

Application and Realization of BIM in Construction Engineering Management

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Abstract: With the continuous improvement of scientific and technological level, the construction level of modern construction projects is constantly improving. Informatization technology has been widely used in construction engineering management. In these technologies, BIM has been widely praised by the industry for its visualization, coordination, simulation and optimization. In this context, based on in-depth analysis of BIM technology characteristics, this paper analyses the necessity of BIM application in construction engineering management, and puts forward specific strategies for BIM application and implementation in construction engineering management from aspects of cost estimation, construction site management, reasonable site layout, simulation of construction progress, in order to promote the specific application of BIM in China's construction engineering management.

1. Introduction

1.1 Literature review

Many scholars have studied the application of BIM technology in construction engineering management. Ma Shaoxiong, Li Changning and others took an administrative complex building project in Shishi City as an example. By using the Revit software, BIM model was established, and the drawings auditing and construction scheme optimization were realized. On this basis, the BIM technology is further used for collision inspection, which solves the problem of precise positioning of reserved openings. At the same time, the BIM technology is used for quota collection to realize the fine management of materials (Ma et al, 2016). Qiu Yuqiang pointed out that the application of BIM technology in construction engineering management would help to control the space-time cost and promote the rapid development of the construction industry (Qiu, 017). Meng Hong believes that BMI technology is highly integrated with building information data, which ensures the integrity of information. Timely adjustment of database information can assist decision-making process, improve project quality and control project cost. In the construction phase of the project, BIM technology can control the capital risk and improve the overall construction efficiency (Meng, 2016). Fupeng further pointed out that with the continuous improvement of people's building requirements, modern building structures are becoming increasingly complex and construction management is becoming more difficult. The application level of BIM technology in construction engineering management needs to be further improved. The specific analysis is made from the design and project construction stages (Fu, 2015). Wang Zhiju pointed out that the current application of information technology in the field of construction is at a relatively low level, which can not meet the sustainable development goals of the construction industry. Informatization construction is the focus of follow-up development. The application of BIM technology in the field of construction engineering management urgently needs to be promoted (Wang, 2018). Wang Yujia and others point out that BIM technology can run through the whole life cycle of the building,

realize data sharing among the participants in the project construction, and support the virtual construction of the project. On this basis, the application advantages of BIM technology are introduced, and the importance of BIM technology for management informatization and refinement in the construction process is analyzed from the perspective of management (Wang et al, 2016).

1.2 Purpose of the study

By reviewing the existing literature, it can be found that although there are many studies on BIM technology in the field of construction, the specific application of BIM technology in project management is not much. Occasionally, they are mostly concentrated in a certain stage of project management, such as project cost, cost budget and so on. Generally speaking, the application of BIM technology in construction engineering management is insufficient and lacks overall analysis and guidance at the macro level. Based on this, this paper attempts to analyze the specific application of BIM technology in the whole life cycle of Construction Engineering Management in order to improve the application level of BIM technology in the construction field and promote the development of BIM technology. China's construction project management is informationized and refined.

2. BIM technical characteristics

BIM is the abbreviation of building information model. This technology was first proposed by Autodesk in 2002. It is mainly used in engineering, architecture and other fields. With the characteristics of integrating building information, providing life cycle services for project design, construction and operation, BIM technology has been recognized worldwide (Zuo, 2018). With the help of BIM technology, construction units, design teams and owners can work together to achieve efficiency, reduce project costs and achieve sustainable development. In essence, BIM is a platform for sharing knowledge resources. At different stages of the project, various stakeholders can extract, update and exchange information through BIM.

Specifically, BIM has the following four characteristics:

First, visualization. For the construction industry, the realization of visualization is of great significance. At present, the construction drawings used are only the planar line drawing form of each component, but the actual situation can only be judged by the experience and technology of practitioners. BIM technology enables the past linear components to be visually displayed in three-dimensional form in front of people. Although the designer will also show the effect drawings, at present, the design drawings are lack of interaction, and only contain the size, location and color information. Visualization realized by BIM technology can not only display results directly in the form of effect maps and reports, but also provide good feedback between different components. In addition, the discussion and decision-making of project design, operation and other stages can be carried out in visualization.

Second, coordination. In the construction industry, the implementation of a project often involves different stakeholders. Whether it is the owner, the construction unit or the designer, it involves a lot of coordination and cooperation. When there are obstacles in the process of project implementation, the relevant subjects usually find out the causes of the problems by negotiation and discuss solutions (Shen, 2018). Taking the design stage as an example, due to the inadequate communication among designers of various specialties, there are often contradictions in design. For example, pipeline layout is usually only drawn in their own design drawings. In the actual construction process, there may be conflicts between pipelines, or there are beam structure obstacles at the nodes of pipelines. BIM technology can effectively solve this problem. By using BIM technology, various specialties can be coordinated in the early stage of building construction, and the coordination of elevator shaft layout with other design layout and clearance requirements, underground drainage layout with other design layout, and fire protection zoning with other design layout can be completed.

Thirdly, simulation. The so-called simulation, not only refers to the building model simulation, the actual operation steps can also be carried out model. At the design stage, with the help of BIM

technology, related simulation experiments can be carried out in advance. For example, emergency evacuation simulation, sunshine simulation, thermal conduction simulation and so on (Fan, 2016). In the bidding stage, 4D simulation can be directly carried out, that is, simultaneous simulation of the project development time and three-dimensional model. In the construction stage, construction simulation can also be carried out. On the basis of 4D simulation, cost control can be carried out in the operation stage. Daily emergency treatment and fire evacuation can be simulated.

Fourth, optimization. The whole process of design, construction and operation of a construction project is essentially a continuous optimization process. Using BIM technology, we can provide better optimization services on the basis of existing ones. The optimization of a construction project is mainly constrained by information, complexity and time. If the information is inaccurate, the optimization results will not be reasonable. BIM technology provides the necessary information including rule information, geometric information and so on in the construction process of a large number of buildings, and greatly reduces the complexity of the project. In addition, BIM technology can also provide various professional drawings and deepening drawings to promote more detailed engineering expression.

3. Necessity of bim application in construction engineering management

3.1 Optimizing the management model

With the continuous progress of the times and the continuous advancement of the globalization process, if enterprises want to improve their competitiveness and survive in the fierce market competition, they must actively explore new technologies, which is to make their own work flow more intelligent and the management model more modern. BIM technology has not been introduced and cited in China for a long time, and there is still great room for development. With its good visualization and coordination, BIM technology can optimize the original management model. In practical work, managers can intuitively view the relevant information of construction projects, and realize a comprehensive understanding of the construction site and progress without dead angle, which is impossible for inspectors to complete. Through factual input of dynamic data, managers can have a clear understanding of the workload and content of each construction stage, and then formulate management plan. The construction of BIM technology network is the summary of information of construction projects, which helps to improve work efficiency, get rid of the problem of information islands of previous participants, and realize the further optimization of management mode.

3.2 Promoting economic benefits

One of the important prerequisites for the development of enterprises is whether they can obtain enough economic benefits. In the field of construction engineering, because of the large investment, the risk is high. Once there are loopholes in the process of a certain stage, it will not only affect the quality and duration of the whole project, but also reduce the credibility and economic benefits of the enterprise. The application of BIM technology in construction project management can not only realize the coordination and communication among the participants, ensure the smooth development of the project, but also shorten the construction time to a certain extent, provide construction efficiency, and make the enterprise project tend to be intelligent. The BIM technology for data planning, aggregation and sharing services at all stages can greatly save resources and reduce the cost of communication among participants. In the design stage, the application of BIM technology can effectively reduce the conflict problems in the design stage, and then improve the economic efficiency of enterprises. In the construction stage, the dynamic nature of BIM technology can enable managers to find construction errors in time, avoid or reduce rework problems, and then improve the economic benefits of enterprises.

4. Application and implementation strategy of bim in construction engineering management

4.1 Cost estimation

The cost estimation of traditional construction projects should be based on CAD technology, and the computer can not automatically count the component information of construction projects. Moreover, the two-dimensional design can not realize the association of design libraries, the utilization rate of historical data is not high, and its value has not been fully excavated. Many cost personnel in the calculation of construction cost through manual completion, found that the problem is mostly based on their own experience to solve, this situation directly leads to the lack of accuracy in the estimation of construction cost. Therefore, in the stage of cost estimation, BIM technology can be used to establish a database, collect and store a large number of engineering data related to the cost of construction, and provide services for cost personnel to query at any time, and import software to calculate, so as to make the calculation results more accurate.

4.2 Manage construction site

The management of construction site is one of the important contents of construction project management, and it is also the difficulty of construction project management. Especially when the construction project is very large, the construction site usually stores a large number of construction materials and equipment, which requires planning the storage location and transportation route in advance. Moreover, modern construction involves a variety of large-scale machinery and equipment, such as tower crane, whose rotating radius also needs to be scientifically calculated and planned. Therefore, BIM technology is applied to store and transport materials and equipment on the construction site through relevant software, and various mechanical equipment parameters are input into the data center for calculation and planning, simulation of the site situation, and rational layout of the construction site.

4.3 Reasonable site arrangement

In the traditional construction process, most of the construction drawings used are two-dimensional drawings, and the details of the internal structure of the construction project are not clear enough. BIM technology has the characteristics of visualization. By building a three-dimensional model and using Luban node software to simulate key nodes, the construction of nodes can be clearly displayed. The builder can make construction plans according to these three-dimensional models, and adjust and optimize the original scheme after finding problems. For the construction technology and process, the feasibility of the simulation exercise is verified in advance. Through the simulation of BIM technology, we find the possible problems in the construction process, adjust the optimization scheme in time, and simulate again until there are no problems in the simulation process, and minimize the quality problems and progress problems in the actual construction.

4.4 Simulate construction progress

In addition to the simulation of construction process and process, BIM technology can also be used to add time dimension in the simulation of construction scheme, and Navisworks can be used to correlate construction schedule. The construction time of each link and process can be calculated accurately and displayed visually. According to the calculation results, the construction party can determine the specific time corresponding to each link in the construction project, and compare it with the construction schedule, find out the content of construction delay, adjust in time, or formulate corresponding emergency plans. Because the construction progress of construction projects is affected by many factors, and various factors are not fixed, but in the process of dynamic change, so dynamic management of construction progress is very important. The BIM technology is applied to track the construction progress dynamically, adjust and allocate resources in time, and make the construction progress meet the requirements.

4.5 Project completion phase

The management of the completion stage is one of the important links in the management of construction projects. This stage has a huge workload. It is necessary not only to carry out all-round quality testing, but also to review a large number of construction materials. Traditional review process is time-consuming and workload-intensive. Through BIM technology, data can be collected in a database and queried at any time to reduce the workload at the completion stage. In the process of operation, BIM technology also has a broad space, such as the use of software linkages, the use of equipment and operating limits in Apple's construction projects, to formulate the most economical and reasonable plan, and to simulate the operation status of earthquake and fire protection channels, and to evaluate the safety performance of construction projects.

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