

# *The Practice of System Management in Construction Engineering based on 3D Building Information Model*

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**Keywords:** 3D Building Information Model; Construction Engineering; System Management;

**Abstract:** With the development of science and technology, people's living standards have gradually improved. People begin to demand higher and higher functions, appearance and comfort of buildings, which leads to more and more complex construction and higher quality requirements. Taking 3D BIM and engineering construction management as the main line, we apply 3D BIM to Engineering management, such as schedule management, quality management, safety management, procurement management. Through business management process analysis and reorganization, 3D BIM is transformed from a single technology application to engineering system management application, which makes 3D BIM appreciate and forms a system management. Through the system management of 3D BIM construction engineering, we will ultimately improve the competitiveness of enterprises and create economic benefits, such as improving the management level of construction engineering, reducing the operating costs and risks of enterprises.

## 1. Introduction

Construction industry is one of the pillar industries of China's national economic development. It has made great contributions to the country's economic construction. China's construction industry has always been a labor-intensive and extensive operation of the industry, such as as as construction efficiency is low, construction costs are high, construction quality is poor. In the actual construction of a project, the inefficiency of management often leads to the quality problems of the project, especially the projects with large investment, many units and long cycle. With the increasing difficulty of project management, quality problems are relatively easy to occur. The poor information transmission is one of the main reasons for the inefficiency of project management, which is the continuous loss of information in the process of transmission. BIM technology has brought profound changes to the whole construction industry, and provided the possibility for the informationization development of the construction industry. BIM technology upgrades the construction technology and optimizes the construction process, which brings great value and benefit to the construction process of the project.

## 2. Technical analysis of BIM

### 2.1 Introduction to BIM technology

BIM is the abbreviation of Building Information Modeling, which was created by Philip G. Bernstein, the vice president of Autodesk in 2002. With the expanding application of BIM, people's understanding of BIM is deepening. So, the definition of BIM is changing constantly. Combining various definitions of BIM by various national institutions and scholars, it can be concluded as follows. BIM is the digital expression of all information on construction project. It is an informationized electronic model of project virtual substitutes. We can think of it as a resource for sharing information. BIM can provide a transparent, repeatable, verifiable and sustainable collaborative environment for the construction process. All participants in the project can communicate and share project information at any time and time point in the whole life cycle of the project, so that the project can be effectively managed.

### 2.2 Application value of BIM technology

BIM technology is a new product and technology of global construction industry in the 21st century. In some developed countries abroad, BIM technology has been widely used in the construction industry. Through BIM technology, the information of construction project is fully shared and non-destructively transmitted in the whole construction process of planning, design, construction, operation and maintenance. In project life cycle management, participants can operate information, model, communicate and cooperate in BIM model through BIM information platform. BIM technology contributes to engineering management, such as quality improvement, cost savings, shortening construction period.

## 3 Engineering information management based on BIM

### 3.1 System framework

The concept of engineering information management based on BIM is the integration of all elements in the life cycle of a building. It is mainly composed of four key elements, including organizational elements, process elements, application elements and integration elements. These four elements are interrelated to form a tetrahedral model, as shown in Figure 1.

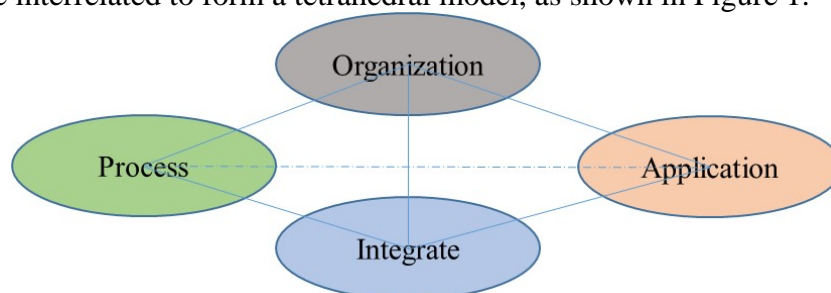


Figure 1: Engineering Information Management System Framework Based on BIM

Organizational elements are members of BLM's organizational management model. There are four main modes of organization management, including project general contracting, Partnering, life-wide integrated management organization and network/virtual organization. According to the organizational structure, construction engineers undertake corresponding responsibilities and tasks. Therefore, the framework of BIM includes the description of the information requirements of

various roles of organizational elements, such as organizational view model, organizational view model, operation authority and acquisition mode.

Application elements are professional software systems that support BIM information creation. With the popularization of computer technology, engineers complete all kinds of affairs through computer information system. For example, architects use CAD software for architectural design, while structural engineers use structural analysis software for structural analysis. Building product information is the core of BIM modeling and management. It is encoded and stored in various formats, usually including unstructured office files, CAD files, multimedia files and structured engineering data.

The process elements are workflow and information flow in construction production. The traditional construction process is separated from each other, which seriously affects the effectiveness and efficiency of engineering construction. BIM technology can be optimized from a global perspective.

Integration elements are the integration of BIM information at different stages for building life cycle. The effective integration and sharing of these information needs the support of BIM information integration platform.

### 3.2 Basic Architecture

The BIM integration framework includes data layer, model layer, network layer and application layer, as shown in Figure 2.

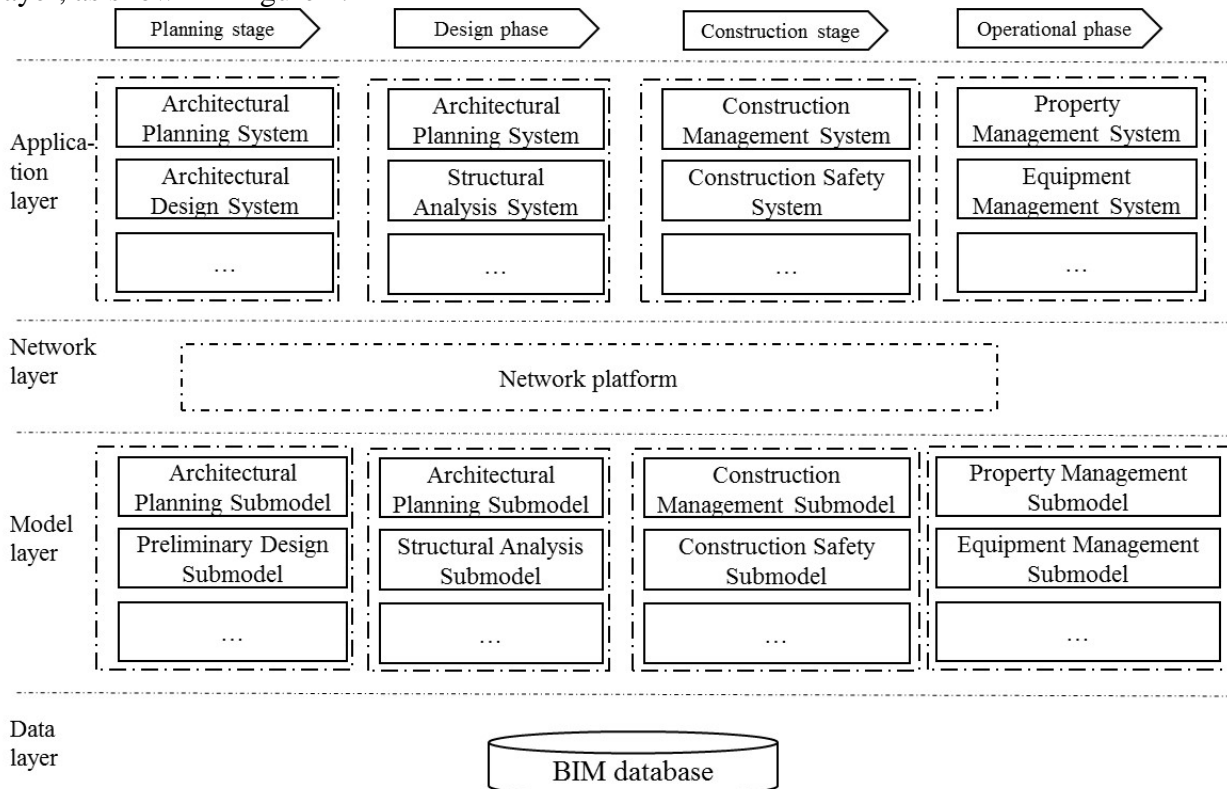


Figure 2: Basic Architecture of BIM

### 4. BIM Information System Management

BIM information management consists of the following steps.

Firstly, determine the organizational model. The organizational model should fully embody the

concept of BIM and give full play to the advantages of BIM information integration. By changing the traditional linear information flow into parallel information flow, we can improve the efficiency of building production.

Secondly, formulate process management rules and regulations. The transmission and exchange of information should be regulated and constrained by rules and regulations, including the creation, modification, maintenance and access of information.

Thirdly, to determine the professional software platform. If we want to make full use of the advantages of information integration, we need to select different professional software for different phases of the building life cycle, such as data standards, data format compatibility, and interaction between professional software.

Fourthly, choose BIM information integration software and hardware platform. BIM information integration platform is the key to realize data integration among heterogeneous systems. BIM information integration platform needs to meet the scale of engineering construction, such as data storage scale, network support, data integration standards support.

## 5. Conclusions

The application of BIM needs systematic management means and methods. New technology will inevitably bring about changes in management. There is no systematic management of construction projects based on 3D BIM. The application depth and breadth of new technology are far from enough. The way to create economic benefits is not the only way, we need to constantly explore more and the best way. 3D BIM system management will have a far-reaching impact on the development of enterprises, which will greatly accelerate the industrialization driven by enterprise informatization.

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