

# Optimization Effect Analysis of Large-scale Building Engineering Based on Building Information Model

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**Abstract:** In recent years, the rapid development of social economy in our country, all kinds of emerging technologies are applied in various industries, which has promoted the industrial upgrading and social progress in an all-round way. In the construction engineering industry, the application of building information model technology is more and more extensive, and this kind of technology has made an important contribution to the management and upgrading of large-scale construction projects. This paper firstly expounds the concept and characteristics of building information model technology, then analyzes the difficult problems faced by the construction management of large-scale construction projects, and finally analyzes the optimization effect of large-scale construction projects based on building information model, hoping to provide reference for the reform and development of related industries.

## 1. Concepts and Characteristics of Architectural Information Model Technology

The construction engineering industry is the foundation of the development of the contemporary society. Under the environment of the transformation of industrialization and the accelerating process of urbanization, the construction scale of the construction project is expanding and the function is becoming stronger and stronger, and at this time the construction and management of the project encounter some difficult problems. Building information model (BIM) technology, as a modern computer technology, Internet technology, virtual simulation technology and other technologies, has a powerful function, and it is of great significance to apply this technology to the construction and management of large-scale building projects.

Building information model, or Building Information Modeling, or BIM, is an advanced technology based on modern computer information technology to construct 3D data model of relevant information by collecting and arranging relevant information data. In the field of construction engineering, the application of BIM technology can present each entity part of the construction project virtually and digitally. Before the concrete construction of the project, the virtual presentation of the project in the computer is carried out by using the 3D digital simulation technology through BIM, and the project task assignment and planning are carried out based on the virtual model[1]. In the process of engineering construction, the model can assist the construction unit to carry out the dynamic management of construction quality, standard and schedule, and ensure that the construction of the project is carried out in an orderly manner. The completion process can be optimized by collecting the relevant dynamic data through the virtual model.

As shown in figure 1, the application of building information model technology, the reform of traditional engineering project construction and management mode, is the practical application process of multi-dimensional information integration technology based on CAD technology. In general, BIM technology can improve the efficiency and quality of construction engineering, and reduce the construction cost by optimizing the construction process and strengthening the process management, which will help the construction project to realize the whole process management really.



Figure 1 Application characteristics of BIM technology

## 2. Difficulties Encountered in the Management of Large-Scale Construction Projects

### 2.1. The Engineering Design is Heavy and Time-Consuming

The most important thing in the preparation stage of large-scale projects is the design of the project and the verification of the drawings. After the comprehensive investigation of the project site and the comprehensive understanding of the engineering function requirements of the owner, the large-scale project often needs to consume a lot of manpower and time to carry out the engineering design. Engineering design needs to collect a lot of information, calculate a lot of data, and based on the design drawings for feasibility simulation calculation. This is a complex process, and large-scale engineering projects are particularly serious, once a link problems, will seriously affect the quality of the project and multiple interests[2].

The emergence and application of BIM technology can use its mature information model to process all kinds of data, and use 3D simulation technology to carry out engineering design, which can simplify the design and calculation process. as shown in figure 2, the building 3d model based on bim can support the design team to simulate the engineering feasibility, which is important for improving the design efficiency, accuracy, rationality, and can greatly shorten the design cycle and reduce the cost consumption.



Figure 2 Three-dimensional model of building engineering based on BIM technology

### 2.2. Resources and Information are Complex and Difficult to Manage

With the deepening of the process of urbanization, the construction projects in many regions of our country are gradually showing a trend of scale and complexity. Such projects, whether in the preparatory stage, the construction stage or the completion and acceptance stage, involve a lot of resources and information. From the construction point of view, a variety of construction materials, construction machinery categories, the number of many, the need for reasonable distribution and scheduling in different construction stages; the number of construction personnel, scheduling and

management is difficult; each construction stage of the design drawing check, actual construction supervision and construction acceptance links, heavy workload. These problems are mainly reflected in the high difficulty of management, and a little error may affect the progress, quality and cost of the project.

In response to this difficult problem, BIM, as an information data-based system, can carry out information management of all the resources involved in the project, and then allocate and manage it reasonably through the virtual model. Based on the system, the resources, personnel and information involved in the project can be organically integrated to implement the scientific management mechanism[3].

### **2.3. The Process Supervision Mechanism is Imperfect and Its Effect Is Poor**

In the process of formal construction of traditional large-scale construction projects, the management of engineering quality and construction personnel standard basically adopts the way of personnel inspection, even if the video surveillance system is added, it is still unable to effectively supervise and assess the construction quality and personnel behavior of related projects. For example, in the construction process of large-scale engineering projects, there are often a number of projects carried out synchronously, and the scheduling of materials, stacking, equipment scheduling, operation, personnel arrangement and operation, it is easy to conflict because of unreasonable arrangement, and even cause safety accidents.

In view of the construction process supervision and management problem of large-scale engineering projects, the construction information model technology can simulate the construction process based on the design model, and on this basis, the materials, equipment and construction personnel can be reasonably scheduled to improve the efficiency and reduce the cost on the basis of ensuring the construction quality and safety.

## **3. Analysis on Optimization Effect of Large-scale Building Engineering Based on Building Information Model**

### **3.1. Design Deepening Phase**

Design as the primary task of the construction project is to determine the whole project construction mode pendant. The application of building information model technology and the design stage of large-scale building engineering can comprehensively raise the feasibility and take into account the economy. For example, the design of large-scale construction projects requires the participation of professionals in relevant fields, and if the communication is not in place during the period, it may lead to the problem that the design drawings are not intuitive. And the application of BIM technology, designers can directly use the relevant software for drawing design ,3D model not only makes the design drawings more intuitive, but also will avoid some hidden problems and reduce the risk of design. At the same time, the information model can share online, support multi-distance communication and check, and provide important guidance for the construction site[4].

### **3.2. Construction Phase**

Large-scale construction projects have the characteristics of high complexity, long construction period and wide range of influence, which will be affected by factors from many fields inside and outside, including weather, surrounding environment, personnel professional quality, funds and so on. That is to say, in the actual construction, there may be a situation where the actual situation conflicts with the plan, plus the management of the construction process, if there is a problem, it may lead to the delay of the construction period. And through the three-dimensional model established by BIM technology, we can do a good job of dynamic management on the basis of construction drawings and planning system, especially can establish dynamic association between CAD drawings and operation surface, deal with all kinds of emergencies in time, and do a good job of schedule management. As shown in Table 1, the progress plan can be made for the equipment application of the related engineering construction link through the BIM database, and the table can

also be used as the basis for the evaluation of the construction progress.

Table 1 Schedule of Construction Schedule of Related Equipments in the Construction Stage of the Main Building Pipe Pile Foundation

Construction of pile foundation in dormitory building and complex building	21d	10 August 2018	30 August 2018
Construction of No.1 Pile Machine	16d	10 August 2018	25 August 2018
Construction of 1-axis-13-axis/A-axis-N-axis pipe pile	8d	10 August 2018	17 August 2018
Construction of 14-axis-23-axis/A-axis-N-axis pipe pile	8d	18 August 2018	25 August 2018
Construction of No.2 Pile Machine	16d	10 August 2018	25 August 2018
Construction of 1-axis-13-axis/N-axis-Y-axis pipe pile	8d	10 August 2018	17 August 2018
Construction of 14-axis-28-axis/N-axis-Y-axis pipe pile	8d	18 August 2018	25 August 2018

The quality of large-scale construction projects is related to the quality of engineering materials, the professional quality of construction personnel, the level of technology and other factors. BIM technology can let the project leaders and construction personnel share, report and analyze the work information through the system terminal, so that the person in charge can supervise the work effect and construction quality of the construction personnel.[5]. At the same time, the construction personnel can intuitively understand the engineering plan and quality requirements through the system terminal, receive the updated design model in time, and reduce the communication cost. In addition, supervision and safety personnel can work on the problems found in real-time evidence, upload, and into the management system to analyze and solve the problem in a timely manner.

### 3.3. Completion Acceptance Stage

After applying the BIM technology to the large-scale construction project, in the stage of project completion acceptance, the relevant technicians can directly check the quality of the project completion against the three-dimensional virtual model, which can improve the accuracy and acceptance efficiency. At the same time, the project cost, financial accounting personnel can use the system perfect information data to support the project accounting. The BIM database can extract a variety of data quickly, and can be calculated according to the actual requirements of the data information demanders, and after finding the problem, it can also obtain the corresponding data for cause analysis, timely responsibility and accountability. It can be said that the application of BIM technology can reduce the risk of cost control of large-scale construction projects and improve the level of engineering construction and management.

## 4. Conclusion

To sum up, under the environment of continuous development of modern computer technology and information technology, advanced technologies such as building information model have gradually entered into the production of contemporary society. In view of the problems of large construction difficulty, long period and high management difficulty in large-scale construction projects, the building information model can rely on three-dimensional virtual model technology to improve the design level of the project in an all-round way, shorten the design period and reduce the design difficulty and cost. At the same time, the application of this technology is of great help to the construction process management and completion acceptance of large-scale construction projects, which can improve the quality and level of engineering construction in an all-round way, reduce the wastage, and then reduce the risk of project cost control. Therefore, it is necessary for the construction engineering industry of our country to study the application of the building information model in depth, and to continuously improve the level of engineering construction management.

## References

- [1] Zhang, Zuoping. BIM technology application of engineering cost management in intelligent building. *China Strategic Emerging Industries*, no. 2, pp. 38,40, 2020.
- [2] Zhao, Qingbin. Application analysis of BIM technology in construction engineering management. *Urban Construction*, no. 12, pp. 159, 2019.
- [3] Wang, Junping., Chen, Yingjie., Wei, Jinghui. Application of BIM technology in cost control of construction engineering. *Value Engineering*, vol. 38, no. 35, pp. 230-232, 2019.
- [4] Ling, Yefeng. Application analysis of BIM technology in construction engineering management. *Building Materials and Decoration*, no. 35, pp. 135-136, 2019.
- [5] Li, Mingyong. Application analysis of BIM technology in construction engineering management. *Decorate the world* , no. 22, pp. 54, 2019.