requirements of the system need to be analyzed in detail, in order to better describe the requirements, the functional requirements will be modeled. For the description of the main function of the use case diagram modeling. The use of these cases to improve the efficiency of system design and development. Through the use case analysis module design and development. After the realization of the whole system, we can use the use case model to establish test cases to test the system in detail. Only understand the business processes of different users of the system, not only users can use the specific functions of the system, and the division and cooperation between participants and participants. UML activity diagram can be dynamic modeling of the system, to make up the insufficient case diagram. In the activity diagram, it describes a flow diagram of an activity to another activity that describes the concurrent operation of the system. In this system there are many activities such as template management, cost analysis, price management, and system management and so on. The use case diagram is a tool for describing use cases. The activity of the system can use the simple graphical elements to express the use cases and the relationship between them. Its principle is to stand on the user's point of view of the system, define the system; the user can understand the language to express. Activity diagram is a

dynamic diagram, which can describe the system flow well. Through the system requirements analysis can get the functional requirements of the system, find the system use case from the functional requirements, including the main case system participant relationship before the template design personnel, system administrators, suppliers and case. Class by class and relation class, and from the static and dynamic operation. The function of the system is realized through the communication between different classes of objects, and the use case diagram describes the basic functions of the system, so the class can be extracted from the use case diagram, and the class diagram can explain the use case diagram. The class diagram of this paper is identified by use case diagram and collaboration diagram, through the use case to find the class involved in the system, through the collaboration diagram to determine the relationship between classes and class attributes. If add cost template, refer to add template collaboration diagram can determine the main operation of the object are: add, modify, delete, save, etc [10]. class is the object of abstraction. According to the needs of users on the cost information system carried out a detailed needs analysis, firstly analyzes the feasibility of the system from the angle of economic operation, and then the system; business process analysis, and according to the business processes of the functional requirements of the system and function requirement modeling by using unified modeling language for system. The key business process system in business process analysis, system requirement modeling and introduces the UML language use case diagram, collaboration diagram and activity diagram modeling method, and establish the system use case diagram, class diagram and activity diagram, use case diagram static description of the system function, the system object and object state description of the activity diagram. The system class diagram is shown in Figure 7.
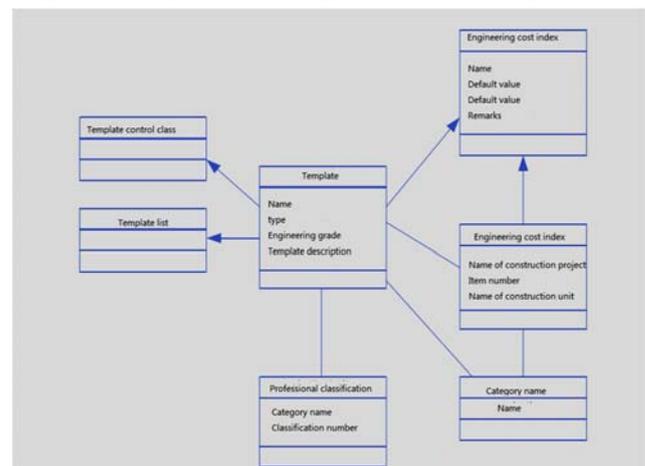

Figure 7. System template management class diagram

IV. DESIGN AND IMPLEMENTATION OF THE SYSTEM

This system takes the database as the center, each processing logic is takes the database as the operation object. The same logic can be implemented on multiple databases. In order to improve the performance of the system, should

carry out separation makes the business logic of the system, different business activities corresponding to different module will not affect other business modules in a business change, considering the system scalability required in the system design, can be modified when the scale to add new features to the needs of occurrence change the future. This allows managers to understand the structure of the system from the actual business perspective, but also in the maintenance period to make maintenance personnel easier to maintain software, reduce the workload of software maintenance. Management information system development technology in the framework of the main Client/Server (C/S, client / server) structure and Browser/Server (B/S, browser / server) structure. The following will compare the advantages and disadvantages of the two architectures to choose the architecture of the system program. Through the analysis of the construction cost management information system, this paper will use the B/S structure of the construction cost management system. By using the framework of.NET technology development system. The system provides a complete set of construction cost management functions, while providing a lot of additional features, such as data integration analysis [11], construction cost audit. In the construction project cost often considered the focus of the project cost in the construction stage, generally strengthen the construction plan budget and engineering settlement price audit, thus ignoring the construction phase of the cost control. Project investment decision-making is the basis of investment control, once neglected the work of the previous period; it may lead to estimates over estimates, budget over budget, settlement budget phenomenon. In order to avoid this "three super" phenomenon, should be in the feasibility study stage do basic information collection, ensure informative, accurate. Analyze the accuracy and reliability of data to ensure the accuracy of investment forecast and economic analysis. The control project of the early work stage cost cannot be ignored. Not only to do market research work, but also should be combined with the actual situation, better completion of the construction works in energy, control cost, strict comparison of various schemes, so as to select the optimal design scheme. In the method, the function modules of the system, there are several requirements. First, to comply with the classification of software engineering operations; two is based on the actual situation of the classification of Engineering information. This section will be divided into software modules and construction processes and related policies module. According to the needs analysis, business modeling and analysis results, determine the functional modules of the project cost information system. This paper mainly includes three kinds of user function modules. The main contents of the project including project information, project schedule, project item information, including project item information mainly includes: project number, project name, project status, project description etc. The project measures list, a list of other items, fees and taxes can refer to the list of items list of relevant information. For items not involved in the information, in accordance with the actual situation to give supplementary instructions. The function of the engineering template module is to select the

appropriate cost estimate template according to the engineering information, or the new design conforms to the engineering need template, and only through the template audit can apply to the engineering. The main content of engineering template module is: project quantity list, sub project quantity list, other items list, and tax item list. The cost of construction project is composed of engineering quantity and project cost. The project quantity is provided by the project quantity list, which is the main basis of the sub segment construction project quantity. Comprehensive cost refers to the cost of project quantities to provide the comprehensive pricing of the project according to the relevant requirements of the project and the relationship between the characters and many pricing provisions, materials and equipment in the bidding documents according to the price estimated price is included in the project cost in. Measures for the project cost valuation must abide by the following principles: first of all the project measures the project from BOQ listed; secondly measures project cost calculation method must be calculated in accordance with the provisions of the standard, there is no standard for some valuation of the project must be on the project standard determined by the staff; safety construction costs finally all projects in bill of quantities the involved must be in accordance with the provisions included in the valuation measures the project cost. Engineering quantity is divided into sub project quantity must be tender document engineering quantity list provides engineering quantity. Which mainly includes integrated unit labor costs, material costs, equipment costs, comprehensive cost? These costs can be denominated in accordance with the relevant provisions of the cost management, can also be carried out in accordance with the valuation of the market price, the cost of raw materials can also be used for pricing according to the bidding documents and the contract signed, in accordance with the valuation of fixed costs can be integrated with enterprise and the actual situation. In the comprehensive unit price should consider the bidder and contract signing both sides need to bear the risk cost. Project cost management must select a base date, after the base date if the change existing policies and regulations will have an impact on the cost of the project, according to the needs of the construction project management department and the relevant provisions of the cost management mechanism to modify the project cost. The bidding project for survival period is generally 28 days. In accordance with the bidding deadline to push forward 28 days start bidding. The function of project tracking management module is to control the engineering cost in the project, the main function is to project information, project cost, cost estimate of the actual situation of registration adjustment and cost balance etc. Because this system is not only used in the enterprise, but also facilitate the supplier's quotation function, different user permissions are not the same, so the system to manage user permissions, user permissions according to the demand will be divided into three groups, employee permissions, supplier permissions and administrator privileges. Different users can only use different functions. The employee is responsible for the operation of internal users, related to the project cost; and

the supplier can publish the relevant information according to the administrator permissions, and review the related information; the administrator has the highest authority in the system according to the needs of users, the administrator can assign permissions to other users, in addition to the administrators also need new registered users data audit, audit by the only new users to be able to properly use the new account. The database of hardware equipment ready after you can create a data management system. The establishment of a database is divided into the following sections: initialize the data structure, the link to consider all the data types and data [12]. The basic data filling, initialization of the database is only a shell structure without content, through the basic data entry, to provide a sample for the processing of data in the future. Link the application, write the corresponding interface to complete the basic operation of the database, such as add, delete, modify, etc. Once the database provides services for the application, means that the design and implementation of the database basically completed. Next is the loop test, and complete the database daily management, including database optimization, security monitoring, backup, performance evaluation, etc. System login interface as shown in Figure 8.

Figure 8. System login interface

V. CONCLUSIONS

In this paper, the idea of software engineering is used to develop the system. The whole process includes system planning, system requirement analysis, system design, system implementation and system testing. Detailed functional requirements of the system in the analysis phase analysis modeling, design the overall system architecture, database and module are designed in detail, finally using visual studio and SQL server to realize the management information system of construction engineering cost. The system is developed based on B/S model and.Net framework. With "high cohesion, low coupling" as the principle of program design, the project cost management information system is realized according to the project demand in the

design thinking and mode unchanged. The system has been tested to meet the needs and realized the basic function module. The application of this system can realize real-time information exchange between the convenience of management, the project cost information of information sharing and multi sector, instead of the previous paper on the complicated business processes, save human resources, improve the efficiency of enterprises.

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