INTEGRATED MANAGEMENT OF THE CONSTRUCTION PROJECT DURING THE BUILDING PHASE

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Abstract: Traditional project management focused on one or a certain management functions separately during the building phase of the project, not systematic enough among management functions to ensure the uniformity of the project management goals. Therefore, it is necessary to establish a multidimensional integrated management system with all functions covered. This paper integrated all project management functions in the building phase (progress, quality, cost, contracts, environment, security, information) into a multidimensional system. Based on this, we put forward an information management model for the building phase in view of the investor’s project management department using Visual FoxPro as the development tool. This mode regards project management as an organic system and can process all dynamic information of all functions comprehensively. And the system can control the building process systematically and set forth the idea of integrated management of the construction project during the building phase by means of the computer simulation.

Keywords: building phase; integrated management; information system; Visual FoxPro

1 Introduction

Construction project is the combination of research, development, construction and operation. Since the beginning of the 1980s, large, super-large, complex, high-tech construction projects have increased, and continuously enhance the scientific and technological content. They more and more become investments which need integrated control. At the same time, the mission range of construction project management has greatly expanded, as the increasing requirement of the coordination of construction projects, the environment and sustainable development, as well as the changes between clients’ role, client’s requirement and contractor’s role (Yao 2000).

Clients, contractors, project managers often have to participate in the management of the project, which has urged the integrated management for the project responsibilities, the duration of the mission, and the stability of organizations. Hence, it has been brought forward that the integrated management system of construction project supports the various parties involved in the entire project for mutual communication, full exchange of information and supervision.

2 The Research on The Integrated Management During The Building Phase

The building phase of construction project is the most concentrated period of funds, resources and participants. It is essential to integrate the project management functions in the building phase effectively, optimizing the realization of project objectives and the development of late-operation.

2.1 The concept of the integrated management during the building phase

The integrated management of the construction project during the building phase is targeted to the project's building phase and plan, organize, guide and control project efficiently through a temporary special soft organization, and achieve the purpose of the organic integration of management functions during the building phase. It will achieve comprehensive coordination and optimization of dynamic management and project objectives during the building phase, thereby enabling the implementation of the project in the best operating condition in order to produce the optimal results in a relatively short period of time.
2.2 The research on the integrated management model during the building phase

There are three modes of general contracting ruled by “Construction Laws”: the general contract of the entire process, the single overall contract, and the multiple general contracts. There are four modes of general contracting available internationally: EPC, the general management contract, the general design contract, and the general construction contract (PMI 2000). We recommend using the single overall contract management model during the building phase, which is advocated by the “Construction Law” and international recognized. It uses total design contract and professional design subcontracting system, and total construction contract and professional construction subcontracting system. This model can be more convenient for integrated optimization management. The integrated project management model will dynamically contact all work in the whole process of building and optimize them mutually. It also can reduce the cost in the entire process of construction for greater savings in construction investment and greatly increase the control capabilities of funds.

2.3 The integration of seven management functions during the building phase

In order to improve the management of building phase in modern construction project, it is required to build a multidimensional management system with all management functions and integrated control. The key is to capture various elements (project management functions) in the integrated system. The seven major management functions of construction projects during the building phase are progress management, cost management, quality management, contract management, environmental management, occupational safety management, information management, as shown in figure 1.

Figure 1 Seven Major Management Functions of The Building Phase

(1) The integrated management of seven management functions

1) The premises of information integration of management functions

The information integration is the key of integrated management of the construction project. In order to achieve the information integration, information identification and systematic code is the prerequisite (Cheng 2000).

Identification of Information Construction project information should be classified and unified in accordance with the classification principles of project information. When a new piece of project information is brought to the project department, information manager should be able to identify the information and extract its elements efficiently, for example, type of documents, index of information, timestamp of access, deadline of feedback and etc. These are all information elements of constructing integrated list, which equivalent to the information index. In the integrated system which will be established afterward, these information elements are the approach and base of query. Therefore, identifying and extracting information elements are essential parts of the proposed system.

Unified Coding of Information It’s the key of solving the Information Isolated Island problem to establish unified coding system of project information. With this system, the communication and exchange of information could be truly realized, and then the integration of information could be realized.

Some countries are carrying out the information integration of the community and international construction projects, for the purpose of establishing a construction information classification system (CICS) as the information center during the lifetime of project. Nowadays, many countries have begun to use these
systems, for example, a unified system has already been used in North America, but there are still no unified standards in China (Gu 2002). The coding principle of this paper is on the basis of “Beijing construction information management” and the actual coding method in construction, to explain the management ideas and intentions of project integration.

2) Practical information coding in construction projects

In practice, many projects have been using the company name or the abbreviation of the project name as the logo of information, such as: The National Opera of China can be expressed as NOC. The information should be classified according to its type, such as designer, contractor, and client. For example, the coded information of receipt can be in following forms as Receipt-Design-001, Receipt-Contractor-001, and Receipt-Client-001.

(2) Implementation of information integration of management functions

The information integration of management functions is to contain all types of unified coded information in one system. In this integrated system, all types of information are associated, so that all relevant information of a particular node can be found and retrieved efficiently

1) Establishing information base

With the help of database system, an information base can be established, which contains all project information. The information of seven major management functions, which is coded in accordance with the unified coding scheme, is the majority content of the database.

2) Linking information

Related information has to be established a logic link. For example, the logic link between the scheduled and actual progress, sending and receiving time, and so on.

3) Linking information base

Related information base also has to be established a logic link, for example, the logic link between key words, catalogues, index, and etc.

4) Information query function

The query of information is an important part of the proposed integrated system. The query function has to be easy to construct, and the result has to be comprehensive and convenient to export.

5) Prompt

When the system is aware the work to be completed (for example, in three days before the planned completion time), it will prompt the manager in advance for project completion on time.

6) Modification of Information

The modification of information should be simple, efficient, and not affect the established logic links.

7) Security

The system has to implement security measures to protect saving and querying information stored in the database. Only project manager can enter the system. Some important data must have double password protection.

3 The R&D of The Integrated Management System

3.1 The review of current approach of construction project integrated management

Since the 1970s, a lot of researches have been made on project management information systems in domestic and foreign countries. And many information systems software (package) have been developed which are in the form of subsystems. In recent years, many people have studied the relationship between project management subsystems, and attempt to establish a link between the various interfaces of subsystems to build an integrated management system. However, many researches don’t explain the complex process and information processing in detail. Some combination of subsystems also called as “integrated system”, but they are not strictly integrated system (Chen 2005).

As the laggard operational management and production methods, incompatible technical support, and the weak foundation of application, there are still many problems in informationization of construction industry now, such as the low level of information sharing, slow communication, communication barriers and low efficiency.
3.2 The R&D of the integrated management system on the basis of Visual FoxPro

(1) Database design
Information integration is the basis and the core of the integrated management system which integrates a variety of process by sharing data. Since Visual FoxPro has its own database and, especially, is good at visualization, it is facilitate through friendly interfaces to access vast data that need for long-term storage, and can ensure the consistency, integrity and security of the data to share by all legitimate users.

1) Establishment of tables
Tables are the basic components of database. All information elements should be reflected in them. They are not only the catalogues and index, but the extraction and enrichment of the information. Figure 2 is an illustration of creating a table.

![Example of Creating Table](image)

In practice, the number of tables to be established should be corresponded to the number of information classifications.

2) Logic links between tables
Logic links between tables are the connections of information, and the titles and fields of tables are the approach of logic links. For example, the logic link of “timestamp of access” would allow managers inquire all the information exchanging at the same day; the logic link of “title” would allow managers track and investigate the same incident.

3) Connections between tables and original information documents
Tables are the refining and enrichment of information documents. By means of logic links, it is very convenient to connect the original information documents through tables. This function can be implemented by clicking “Open Database File”.

(2) Design of interfaces

1) Main interface
The integrated management system has a convenient and friendly main interface where all integrated functions can be implemented. When log on the welcoming interface (to be imported password), managers can enter it.

The menu in the main interface lists the main functions of the system: Project Information Query, To Do List, Management of To Do List, Management Functions, Project Management Department and Project Supervision Department. Each function consists of a number of sub-items, some of which contains several secondary items. All classified information of project could be integrated in these items, through which the information could be input and output conveniently. (Due to space limitations, this paper only presents some major operational interfaces.)
2) Query Interface

![Query Interface of The Integrated Management System](image)

Figure 3 Query Interface of The Integrated Management System

Query function is an important part of the integrated management of the proposed system (figure 3). Through logic links of the same fields of project information tables, managers could vaguely query all relevant information, by date, file ID, title and so on, to obtain the necessary ones and also could directly connect to the original document of these information (figure 4).

![Query Function](image)

Figure 4 Query Function

3) The interface of To Do List

To Do List is to improve the interaction between the system and project managers to help them gain dynamic information from the system to ensure the project progress smoothly. It is primarily designed for planning, the work be about to execute, conventional work and so on. For example, before the date when the work to be completed, the system will make a prompt about the time, work and staff that designated in the overall control scheme and weekly and monthly scheme, to avoid mistakes and delay. The specific number of days before the work to be completed can be determined, such as three days (figure 5).

The information of To Do List will be updated automatically every day. Managers could click “To Do List” on the main interface to browse the information.

The interface of Management of To Do List is similar to the one of To Do List.

![The Flow of To Do List](image)

Figure 5 The Flow of To Do List
4) The interface of Management Functions

![Management Functions Interface]

Figure 6 The Interface of Management Functions

There are two query methods implemented in this system. One is the query function mentioned above, and the other is the query and management according to the different classifications and address of documents (figure 6). For example, all relevant information of management functions is stored in the folder of management functions. The information could be searched and edited through clicking “Management Functions” on the main interface.

The folder of management functions contains the information of six major functions of project management (figure 7). All documents are stored in the corresponding subfolders and can be accessed through different paths. The logic links between information of management functions make the integrated management of information truly realized.

![Information of Six Major Management Functions]

Figure 7 Information of Six Major Management Functions

5) The interface of Project Management Department

![Project Management Department Interface]

Figure 8 The Interface of Project Management Department

The function is to gather all information of project management department (figure 8). Logic links between the information also match the ones of other information. It can be implemented by clicking “Project Management Department” on the main interface.
6) The interface of Project Supervision Department

![Interface of Project Supervision Department](image)

Figure 9 The Interface of Project Supervision Department

The function is to gather all information of project supervision department (figure 9), which is similar to Project Management Department. Information can be visited by clicking “Project Supervision Department” on the main interface.

4 Conclusions

The system is a bold attempt for the integrated management of construction project. By use of database management system Visual FoxPro, all relevant information during the process of construction project can be integrated comprehensively. Individual information will be united into an organic system through logic links to implement the management and control of project information and building process.

The system can be realized simply. With large extension of information integration and powerful interaction between computer and human, it is convenient and comprehensive to query and control. The system better realizes the idea of integrated management during the building phase of construction project and managers could complete all information management electronically under the system.

Further research is to achieve the lifetime integrated management of construction projects for expansion and improvement.

References:

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