

## **Research and Application of Construction of Project Information Management System**

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*Abstract: With the deepening of reform, construction industry has become one of the pillar industries in China. The domestic construction industry has actively carried out many explorations and practices of project management informatization, accumulated valuable experience, and exposed many problems. How to solve these problems is something worth thinking about. This paper mainly analyzes the significance of the construction of information management system for engineering projects, as well as the construction mode, system platform, function module and strategy.*

*Keywords: Engineering project, information management, construction, evaluation, restrictive factors, measures.*

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### **1. INTRODUCTION**

#### **1.1 Project management**

What is project management? It is a kind of reasonable mode of management. Since most of the activities of the mass society can be carried out according to the projects, project management has been applied to various fields and exists in different types and scales. For the companies, the project management concept is the most effective way to the production and operation activities. Many projects can also be regarded as concrete ones which can be realized by the model of project grouping, for example, market researches, market planning and promotion, researches and development of new products, introduction and evaluation of new technologies, training of new employees, optimization of labor relations, facilities transformation or technological revolution.

Engineering project management has attracted wide attention from the whole society. Project management enterprises have played an important role in engineering construction and made remarkable achievements. In 2003, the ministry of construction issued the "Guidelines on the cultivation of general contracting and project management enterprises for development projects". While carrying out traditional project management, all enterprises strive to develop in-depth project management and extend the service area also. It can be said that China's

project management enterprises are in the process of extending from the traditional project management business to the whole process project management business. Especially in today's information technology era, network and computers have entered thousands of households, which has injected new vitality into the management level of project management enterprises. As increasingly large-scale construction of the projects, information exchange and transmission has become increasingly frequent. And it cannot meet the needs of enterprise management and project management if only rely on the traditional information management mode and means, for information management system of construction project management has been more and more enterprises attention. This is also the project management enterprises improve management level and the inevitable trend of development. Whether the project management enterprise has a relatively perfect information management system or not has become an important factor for the owner to judge the level of the project management enterprise. In the process of project management, it has become one of the signs to measure the level of project management whether the information management system is used to implement effective project management. Therefore, the construction of information management system is very important to the development of project management enterprises.

### **1.2 Information system**

With the development of society and technologies, the contents and the forms of information system are constantly changing. Like everything else, information system has gone through a process from low to high, from local to global, from simple to complex. If a project fails to do the researches and scope definition in the early stage, and lacks control on the progress and effective budget estimation of the cost, it will make the projects unable to go on as scheduled and fail to meet the quality requirements of the software, finally result in the failure of the construction of system project.

In the past 20 years, the information technology industries with computers and Internet as the core have developed rapidly. In China, the development of IT industry started relatively late, and the application of project management in IT industry is not mature enough. The failure of software system projects repeatedly exists, which has become a common phenomenon. How to combine the characteristics of IT industry development and project implementation organically to improve the success rate of information system construction is a common task faced by China's IT industry and many experts of the project management.

## **2. SIGNIFICANCE OF CONSTRUCTION OF INFORMATION MANAGEMENT SYSTEM**

The information management system of project management enterprises means not only the use of information technology to replace the manual information processing operations, but more importantly, the use of computer technologies, network technologies, database and other scientific means to collect, sort, process, store, apply and assist decision-making. It also improves the management level of enterprise project management, and reduces the

management cost also improves the efficiency of management, as well as improving enterprise economic and social benefit.

In recent years, many project management enterprises have successfully established the information management system, and the information management system as an indispensable tool for information exchange and management. Some enterprises have developed and applied the information system of enterprise management and engineering project management, and moved the work of enterprise management and engineering project management to the computer system platform, greatly improving the management efficiency of enterprises. Some enterprises use various management software (such as project management master software) in their works to implement effective project management for engineering projects. Although most of the enterprises have established rich web pages as a platform to display their performance, they mainly publish information. The instant communication and interaction of information and information management system have not been realized yet. The author thinks that the significance of enterprise information management system construction is mainly reflected in the following aspects.

(1) Enterprises can achieve high efficiency in office management by using the platform of information management system. The platform greatly accelerates the speed of information exchange, and reduces the duplication of work in the traditional mode of management, also each employee knows online collaboration and information sharing within the scope of their authorization. For example, information management such as announcement notice, receipt and sending of documents, online signing and approval, data upload and filing, etc., they enable employees to timely inquire relevant information, so as to improve the overall office efficiency of the enterprises.

(2) Enterprises can collect timely, store and analyze information by using the platform of information management system. The project management department can collect the information of various activities of project management every day in a timely manner and make timely analysis and inspection of each link of project management to improve the effective management of the project.

(3) By using the platform of information management system, enterprises can establish resource and information database, including common construction materials and information of equipment supplier, engineering technical specifications, standards, laws and regulations, etc., which can be convenient for employees to check in time.

(4) Enterprises can use the platform of information management system to conduct remote monitoring and management of project management projects. Each department of project management can collect various engineering project management activity information collected every day through the network to the system platform, which not only facilitates the information communication between the project management and cool enterprises, but also satisfies the enterprise leaders' remote monitoring of the monitored projects. Especially when the projects undertaken by enterprises spread across many provinces and cities in China, the advantage of remote management becomes very prominent.

### **3. DEVELOPMENT AND TREND OF PROJECT MANAGEMENT INFORMATIZATION**

With the development of modern information technology and its wide application in engineering project management, the study of engineering project management informatization has become a hot topic in the field of engineering project management researches. The project management informatization mainly includes two aspects. One is the hardware condition of informatization, such as computer hardware, network equipment, communication tools, etc. The other one is about the information-based software conditions, such as project management software system, relevant system of information management. From the current situation in China, the hardware condition of engineering project management informatization is not much different from that of western developed countries, but the software condition of engineering project management informatization is much different. From the perspective of software system of engineering project management, engineering project management informatization has gone through many stages at home and abroad and achieved certain results.

#### **3.1 Centralized project management information system based on large-scale computers**

In the 1960s, the project management software developed at this stage was mainly based on the technologies of network planning, and the software function was mainly focused on the progress of compilation and optimization. The software operation was concentrated on large computers, and the main application areas were large defense and civil engineering fields. The cost and use of project management software at this stage were very high, and one set was often sold for more than \$100,000, which was related to the development level and application conditions of the computer at that time.

#### **3.2 Project management information system based on PC desktop**

Stage of the development of project management software was mainly based on system engineering theory and some basic project management methods (technology of schedule control, technology of resource balance, cost analysis, etc.) as the main theoretical basis. The software function included the schedule and cost plan and control, graphical, calculation of quantities, schedule completion data writing, etc., basically ran on stand-alone computer, and can meet the requirements of the use of a single participant of the project. And applications also gradually extended to the energy, transportation, water conservancy, electricity and other fields. Typical representatives were P3 of Primavera in USA, and Project98 of Microsoft.

#### **3.3 Pip-based project management information platform**

From the late 1990s to the early years of the 21st century, modern information technology and network technology have been rapidly developed and widely used in the field of engineering construction. In this stage, project management information system supported by project cybernetics, whole life cycle integrated theory of management, collaborative management theory, project remote control theory. Internet e-commerce and other management theories and ideas emerged. This phase of the software was mainly based on Internet communication tools,

with modern computer technology, large server, and database technology support for data processing and storage technology. It formed as the center of the network virtual environment and integrated the project participants, multiple stages of the projects and multiple factors of management, most of which were displayed in the form of web sites. This phase of the main functions of the software system can not only satisfy the needs of the functions of project management (three major controls, contract, information management), but also provided a personalized project with a single entrance, which can fulfill the functions of multilateral information exchange, collaborative work, real-time transmission of information and sharing of data information, and eventually formed an efficient information platform and the environment of network virtual of information exchange and joint work. Typical project information portals (PIP) included Buzzsaw.com of Autodesk. There were also some similar software systems in China like PowerPIP of Shanghai. The system has basically realized the function of various collaborative work under the network environment, and statistical analysis of relevant information also provided the support for the decision of top leadership. But there was a certain gap with foreign countries, such as foreign countries widely used ASP (Application Service Provider) mode of operation to provide service for the project participants. However, most of the domestic development is still self-development and outsourcing, resulting in a lot of duplication of work and waste of resources.

### **3.4 Project collaborative management platform based on grid technology**

With the development of grid computing technology, grid computing technology has become a new stage of development of the Internet. It tried to realize the comprehensive connectivity of all resources on the Internet, integrating the entire Internet into a giant supercomputer, and realized the comprehensive sharing of computing resources, storage resources, communications, software, information and knowledge. Grid technology has formed a new research hotspot. The construction of project collaborative management platform supported by grid computing technology has become a new field of grid technology application and would bring great changes to the engineering project management. Grid technology can comprehensively integrate the information of project participants, not only providing the project-related information, but also obtaining the corresponding project of engineering management knowledge from the information platform. Therefore, the construction of project collaborative management platform based on grid technology would be the future development trend of project management informatization.

## **4. RESEARCH ON THE STATUS OF PROJECT MANAGEMENT INFORMATION**

In recent years, our country's information construction has made remarkable achievements, but in the process of information construction, there were also many problems, such as "high technology consumption", "isolated information island", insufficient utilization of information resources, low efficiency of informatization and so on, thus appeared the term of "informatization investment black hole". Although the informatization in the field of engineering construction has made many achievements, the process and effect of its promotion

were not satisfactory. Many of the informatization of project management has failed, or the effect of the application was not good. Project management informatization has become a face-saving project in many government projects. For example, a large construction project in China invested nearly ten million US dollars to develop a construction project management system based on network platform in cooperation with a foreign project management company. The function of the system was advanced and complete, but only about 20% of the single function has been used at present, and the project management level has not been improved. At present, the degree and speed of engineering project management informatization still have a certain gap with foreign countries, and also has a big gap with enterprise management informatization. The current status and problems of project management informatization mainly include the following two aspects.

#### **4.1 The micro engineering project management information system is still in the stage of development and application state**

Generally speaking, engineering project of our country management information system is mainly carried out in accordance with several stages of development such as the planning, designs, constructions, operations and so on of the projects. However, most software systems were mainly applied in the construction stage, including cost management software, financial management software, progress management software, quality management software, document management software, contract management software, resources (materials, equipment, personnel) management software, etc. Such a situation made it impossible to exchange and share data between the information of each phase of the projects and the information of each management process of the projects. Information exchange and sharing cannot be achieved either within or between the project participants and government investment project departments, which basically stayed at the level of 1980s abroad.

#### **4.2 There is a lack of information systems with macro and interim monitoring and early warning at macro (national) and medium (regional/industrial) levels**

At present, China's investment system is in the reform stage, and the investment state of engineering projects has formed the situation of various ministries and commissions, industries, provinces and municipalities, and independent and repeated development and construction. If countermeasures are not taken in time, it is impossible to establish a national investment information release system, guiding direction of social investment through investment information, and prevent industrial investment from overheating and overlapping construction. China's national economy and financial security will be subject to fluctuations and risks caused by out-of-control investment at any time. Especially for real estate projects, power projects, energy projects, etc., the country needs monitoring of investments, evaluation and decision-making early warning information system to monitor and control these projects, so as to guide and grasp the investment trend from a macro perspective and realize the national strategic goals.

## 5. CONSTRUCTION MODE OF INFORMATION MANAGEMENT SYSTEM

### 5.1 Self-developed mode

Engineering project management enterprises can design, develop and maintain the system by employing computer management talents or relevant software companies to develop by themselves according to their specific conditions. Self-development mode has the advantages of good reliability, high security and pertinence, but it also faces the disadvantages of high development cost and heavy maintenance workload.

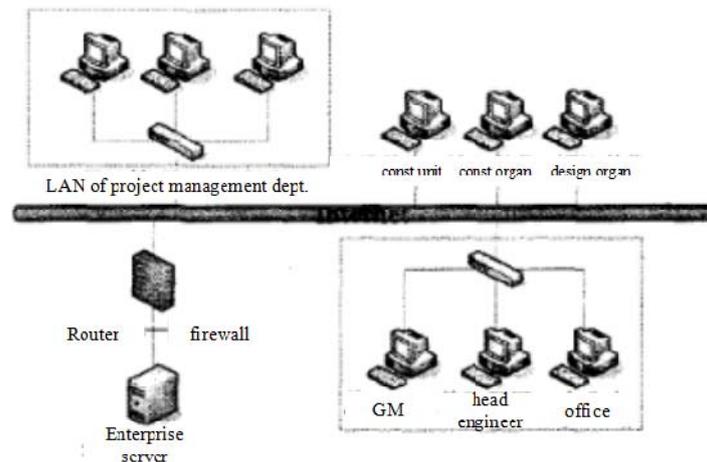


Fig 1. Schematic diagram of platform structure of project management enterprise informatization management system

### 5.2 Direct purchase mode

According to the specific situation of the enterprise, the project management enterprise chooses to purchase the mature information management system software, so that the enterprise information management system platform can be built. The mode of direct purchase usually has the advantages of good reliability, high security and strong pertinence. However, it has relatively high maintenance cost for the system platform.

### 5.3 Service rental mode

Engineering project management enterprises can choose to hire the information management system platform which has been opened by service providers according to their specific conditions, so as to share information and effectively improve the efficiency of enterprise management. Often the charge is based on the number of users, rental time, data occupied space, number of projects, and so on. The model of renting service often has the disadvantages of poor reliability, security and pertinence, but it also has the minimum maintenance workload. Based on the analysis of the construction mode of the information management system of engineering projects in China, it can be understood that all the above modes exist. In terms of quantity, the mode of automatic development is a rare phenomenon, and the mode of renting service is less, and more is the mode of direct purchase. From the perspective of the author, the mode of direct purchase appears more adaptable.

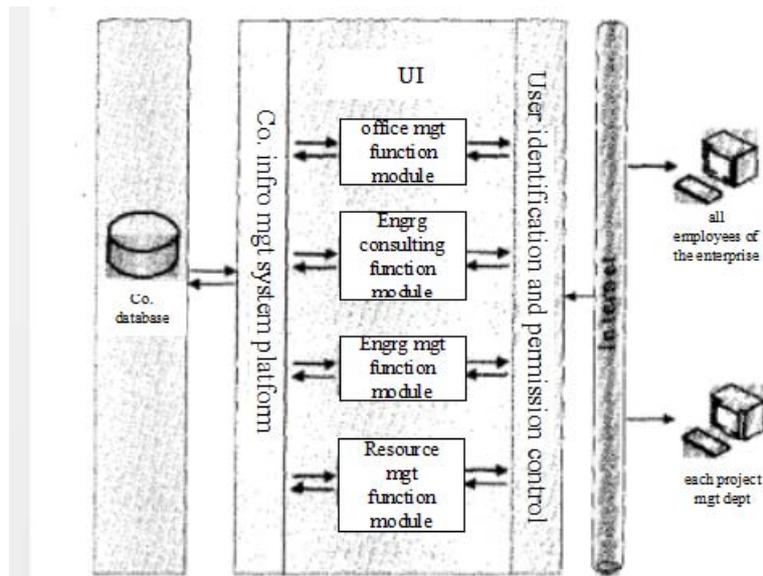


Fig 2. Schematic diagram of functional module of project management enterprise informatization management system

## 6. PLATFORM OF PROJECT MANAGEMENT ENTERPRISE INFORMATION MANAGEMENT SYSTEM

### 6.1 Platform framework of project management enterprise informatization management system

As we all know, the Internet promotes the connection of computers, and network technology helps achieve the overall comprehensive sharing of all resources and information on the Internet. By adopting network technology, the project management enterprise built an enterprise information-based management system platform so that all functional departments of the enterprise, project management department, and project participants, including owners, design, construction, and parties of project management, can work on the unified information platform through the Internet. As a result of that, all kinds of resources and information were shared and coordinated in the project management enterprise. The author suggests that there should be four major modules, what are, office management function module, project management function module, project management function module and resource management function module.

Office management function module.

It mainly includes information management such as announcement and notice, receipt and sending of documents, online signing and approval, data uploading and filing, human resource management (personnel basic information, attendance, etc.), book management, fixed assets management, contract management, etc. In particular, the announcement notification function is able to convey enterprise documents and notice to each employee very conveniently. As soon as you log into the information system, the system will alert you if you have new information to view. Furthermore, the system administrator can control the sending object of the information and know whether the information is viewed or not. For the function of online signing and approval, even if the leader is on a business trip, it will not affect the examination

and approval of online signing and approval, and it can be seen to which level the examination and approval has been conducted. We can also use SMS platform to achieve group messaging within the enterprise as meeting arrangements and other means of related content.

Engineering project management function module.

It is able to effectively provide various departments of project management with procedures and contents related to preliminary management, bidding management, design management, quality control, progress control, investment control, procurement management, safety management, contract management and information management. It also can automatically store and process all kinds of data in the process of project management, and automatically generate project management monthly report based on accumulated data. Meanwhile, the project management plan, monthly report, construction site photos, important notice of project management and meeting minutes can be uploaded to the database in the enterprise information management system in a timely manner. It enables enterprise managers to timely understand the progress of the project and the implementation of the contract, which brings convenience to the project management work and improves the quality and efficiency of the project management work.

Resource management function module.

Through the platform of information management system, resources and information database can be established to collect basic information and prices of common construction materials and equipment suppliers. Engineering technical specifications and standards, laws and regulations and project management enterprise engineering project management technical documents of operation, etc. can be convenient for employees to check.

## **7. CONSTRUCTION STRATEGIES OF ENTERPRISE INFORMATION MANAGEMENT SYSTEM**

The construction of project management enterprise information management system is inseparable from mature information technology and stable hardware operating environment, and more needs a set of scientific and reasonable organization management system. When establishing enterprise information management system, the author suggests that the enterprise should do the following parts.

### **7.1 Enterprises should accurately position the information management system**

The project management enterprise should establish the information management system of the enterprise, and also determine the requirements, construction mode, system platform and scope of the enterprise information management system construction.

### **7.2 Enterprise leaders should take the lead in promotion and stick to use**

Enterprise leaders should fully recognize the importance of the information management system and take the lead in popularizing and sticking to it, which is crucial to the realization of the information management system. If business leaders take the lead and insist on using it, then the system will be quickly applied. If business leaders don't use it, it can be difficult to generalize. In fact, the application of information management system can greatly improve the

management efficiency of enterprises. For example, the function of office management can be implemented on the network without the restraint of time and space. No matter where the business leaders are traveling, they can go through the network and conduct remote registration and approval with the click of a mouse. In addition, enterprise leaders can realize real-time monitoring of multiple projects through information management system, and timely grasp the implementation of projects.

### **7.3 Compile information management manual and work management process, and establish and improve information management system**

The so-called information management system is the key to ensure the normal operation of the system. Through the establishment of the system, information management can be effectively standardized, the information coding system can be standardized and unified, and scientific, procedural and standardized management can be promoted.

### **7.4 Set up a dedicated system administrator**

It is necessary to set up a full-time system administrator to manage the enterprise information management system. Because the information management system is often based on the Internet, the system administrator needs to have some knowledge of professional computer and be familiar with system integration, software and hardware equipment maintenance, etc. The initial establishment of the information system is also very critical, first of all, to ensure the correct installation and configuration, and to each employee of the enterprise according to the role of the distribution of different rights. According to the regulation of enterprise management, establish all kinds of approval process and so on, and be able to adjust constantly based on the system operation. Data backup should also be done in a timely manner, and the security and operation efficiency of the system should be checked regularly to give necessary guidance to relevant personnel of the enterprise. The system administrator should also be able to propose improvements to the system based on the operation of the information system and the development of enterprise business.

### **7.5 All staff training to improve the awareness of information management**

Before the launch of the informatization management system, it should carry out full staff training and knowledge popularization on the significance of informatization management, basic knowledge and skills, expected effect, etc. through various forms such as training classes, which to help the staff form a consensus about the construction of informatization management system as soon as possible and clear what they should be, also enhance the enthusiasm of employee involvement.

## **8. CONCLUSION**

The level of informatization has become an important symbol to measure the competitiveness, modernization, comprehensive national strength and economic growth of a country or region. Information technology is constantly innovating and developing, and management methods also need to be constantly changing and integrating. If the project management related knowledge can be effectively applied and flexibly applied to the construction of information

system in the actual working process, it is believed that the management method and success rate of China's information system construction will be greatly improved.

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