

# Application of BIM technology in risk management of project cost budget

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**Abstract:** Nowadays, China's social economy is booming day by day, and people's living standards have also been significantly improved, and the requirements for the quality of construction projects are getting higher and higher. In the traditional cost management mode and information communication method, due to the influence of the project construction period, construction data, participating units and other factors, the project cost management mode becomes a mere formality, and some large-scale government construction projects even fail, so BIM software is used in the project cost management. The development and application of BIM information model technology promotes the development of the construction industry. The rational application of BIM Technology in construction project management has opened up a new field of project cost management and investment control. Therefore, it is necessary to conduct in-depth research on BIM Technology and understand the use of BIM Technology. Based on the analysis of visual management of building information model, this paper discusses and analyzes the relevant application of BIM Technology in construction project cost control management, combines BIM Technology with project cost, and discusses the advantages and implementation process of Bim in each stage of the project.

## 1. Introduction

Nowadays, my country's society and economy are becoming increasingly prosperous, people's living standards have also been significantly improved, and the quality requirements for construction projects are getting higher and higher. The whole process control of construction engineering cost management is closely related to the call of massive engineering basic data. The timeliness and accuracy of data application need to continuously improve the automation, information and intelligent process of engineering basic data, so as to provide in the whole process of management and control. Various types of information foundation to support decision-making, save process control time and economic costs, efficiently supervise project implementation, and achieve real-time verification and comparison [1]. In order to solve this situation, it is necessary to make further breakthrough and development in engineering cost management [2]. The application of BIM technology can greatly reduce the project cost risk, provide accurate data reference for related management work, and also provide some reference experience for the daily operation of construction enterprises [3].

The construction industry is one of the ancient industries in the world and plays an important role in the history of world development. Since the reform and opening up, China has continuously launched relevant policies to promote the development of the construction industry, and the construction industry has also developed to its peak. In China, the informatization degree of electronic industry, manufacturing industry and other industries has been at a high level. The production efficiency of these industries has been significantly improved by the model generated by information technology, but the informatization of construction industry is still in its infancy [4]. In developed countries such as Europe and America, the informatization of construction industry started earlier, and the application of information technology in construction enterprises has become more common, mainly reflected in the extensive use of Building Information Modeling. At present, various costs are increasing with the development of economy. It is of great practical significance to study how to use modern science and technology to effectively and scientifically control the construction project cost, control the cost and increase the project investment income [5].

## **2. Basic characteristics of BIM**

### **2.1. Visualization**

Visualization is visible. At present, the main construction drawings of construction projects are plane, and various component information is drawn on the drawings in the form of lines, which requires the construction personnel to imagine by themselves. Simple drawings and lines are easy for construction personnel to understand. However, in recent years, buildings have different forms, complex shapes and strange buildings emerge one after another. It is inevitable to have one kind of thinking deviation by relying on people's brain to imagine [6]. BIM technology can improve the effectiveness of project cost management, realize refined management, and improve the efficiency of information resource sharing. Therefore, the application of BIM technology to the construction of engineering projects is to take advantage of one of the characteristics-visualization. The component information of traditional engineering projects is established through software to establish a visual three-dimensional model, and BIM is visualized in all stages of engineering construction. It can be visualized in the state of the project, such as project decision-making, design, construction, and even the use stage.

### **2.2. Harmony**

This aspect is the key content of the construction industry. Whether it is the construction unit, the owner or the design unit, they are doing the work of coordination and cooperation all the time. In the design stage of engineering projects, the lack of communication among designers of various disciplines leads to problems such as collisions between components in the actual construction process, which can be solved by the coordination of BIM technology. BIM software can input the information of drawing components into BIM software after the design drawings are plotted, and the software will check the collisions and generate coordination reports, so that designers of various disciplines can find the collisions in time and control them beforehand, instead of taking remedial measures after the discovery, thus greatly saving time and capital costs. This technology originated in the manufacturing industry and initially integrated the concept of computer integrated manufacturing system integrating CAD and cam [7].

### **2.3. Analogy**

Simulation can not only simulate the design of building models, but also simulate things that cannot be operated in the real world. During the construction process of a building, there are different management methods for different majors and personnel, in which the information is very complicated and it is difficult to share information resources. The core of BIM technology is information. Actually, the basic elements of BIM model are composed of a single object, and specific parameters are used to control the cost information, geometric information, physical characteristics and construction requirements of the object. Nowadays, in construction projects, the phenomenon of "three overruns" occurs frequently, and the pollution to the environment is becoming more and more serious. The occurrence of these problems largely depends on the lack of the concept of refined management in enterprises, only the progress of the project itself, and insufficient grasp of the details in the project construction. Therefore, if you want to maximize the benefits of investment, you must implement refined management, implement this management model to each stage of project construction, and improve the cost awareness of the project unit. In addition, collect relevant data information, use spatial topological relations and 3D Boolean operations to organize the data, and build a digital model. Based on BIM technology, construct a project operation system and adjust relevant information in a timely manner. Relevant and useful information is obtained through simulation, which provides designers with a better design basis and avoids various responsible problems that arise after the building is completed.

### **3. Application of BIM technology in cost management**

#### **3.1. Project design stage**

The calculation amount can be calculated by BIM software, and it can be automatically generated without human intervention. After being generated, various economic index reports can be uploaded to the platform, so that developers can have a preliminary understanding and control of the overall project cost. BIM technology communication is relatively simple, and relevant staff can quickly and accurately select and call the required engineering data and information. All the information in BIM database is dynamic. If the construction changes or the market price changes during the project construction, relevant staff can adjust the corresponding data in BIM database in time, and can also share the updated data [8]. In addition, the project cost management personnel can also store all the cost data of the whole life cycle of the project in BIM system, such as project planning, project design, bidding, project construction, material procurement, project completion acceptance, etc. If the project cost information feedback is not timely or the relevant data are insufficient, the project can only be analyzed and studied according to similar projects as a reference. There is often a difference between the actual investment and the project cost. The decision-making stage plays an extremely important role in the whole life cycle. According to relevant research, the decision-making stage has a great impact on the project cost. It can be seen that the decision-making stage plays a decisive role in whether the project value requirements can be realized.

#### **3.2. Bidding stage**

In this stage, BIM software has a valuation model of bidding quantities, which can strictly control and calculate the valuation of quantities, and calculate in detail according to the list quantity and valuation rules, so as to ensure the accuracy of quantities and specific valuation, and generate bidding documents after obtaining specific data. Tender offer is generally calculated separately by specialty, and then unified. The import of engineering orders of cost software in BIM technology can easily integrate the calculation results of various disciplines, and finally form a complete tender. In the case of using BIM for cost management, the tenderer can directly extract all the engineering information of the project through the BIM model provided by the designer, effectively avoid missing items, and obtain the price preparation base price closest to the market from the software. At this stage, the most complicated and most important work is the calculation of engineering quantities, especially now that the volume of construction projects is large, and some are particularly complicated, this stage will consume a lot of time and energy. If the bidding time is tight, the accuracy and timeliness of traditional manual calculation cannot be guaranteed at all [9]. During the bidding process, the construction unit should suspend quotas in accordance with the bidding documents, and at the same time, calculate the number of cooperation based on its own construction level and technology, and complete the construction valuation. The content of 3D calculation software can complete the quota and output results under the quota situation of all regions in our country.

#### **3.3. Work progress**

Calculating the progress of fund allocation is an effective way to control the cost, so the calculation of project progress becomes a specific reference to support the calculation of fund allocation. The current project settlement methods in China mainly include monthly settlement, one-time settlement after completion and subsection settlement. At present, the monthly settlement method is mostly adopted in Jian 'an project, and the construction unit advances part of the project funds in the middle of the month and settles them at the end of the month according to the actual statistical progress of the completed project. Because the cost management data based on traditional 2D drawings are scattered, it is difficult to split and summarize the quantities. Make rational use of BIM technology, give full play to its visibility, coordination and simulation, improve construction efficiency, reduce cost waste and avoid rework and reconstruction. The contents of the design

drawings are reflected in the BIM database, and various information of the construction project can be output in the form of divisional and subdivisional works according to different time. The quota design is reflected in the design stage to control the project price. By using BIM Technology, the contents of various disciplines can be integrated in the process of design disclosure and drawing joint review; When reviewing the drawings, different units can start from different angles and use the visualization, collision inspection and other functions of BIM Technology to find the errors in the drawings in time, so as to reduce the design errors [10]. In the process of final settlement, the project software should be checked, the specific project verification indicators should be set according to the characteristics of the software, the problems existing in the specific work should be summarized, the details of the construction project should be controlled, and the three-dimensional model should be established in this way. BIM Technology application process is shown in Figure 1.

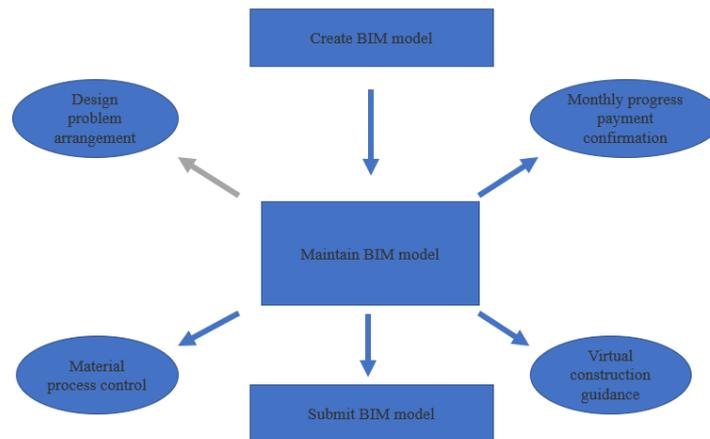


Figure 1 BIM technology application process

#### 4. Conclusions

In order to realize its economic benefits during the construction of construction projects, the management and control of project costs should be strengthened. Under the current economic situation and management mode, the construction industry has become a low-profit industry. To survive in the market, it is necessary to adopt scientific methods to control costs. In recent years, the construction industry has continuously recognized BIM technology, and related software based on BIM technology has been continuously updated and developed, and the construction industry has also paid more and more attention to it. In view of the fact that the application of BIM in my country has not yet been popularized, the "distributed" method is finally adopted to establish a BIM cost model based on the two-dimensional design drawing to help complete the project cost management. There are many problems in the traditional construction project cost control management, which can not realize the effective control of the project cost at all. The application of BIM building information model in project cost management provides technical support for the whole process control of project cost. Using BIM Technology, we can not only deal with the problems of building information data in time, but also calculate the specific values in the construction project, so as to improve the efficiency of project cost management and control the project cost.

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