

# Research on the application of BIM technology in the whole process cost management of construction projects

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**Abstract.** This paper conducts an in-depth study on the application of BIM technology in the whole process cost management of construction projects. Firstly, the concept and characteristics of BIM technology and the application of BIM technology in construction engineering are introduced. Then the application of BIM technology in the whole process cost management of construction projects is analyzed from three stages: design, construction and operation. The research results show that the application of BIM technology in the whole process cost management of construction projects has greater advantages, which can improve project efficiency, reduce costs and improve the quality of construction projects.

**Keywords:** BIM technology; the whole process of construction engineering; cost management; application research.

## 1. Introduction

Construction engineering occupies an important position in modern society, and the cost management of construction projects has become an issue that cannot be ignored. There are many shortcomings in the traditional way of cost management of construction projects, such as difficulties in achieving accurate statistics of project quantities, difficulties in project changes and ineffective cost control. Therefore, it is necessary to introduce new technologies and methods on how to improve the efficiency and quality of construction cost management. In this context, BIM technology, as an emerging digital technology, is widely used in the whole process of construction projects, bringing new opportunities and challenges for construction project cost management. The purpose of this paper is to explore the application of BIM technology in the whole process of cost management of construction projects, in order to improve the efficiency and quality of cost management of construction projects.

## 2. Overview of BIM technology

### 2.1 Definition and characteristics of BIM technology

BIM (Building Information Modeling) is a technology that supports building design, construction and operation through digital building information. It is a 3D model-based building information management method that involves almost all aspects of construction, including building geometric information, spatial relationships, materials, quantity, time, cost and sustainability, etc. BIM technology makes use of the advanced technologies such as computer-aided design (CAD) and computer-aided manufacturing (CAM), but focuses more on the management and sharing of building information, and is a new way of managing construction projects[1].

### 2.2 Application of BIM technology in construction engineering

BIM technology is widely used in construction projects. It can provide important assistance in the design, construction and operation phases, thus improving the efficiency and accuracy of construction projects. In the design phase, BIM technology can help designers create digital building models to simulate and analyse the geometry, materials and construction of buildings to better assess the feasibility of design solutions. During the construction phase, BIM technology can help architects and engineers with schedule management and cost control to ensure that projects are

completed on time and within budget. During the operational phase, BIM technology can help architects and engineers better manage building equipment and assets, and anticipate and resolve potential problems. In conclusion, the application of BIM technology in construction projects has great potential to improve the efficiency and quality of the entire construction project[2].

### **3. Overview of the whole process cost management of construction projects**

#### **3.1 Definition and significance of whole-process cost management of construction projects**

The whole process cost management of construction projects refers to the management process of maximizing the economic benefits of the whole life cycle of construction projects by conducting comprehensive, accurate and reliable calculation, accounting and control of the investment in construction projects through scientific and systematic methods at all stages of planning, design, construction, acceptance, delivery and operation of construction projects. The significance of whole process cost management of construction projects is that it can maximise the economic benefits of construction projects from planning to operation, ensure the rationality and effectiveness of investment, effectively control the costs of construction projects and improve the quality and efficiency of construction projects.

#### **3.2 The main contents of the whole process cost management of construction projects**

The main contents of the whole process cost management of construction projects include the following aspects:

I . budgeting of construction projects: according to the needs of the project and the project plan, the construction project budget of the project is formulated, and the funding of the project is co-ordinated and planned.

II . Preparation of bill of quantities: according to the engineering design documents, accounting for various quantities of works and the preparation of bill of quantities.

III . Cost control: During the construction stage of the construction project, the cost of the construction project is controlled by calculating, accounting and controlling the various costs during the construction process.

IV . Cost accounting: accounting for the costs of construction projects, including bill of quantities accounting, project change accounting, progress payment accounting, etc.

V . Cost analysis: analyse the costs of construction projects, find out the composition of costs, assess the cost risks and provide the basis for subsequent decisions.

VI . Project decision support: through the analysis and prediction of the whole process cost of construction projects, provide data and decision support for project decision.

### **4. The application of BIM technology in construction project cost management**

In the cost management of construction projects, the application of BIM technology can effectively realize the cost control and optimization of the project. Specifically, the application of BIM technology in construction project cost management is mainly divided into three stages: design stage, construction stage and operation stage.

#### **4.1 Design stage**

In the design stage, BIM technology can help architects and designers carry out three-dimensional modelling and simulation of architectural design, providing more accurate data for subsequent construction and operation. At the same time, BIM technology also enables automated bill of quantities and cost estimation, reducing the large amount of manual work and human errors in traditional cost management and improving the accuracy and reliability of data.

#### 4.1.1 Modelling and simulation

In the design phase, BIM technology can help architects and designers to carry out 3D modelling and simulation of buildings, making design solutions more intuitive and visualised. BIM technology not only presents the physical form of a building, but also allows for accurate simulation and optimisation of the building's internal structure, equipment and piping. This digital modelling approach not only improves design efficiency, but also avoids errors and omissions in traditional cost management, reducing the cost and risk of construction projects[3].

#### 4.1.2 Bill of quantity and cost estimation

In the design phase, BIM technology can also achieve automated bill of quantities and cost estimation. Based on a digital model, BIM technology can automatically generate a list of quantities for each material, equipment and labour, and make cost estimates based on market prices and construction quantities. This automated approach not only improves efficiency, but also avoids a lot of manual work and human error in traditional cost management, reducing the uncertainty and unreliability of data. Through the application of BIM technology, cost control and optimisation of construction projects becomes much easier and more feasible.

### 4.2 Construction Phase

#### 4.2.1 Progress management

BIM technology plays an important role in the progress management of the construction phase. In the BIM model, all components are defined as objects and given accurate location and time information, enabling construction progress to be tracked in real time in the BIM model. By integrating the schedule with the BIM model, it is possible to update the schedule in real time during construction, as well as checking that the construction site is progressing according to plan.

In addition, BIM technology can also visualise progress information, enabling construction managers to understand construction progress more intuitively, identify and resolve progress problems in a timely manner and avoid construction delays. At the same time, BIM technology can also check construction quality and progress through 3D scanning and simulation of the construction site, so as to better manage the construction progress[4].

#### 4.2.2 Cost control

BIM technology also plays an important role in cost control during the construction phase, as the BIM model contains geometric and attribute information of all components, which can easily generate various diagrams, reports and lists required during the construction process, such as the component quantity list, material list, equipment list, etc.

By integrating the BIM model with cost control software, cost control can be carried out more accurately. During construction, BIM technology can monitor the use of construction materials and equipment in real time, as well as track workers' working hours, and integrate and analyse this data with cost control software to identify cost deviations and make cost adjustments in a timely manner. In addition, BIM technology can help identify and resolve potential cost issues during construction, thereby reducing waste and costs[5].

## 5. Conclusions

Through the research of this paper, we can see that the application of BIM technology in the whole process cost management of construction projects has great potential and advantages. BIM technology can bring higher efficiency, lower cost and better quality to construction projects, and can also provide guarantee for the sustainable development of construction projects. It is believed that through continuous efforts and exploration, the application of BIM technology in the whole process of cost management of construction projects will be more widely and deeply promoted and applied.

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