# Design and implementation of ship engineering project management system

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***Abstract*—With the rapid development of the shipbuilding industry and the increasingly frequent communication with the outside world, the joining of various industries has made the management of shipbuilding projects more and more complicated. The traditional manual management method is difficult to adapt to the increasing number of ship engineering projects, which seriously hinders the development of the enterprise. It is essen-tial to manage the project side scientifically, standardly and reasonably. Based on the problems existing in the ship engineering project management center, this paper demonstrates how to apply information technol-ogy to the project management process based on the SQL Server database for data organization and system development. By considering system requirements from the bottom up, and considering data requirements from the top down through life cycle design, a general model containing ship product data is developed. The system can ensure that the correct data is provided to the user at the right time and in the correct form, mak-ing the entire ship engineering project proceed more smoothly. It solves the problems of cluttered project information, difficult information integration, and chaotic process management. It realizes the functions of electronic management of ship engineering projects, unified management of initial data, and online pro-cessing of business processes, which improves management efficiency and reduces management costs.**

***Keywords-component; ship engineering; management system; data exchange; SQL Server formatting***

## I. INTRODUCTION

With the country's continuous progress in the reform of the ship system, ship engineering project management is required to be constantly explored and innovated to keep pace with the times. The establishment of a set of engineering project management operation procedures and its institutional systems and methods that meets its own characteristics is imminent. Therefore, it is important for enterprises to effectively manage data, integrate information, and simplify work. To solve these problems, information technology must be integrated and run through the entire project, but due to the confidential and security information, many ship companies still use paper office, and in the long run all kinds of data are large and cluttered [1]. Under such a background, information collection is imperative. Only by collecting, classifying, and scientifically managing all paper materials can we better improve the work efficiency of employees and enhance the competitiveness of enterprises [2].

The system is designed and implemented in combination with the actual situation of ship engineering, and the importance, necessity and feasibility of the ship engineering project management system are discussed in detail. The research significance of the project management system is summarized as follows:

- We abandon paper office to save company costs and reduce waste of human resources. For example, contract approval not only wastes time, but also has a long cycle, which is not conducive to the development of enterprises. But with this system, we can control and approve at any time, which improves efficiency and reduces costs [3].
- We should categorize and organize the information reasonably and scientifically.
- The project can analyze the report through data mining, grasp key information such as project progress, expenses, etc. at any time, effectively manage the project, improve implementation efforts, and reduce risks.
- The database management of the ship engineering project allows the staff on the entire project process to

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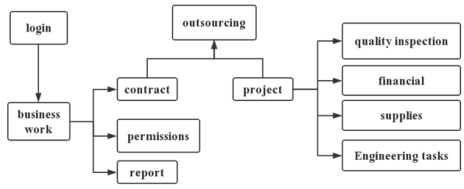
know the project progress clearly and understand their work needs in time [4].

## II. SHIP ENGINEERING PROJECT BUSINESS MODLE

At present, ship engineering projects are basically managed manually, and both electronic and paper documents need to be organized manually [5]. A large amount of data makes it difficult to search and summarize. The difficulty of project management increases exponentially with the increase of projects. Through the construction of a ship engineering project management system, safety, stability, and ease of use are increased, and the ability to digitally store and share information is realized. This system takes the contract as the key clue, and collects information around the contract. After the company signs the contract with the owner, it is jointly completed by the following departments, including the subcontracting company, engineering department, material department, security department, and financial department. Each department has different responsibilities. Different branches and departments work together to complete projects based on contracts. The business model is shown in Fig.1.




Figer 1. Business model of ship engineering project

## III. DEMAND ANALYSIS OF SHIP ENGINEERING PROJECTS

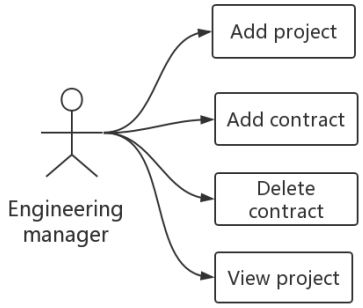
### A. *Features of ship engineering projects*

With the economic globalization, the current ship market competition is very fierce, in order to improve competitiveness. The quality of the project management by the project manager directly affects employees' work efficiency, company efficiency, and corporate reputation. Ship engineering projects have high requirements and involve many manufacturers, but it takes a long time for the engineering design to be approved by the classification society. Ship engineering projects need to consider many factors. Different countries have different requirements for different varieties, and the required indicators are different. Details It needs to be finalized one by one. After the contract is signed, it is produced on demand and according to standards, which greatly prolongs the project cycle. Shipbuilding projects usually involve huge funds and long financing times, and some equipment requires customized processing, which increases time cycle.

In summary, it can be seen that the characteristics of shipbuilding projects are clear, involving many manufacturers, long project cycles, large overall scale, complicated links and overlapping conditions, and large project funds.

### B. *Functional requirements analysis of ship engineering project system*

Ship engineering management is mainly divided into three parts, engineering business, engineering settlement, and engineering subcontracting. The engineering business includes: the management and control of the entire process from the implementation to the completion of the shipbuilding project, which involves the situation of the construction drawings, the as-built drawings, and the progress of the project, the project report, and the construction unit. The software needs to collect data from each link and analyze Summary. The project settlement includes all the amounts involved in the ship engineering project. These include: project settlement amounts, project audit amounts, and compensation payments. Engineering subcontracting is the subcontracting of a certain project under a shipbuilding project to a subsidiary or subcontracting unit. The project is completed by the subsidiary or subcontracting project, but it is necessary to collect all data during its construction, including various types of subcontracting. Information and expenses for easy control. Project management use case diagram, as shown in Fig. 2.



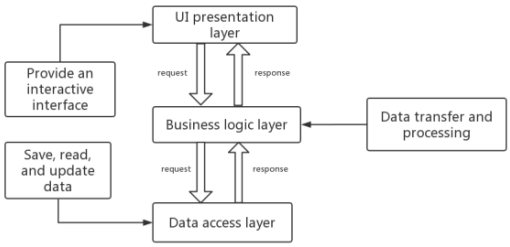

Figer 2. Project management use case diagram

The specific requirements mainly include: collecting engineering data of each project according to the contract, and project personnel can view, summarize, and analyze according to their respective authority; each department in the ship engineering project has a separate entry interface, and information can be collected by unit or department at the same time. Part of the data of each department can be selectively shared, that is, some information only needs to be entered by one department, and the information can be linked to another department to achieve data sharing.

## IV. DESIGN OF SHIP ENGINEERING PROJECT MANAGEMENT SYSTEM

The design of a ship engineering project management system is an important part of the entire system development process. Its main plan is to give a detailed design diagram to guide the developer to complete the system construction, which is similar to the design drawings required to build a building. According to the analysis above, the content of the system and the characteristics of the problem have been combed in detail. In the design phase, the entire system is divided into multiple

functional modules, and the functions that each module needs to implement are designed in detail. In terms of software architecture technology, the system uses the current mature and stable three-tier architecture technology. It is divided into: presentation layer, business logic layer, and data access layer. The data layer concentrates the main data of the system to achieve the persistence of the data. The business logic layer is only responsible for the transaction processing of the transaction, responsible for the data processing, receiving the client's request to return the required data; the presentation layer is mainly to provide the user with an entry and present The interface is intuitive to the user in a visual way. The software architecture of the ship engineering project management system is shown in Fig. 3.

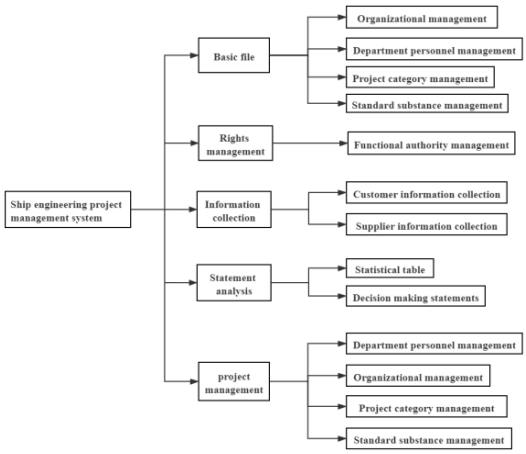



Figer 3. Software architecture of ship engineering project management system

By analyzing and summarizing the status quo of the enterprise, the function of the ship engineering project management system is designed. The research of this project covers the following:

- Perform analysis during the preparation phase of the ship engineering project management system to confirm its feasibility.
- Carry out a detailed requirements analysis, mainly focusing on the current situation of the enterprise, summarize the system's business processes, analyze its office difficulties, data confusion, and search difficulties, determine the functional and non-functional requirements of the system, and use the system requirements as a process. Diagrams and use case diagrams to explain the system requirements and design methods.
- Establish a plan in the system of the ship engineering project management system. In the discussion of the usability, security, and operability of the system, the login mode, personnel management mode, authority management, and data acquisition module were developed.

The overall functional structure of the system is shown in Fig. 4.




Figer 4. System overall function diagram

Database design. The system's database physical structure is designed through a data dictionary, reflecting the length, type, and data results of each table field. The purpose is to explain the data items of each table.

The user table is used to store the company's employee information for project management. It mainly includes user ID, user name, password, name, gender, department, role, contact information, company and other fields. The specific SQL server table is shown in Table I.

TABLE I. USER TABLE

| Key | Type | Allow empty | primary/foreign key |
|---|---|---|---|
| UserId | Int | N | Primary key |
| UserName1 | Varchar | Y | -- |
| PassWord | Varchar | Y | -- |
| UserName2 | Varchar | Y | -- |
| Gender | Varchar | Y | -- |
| Role | Varchar | Y | Foreign key |
| Department | Varchar | Y | -- |
| ContactInfo | Varchar | Y | -- |
| Company | Varchar | Y | -- |
| Remark | Varchar | Y | -- |

The project table is the recorded information of the construction project management system, which mainly includes the project number, project name, project leader, creation time, project plan start time, plan end time, project cost, project progress, construction unit, design unit, etc Field, the specific structure design is shown in the following table II.

TABLE II. PROJECT TABLE

| Key | Type | Allow empty | primary/foreign key |
|---|---|---|---|
| ProjectId | Int | N | Primary key |
| ProjectName | Varchar | Y | -- |
| BusinessCharger | Varchar | Y | Foreign key |
| CreateTime | Datetime | Y | -- |

| | | | |
|---|---|---|---|
| StartTime | Datetime | Y | -- |
| EndTime | Datetime | Y | -- |
| ProjectCost | Float | Y | -- |
| ProjectSchedule | Varchar | Y | -- |
| ConstructionCom | Varchar | Y | -- |
| DesignCom | Varchar | Y | -- |

The contract table is used to store the information of the project contract documents, mainly including the contract number, project number, signing date, contract amount, contract party A, contract party B, contract start date, contract end date, contract status, party A signatory, party B Signatory and other fields, the specific structure design is shown in the following table III.

TABLE III. Contract table

| Key | Type | Allow empty | primary/foreign key |
|---|---|---|---|
| ContractId | Int | N | Primary key |
| ProjectId | Int | Y | foreign key |
| Money | Float | Y | -- |
| SignDate | Datetime | Y | -- |
| PartyA | Varchar | Y | -- |
| PartyB | Varchar | Y | -- |
| Remark | Varchar | Y | -- |

This chapter mainly designs the functions of the system in detail. First of all, the software architecture, system functions and database of the system are designed; the functional modules in each design link system are explained in detail, including the basic data module, rights management module, information acquisition module, project management module, and report management module; Modeled the database and designed the table structure.

## V. CONCLUTION

Because the standards, requirements and management modes of ship engineering projects are quite different from the corresponding standards, requirements and management modes of ships. Therefore, in overseas shipbuilding enterprises, marine engineering projects and shipbuilding are generally carried out in different regions, and are organized by establishing specialized divisions or workshops for marine engineering. Domestic shipbuilding enterprises are limited to the scale of their development. Such arrangements and arrangements are not yet available. Therefore, marine engineering construction and shipbuilding can only share a set of production management processes, which will inevitably cause special difficulties for shipbuilding enterprises to manage marine engineering projects. This article generally researches and discusses how to establish a ship engineering project plan management mode in a shipbuilding company. In the shipbuilding company's organization of shipbuilding project construction planning management, it must also combine the specific situation of the company and the engineering projects it undertakes. Make specific adjustments and arrangements.

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