

# Probe into the Practice of BIM in Engineering Cost Management

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**Abstract:** Taking the practice of BIM in engineering cost management as the research object, this paper firstly gives a brief overview of BIM and analyses its hotspots, then discusses the practical advantages of BIM technology in construction cost management. Finally, based on the analysis of the existing problems in construction cost management, the paper focuses on the practice of BIM in engineering cost management for reference.

## 1. Introduction

Cost management runs through the construction of construction projects all the time. However, with the construction structure becoming more and more complex, the traditional cost management has been difficult to meet the actual construction requirements. Therefore, it is necessary to discuss and analyze the practice of BIM in engineering cost management, which has important practical significance for promoting the application of BIM technology in China's construction projects and promoting the development of China's construction industry.

## 2. Overview and Characteristic Analysis of BIM Technology

BIM is called "Building Information Modeling" in English. This concept was first put forward by Professor Chuck Eastman in 1975. The main purpose of BIM is to visualize the design of building construction and effectively improve the efficiency of building construction. Until 2002, with the successful development of BIM's three-dimensional software, it effectively promoted the implementation and application of BIM technology in the construction industry and other industries. BIM runs through the whole life cycle of architecture from the initial design to the completion. It embodies all kinds of physical parameters and functional characteristics of architecture in digital form. With the help of three-dimensional digital technology, it connects the three-dimensional model of architecture with geometric/non-geometric information of architecture, and effectively realizes the sharing of architectural information resources.

Nowadays, with the application of BIM technology becoming more and more mature, its technical characteristics are gradually highlighted, which can be divided into the following points: First, visualization is not only a characteristic of BIM technology, but also a core function of BIM technology. It effectively connects different specialties such as architectural structure, cost, electromechanical and so on through three-dimensional simulation form, so as to facilitate workers. According to the location relationship of building model components, the staff carries out problem analysis and simulation exercises in advance, so as to avoid finding problems in the later construction period and increase the construction cost. The second is the sharing characteristic. When BIM technology is applied in practice, it mainly relies on the information base and sharing function. BIM model stores all kinds of building information in a unified classification and puts it on a public platform, which facilitates the designers in charge of different professions to communicate with each other on the same platform and realizes the sharing of information resources. In addition, for different BIM technology software, it can also achieve information integration, exchange and sharing between BIM software based on IFC standards, effectively improve the efficiency of building information

model construction. Third, coordination, in the implementation of construction projects, different building participants can also rely on building information model to coordinate management, especially for specific professional design content, with the help of BIM model, even non-professional personnel can communicate and coordinate with designers without barriers, which has an important impact on improving the efficiency of building construction. Fourthly, simulation of construction is also a major application feature of BIM technology. Especially in determining major construction schemes, the staff can use the built BIM model to carry out dynamic construction simulation of specific construction sites, so that they can anticipate some problems that may exist in the implementation of specific construction in advance and effectively guarantee the good quality of major construction schemes. The application results, such as the dynamic simulation function of BIM technology, can realize thermal energy conduction simulation, emergency evacuation simulation, daylight simulation and so on, which is of great significance to the improvement of construction quality and efficiency.

### **3. Practical Advantages of BIM Technology in Construction Cost Management**

The construction cost management is an important part of the construction process. The application of BIM technology in the construction cost management process has the following advantages:

First, it can effectively improve the accuracy of engineering measurement. Engineering measurement is the basis of cost management. With the help of BIM technology, it can display the parameters information of various parts of construction project in digital form. It is more conducive to achieving unified calculation, improving the accuracy of calculation and promoting the smooth and smooth progress of cost management. At the same time, through the application of BIM technology, it can also realize the sharing and exchange of different professional information and data resources, prevent the duplication of data, which is more conducive to improving the efficiency of resource allocation and reducing the cost.

Secondly, it can promote the level of resource management. In the process of BIM technology, it is a common way to establish three-dimensional building model. Based on the three-dimensional building model, it can effectively improve the management and supervision of the construction activities of architectural engineering design, and flexibly adjust the allocation of funds, personnel, equipment and other resources in combination with the actual architectural design and construction, so as to effectively save the project. Cost management costs, improve the level and efficiency of cost management. In addition, the application of 5D model in BIM related software can also analyze and input the data resources of the whole process based on different stages of the construction process, and make the project cost management more scientific, reasonable and refined by doing a more comprehensive and accurate calculation.

Third, it is conducive to promoting the change of the traditional concept of project cost management. Traditional cost management is mainly based on human resource management, which is inefficient and influenced by uncontrollable factors. It has a serious impact on the improvement of the quality of project cost management. With the popularization of BIM technology, the traditional concept of project cost management has been effectively changed, and more attention has been paid to the integration of information and integrated management thinking, which has a positive impact on the overall level of project cost management. Through the application of BIM technology, it can effectively solve various complex data problems in cost management, improve the efficiency of cost management, provide a strong guarantee for the overall construction quality improvement, but also more in line with the needs of the development of the times.

### **4. Problems Existing in Construction Cost Management**

First of all, in the traditional cost management in engineering measurement, inventory measurement is generally adopted. Although this measurement method provides good support for

cost management, it still has the following shortcomings. First, the precision is insufficient. In the actual use of inventory measurement method, for some special parts of the measurement, through simplified treatment, such as decoration engineering design. If the area of the opening is less than 0.3m<sup>2</sup>, it is not usually calculated. However, if the overall building scale is large and there are too many simplified treatment parts involved, the final measurement accuracy will be seriously affected, which is not conducive to cost management. Second, in the measurement method, for some particularly complex parts of the building structure which are not easy to calculate directly through drawings, such as ceiling, staircase and so on, the bill measurement method will take the way of calculating projected area, which is difficult to reflect the real measurement data, and will have a certain impact on the final cost management. Third, with the continuous development of China's construction industry, the building structure is becoming more and more complex. It is difficult to accurately describe the building characteristics only by the way of inventory measurement, which leads to the inability to achieve an accurate quotation for the building in the actual cost management.

On the other hand, it is difficult to achieve collaborative sharing of engineering information. At present, there are many engineering cost management organizations in our country. There are some differences in specific regulations and accounting standards between different cost management organizations. Moreover, it is difficult to achieve effective communication between organizations, which makes it difficult to achieve collaborative sharing of engineering information resources among organizations. In practice, cost management needs to be carried out. The second processing of relevant engineering data by staff can be applied, which not only seriously affects the efficiency of cost management, but also has a certain impact on the reliability and stability of project cost management.

## **5. BIM's Practice in Engineering Cost**

A construction project has a total area of 4396m<sup>2</sup>, a height of 13.14m, three floors above ground and two floors below ground. Its main structure is a frame structure. Its design service life is 50 years and its anti-seismic and anti-crack strength is 7 degrees. The following is the application of BIM technology in the cost management of the project.

Practical analysis of investment decision-making stage. In the stage of investment decision-making, it is one of the most critical links in project investment decision-making to make a reasonable prediction of the total cost of the project and effectively guarantee the overall economy of the construction project. Traditional engineering cost management is mostly based on a large number of drawings for engineering quantitative analysis, which is easily affected by various uncontrollable factors, and is not conducive to the formulation of the best investment plan. By applying BIM technology to collect similar case references from database and restore relevant information data with the help of three-dimensional simulation computer, investors can adjust and modify the three-dimensional model flexibly in real time according to the actual project scheme, and finally form different scheme models, and complete the calculation of project quantity and total cost. By comparing the schemes, they can choose the most economical and reasonable one. Investment plan. Generally speaking, in the stage of investment decision-making, if BIM is used to assist construction units to compare and select design schemes, with the help of BIM technology, through referring to various historical data, the rapid evaluation of project cost can be realized, and the cost of project investment can be estimated well by analogy method based on similar projects. Effectively improve the accuracy of investment fund estimation.

Practice analysis in design stage. With the rapid development of China's construction technology, China's building structure has become increasingly complex, which greatly increases the difficulty of cost management in the stage of architectural design. It is difficult to meet the actual management needs only by two-dimensional drawings. Through the application of BIM technology, it can realize the transformation of drawings from "two-dimensional" to "three-dimensional". Under the BIM model based on the construction, it is helpful to shorten the distance between the design unit and the construction unit, and more convenient for the design unit to convey the design ideas and ideas to the

construction unit. Construction units can also accurately express their modification opinions according to the actual 3D model, and on this basis, better promote investment estimation and effectively control the final total investment. In addition, BIM technology can also be used to effectively inspect the pipeline collision inside the building, refine the pipeline layout, effectively reduce the difficulty and cost of pipeline layout in engineering construction, and improve the level and quality of cost management.

**Practice analysis in bidding stage.** For the construction units, the traditional bidding needs a lot of manpower and material resources. Cost staff need to do a good job of calculation and audit around the actual amount of work. For example, under the bill pricing mode mentioned above, both bidders and bidders need to calculate repeatedly to determine the final amount of work. For the bidding party, it is also necessary to calculate the amount of work consumed by the quota for bidding, and to formulate a unified form after completing the relevant analysis. In this process, due to the large number of participants, it is easy to have various differences, which seriously affects the accuracy of the calculation results. By using BIM technology, this process can become fast and accurate. Firstly, for the construction units as bidders, BIM technology can be used to do a good job in the retrieval of Engineering information, effectively improve the production level of the bill of quantities, reduce the lack of content or calculation errors, and prevent the occurrence of various disputes. On the other hand, potential bidders can make full use of the data in BIM database to make a comprehensive analysis of bidding planning, bill of quantities, bidding control price, and determine the bidding quotation, so as to formulate corresponding strategies in time until the contract price is determined. Therefore, BIM technology can effectively improve the accuracy of the basic work of both sides and protect the interests of both sides.

**Practice analysis in construction stage.** In the construction stage, by adding two forms of time control and capital control on the basis of BIM building model of gardens, the five-dimensional (BIM5D) project management control is finally formed, which can better guide and supervise the construction of the project. After BIM model simulation construction, it can be specifically implemented in the actual construction, so that it can be launched in advance through simulation construction. Exhibition actual construction may encounter problems, timely preparation, so as to make the project cost more accurate and reliable, but also more conducive to the determination of project funds in different construction stages. On the other hand, in the process of cost management, construction change is one of the important links. Cost change calculation and management after change need to be done well through cost management, which greatly increases the difficulty of cost management. Under the application of BIM technology, it can effectively reduce the amount of project change, even if there is change, it can also simulate the change plan and improve the project after change. The efficiency of quantity and cost increase and decrease calculation promotes the cost to be well controlled in different construction stages.

**Practical analysis of completion acceptance stage.** At this stage, BIM model will contain the whole engineering information, such as the price of construction materials, construction progress, the change of engineering quantity caused by construction changes, etc. These information are generated in the actual construction process, which can effectively reduce the disputes between construction units and construction participants in the completion of engineering quantity. Meanwhile. The complete settlement data in BIM can effectively reduce the cost of completion acceptance.

## **6. Summary**

In summary, BIM technology plays an important role in actual cost management. Therefore, it is necessary for relevant cost managers to pay more attention to the application of BIM technology. Combining with the existing problems in current cost management, we should strengthen the practical application of BIM technology in project cost management, give full play to the value of BIM, and promote the better development of China's construction industry.

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