

BIM Technology Application in the Project Construction Cost Control Research

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Abstract: With the continuous development of the construction industry, BIM technology has also been vigorously promoted in the construction field of China. Based on this, the concept of BIM technology is studied, and the research status of BIM technology in China is introduced. The application of BIM technology in cost management has been studied from the aspects of improving cost efficiency, coordinating cooperation among various professions, and dynamic control of cost. Finally, through an actual case, the application of BIM technology in the whole project is analyzed. Practice has proved that the application of BIM technology can effectively solve the problems in traditional engineering cost management.

1. Introduction

Today's society is in the context of the era of big data, this is the upgrade of the information age and the Internet era. The construction industry can be seen as the largest and largest industry in terms of data volume [1]. In the traditional built environment, even the construction process of an ordinary building requires a certain amount of time to manage the massive data. In recent years, the application of BIM technology in the engineering neighborhood has begun to grow rapidly [2]. BIM is a new concept and practice that reduces the waste of the construction industry and reduces carbon emissions in the construction industry through the application of information technology and innovative commercial structures [3]. Therefore, enterprises can reduce costs and bring greater profits and competitiveness. At the same time, using the technical data of BIM, the concrete main components are prefabricated in the factory, and finally transported to the construction site for unified construction, which can meet the needs of industrialization and engineering precision management [4]. The application of BIM technology to all aspects of engineering management is construction. The inevitable trend of improving management means [5].

2. State of the Art

The concept of BIM was introduced in 1975. Now that it has been 40 years old, BIM has gradually been recognized by people in the industry. Since 2002, the term BIM has been gradually adopted in the field of engineering construction [6]. Currently, BIM is in the United States, the United Kingdom, and the United States. Many countries such as Singapore and China have received great support and development [7]. BIM is an abbreviation of Building Information Modeling. It uses digital technology to build a virtual building engineering information model in a computer, and provides a comprehensive and dynamic building engineering information library for the model [8]. With BIM technology, all participants in project construction can operate in a digital virtual real-world building model, thereby achieving efficiency and quality throughout the life of the building, as well as reducing errors and risks [9]. China is different from the earlier application of BIM. Among the BIM users in China, the contractor has the highest usage rate, which is much higher than the number of Party A and design units. China's construction units have a high level of technology and competition between large units is fierce. Using BIM can identify design vulnerabilities and optimize construction progress, thus reducing budget. The application of BIM not only helps Party B to win the project, but also can get more benefits in these projects [10].

3. Application of BIM in Cost Management

3.1. Cost combination with BIM information platform management

It can be seen from the practice of BIM technology that there are fewer and fewer BIM applications, and more is to integrate BIM technology with other professional technologies, general information technology, management systems, etc., in order to exert greater comprehensive value. The BIM application presents the characteristics of "BIM+", and the "BIM+" application features have the following aspects. First, use the extension from the design phase to the construction phase, and secondly from the single business use to the multi-service integration use. There are also synergistic applications, from single-machine applications to network-based multi-party collaborative applications. Finally, popularization applications, from iconic project applications to general project applications. As shown in Figure 1.

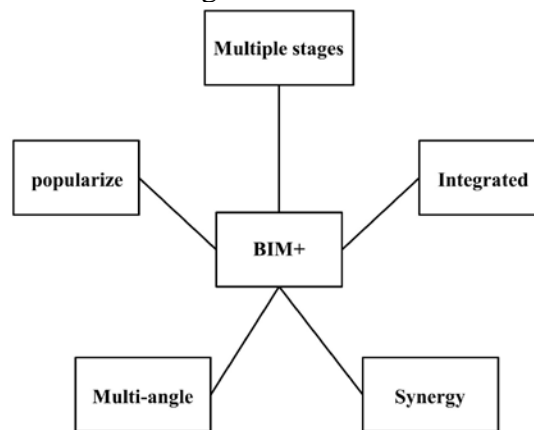


Fig.1. Trend of BIM technology application

The BIM information platform is based on the Internet and computer data sharing methods, which can ensure that information will not lag behind. At the same time, the establishment of the sharing platform enables each engineering participant to summarize the information and release the information islands to achieve efficient and accurate information exchange. The important factor for the smooth implementation of cost management is information management. From the perspective of all stages of the project and the aggregation of information from different professions, the main task of cost management is to obtain estimates, budget estimates, budgets and other cost information on top of these data. And continuously combined with the actual development of the project to update and supplement the data, to achieve the effective implementation of the entire process cost management, the cost combined with the BIM information platform plays a huge role.

3.2. BIM improves cost management efficiency

The construction project full cost management uses BIM technology as the basis of a work platform. It only needs to assign the building model to the calculation rules and price matching to the attributes. With the measurement and pricing method of the building model, the computer can be used, and the computer can adopt the "three-dimensional calculation". The semi-automated process will yield the required cost information. It is not only efficient for our traditional cost, but also ensures the credibility of the data. BIM has the characteristics of visualization, parameterization, multi-dimensionality, optimization, simulation, information integration, etc. The BIM platform has various functions such as mutual communication, simulation construction, project management, cost management, etc., which are connected to each other through the BIM platform. There is no need to use traditional paper documents and oral communication methods, so that the cost information can be effectively and timely received feedback, and the cost management work at each stage will inevitably be more efficient.

3.3. Collaboration between disciplines and phases through BIM

During the implementation process of construction project cost management, there are many

problems that need to be solved in coordination between the various stages and participants. These problems affect the smooth implementation of the whole process cost, and utilize the characteristics of BIM visualization, self-collection, collection and traceability. It can effectively promote the coordination of problems between the various stages of the whole process cost management and between the various participants. Through BIM, the coordination of each stage of each participant is completed, and the whole process of cost management is promoted smoothly. Through BIM's visual management technology, the past single cost work point, line and surface information are integrated into a three-dimensional virtual model. Through the interaction and update of the model graphics, the parties coordinate and communicate in the same model at each stage, and the model becomes realistic. Combining the cost information with the abstract digital humanized model, combined with the time schedule, allows each participant to understand the clear cost information and optimize the past cost management methods. The effective interaction of BIM information improves the quality and speed of decision-making, promotes the dynamic connection of each participant at different stages, and realizes the comprehensiveness of cost management.

3.4. Dynamic Control of BIM in Cost Management

BIM is a centralized communication and coordination platform. The needs of all parties can understand communication in advance, which drives the dynamic management of cost. In the traditional cost management mode, the relationship between design and owner's needs cannot be well balanced, and design often occurs. In the later period, according to the owner's request, the situation of the drawings was changed, which was quite unfavorable for the cost control and hindered the development of the cost management. BIM realizes the communication between the owner and the design and construction through the visual function. It reduces the rework, reduces the rework, avoids the modification and change after the design, reduces the risk of quality and safety, and effectively realizes the project cost management. Dynamic control in the middle. The use of BIM technology to combine BIM with the whole process cost management can not only promote the cost management of each stage and the participants in the project more accurately and efficiently, but also promote the cost of the letter, at different stages, and in different project participants. Fast and accurate delivery can effectively control the occurrence of design changes and reduce the amount of invalid costs. You can also use the BIM technology platform to accumulate and share the data of completed projects, sum up experience, and further improve the construction unit, construction unit, and cost consulting unit. The entire process of cost management capabilities.

4. Application of BIM Technology in the whole Project

4.1. Construction preparation stage

BIM and its various optimization tools provide the possibility to optimize the construction of complex projects. Based on BIM technology, project solutions can be optimized, project design and investment return analysis can be combined, and the impact of design changes on return on investment can be calculated in real time. Come out: So the owner's choice of design will not mainly stay on the evaluation of the shape, but more can make the owner know which project design scheme is more conducive to their own needs.

Modeling solution MagiCAD. Relying on the BIM product library that comes with MagiCAD, the BIM product model is obtained from the product library provided by it and directly applied to the modeling process. The second modification was made based on the products in the product library provided by MagiCAD. Combined with the company's own materials and equipment procurement catalogue, relying on the software's custom product library function, the company has completed the establishment of more than 20 product material suppliers' BIM component libraries, and initially formed the prototype of the company's internal enterprise-level electromechanical BIM product library.

BIM deepens the design and analysis of key difficulties. In the BIM deepening design stage, the research team carried out a comprehensive and objective analysis, planning and deployment of the

key parts of the project, the deepening of the design key work, the simulation of various key construction processes, and the system check calculation.

The overall profile is initially arranged. First of all, each professional engineer will stack the drawings of each professional, and carry out preliminary planning and pre-arrangement for each key part, the pipeline direction and coordinate position of each system in the pipeline-intensive area, and the professional staff will focus on the key parts and pipelines. The pipeline orientation and coordinate position of each system in the district are preliminarily planned and pre-arranged, and two-dimensional maps of multiple sets of comprehensive layout schemes are drawn, and submitted to the scientific research group for discussion and alternative. After the demonstration group composed of the parties, the selection is optimal. The scenario creates a 3D model.

Electromechanical integrated pipeline collision detection. After the professional modeling is completed, all the professional information models including the building, structure, steel structure and electromechanical based on the same origin are integrated on the Navisworks platform, and then the systems are in accordance with the sequence of inspection processes. Collision detection.

4.2. Construction process

Track construction progress in a timely manner and accurately calculate progress payments. The construction guidance cooperates with the extraction of three-dimensional images and component information to guide the construction site, eliminate misunderstanding of drawings, control material costs, and reduce waste during construction.

Based on BIM technology, cost pricing management can use a variety of fixed pricing and list pricing to easily convert a budget document into a multi-form cost document such as bid price, sub-package price, cost price, delivery price, settlement price, and pricing. To form a cost database that can be shared, referenced and invoked, to achieve dynamic integrated management of group and unit engineering data, to classify unit projects, individual projects, and sub-projects, and the lowest level can meet the needs of progress payment settlement. At the first level, there should be corresponding cost information and bidding information, which can clearly see the cost ratio, the unilateral cost index, and the material index. Construction stage BIM, application BIM integration site - virtual construction of BIM model + actual construction or management site = control site construction

4.3. BIM achieves project cost control throughout the project:

On-site guidance: Construction guidance using BIM models and 3D construction drawings. On-site tracking: BIM models such as laser scanning, GPS, mobile communications, RFID and Internet are used for on-site tracking to ensure that no major accidents (such as fires) occur during construction and provide an accurate and intuitive BIM database. Cost management: Through the BIM model, the most accurate engineering basic data is obtained, and the engineering basic data is decomposed into component level and material level, which effectively controls the construction cost and realizes the whole process cost management.

Progress control: BIM can simulate and analyze the key or difficult parts of the construction, and find that the progress deviation can be adjusted at any time to control the construction progress in real time and improve the enforceability of the schedule. Data sharing: Through BIM, project data can be easily shared and reused, so that the construction site can be shared from the basic level to the high-level information of a group company.

5. Conclusion

The arrival of the BIM era is changing many aspects of the construction industry. The application of BIM technology in the construction cost control can effectively control the project schedule and project cost, ensuring the complete and rapid completion of the entire project. At the same time, a large amount of cumbersome data can be quickly and completely integrated and saved through the machine and information network. This paper studies the application of BIM in engineering cost management. BIM has effectively improved the overall construction management level, promoted

the continuous improvement of economic benefits, and promoted the development of China's construction industry in the long run. Through a practical case, from the construction preparation stage, the construction process, and the control of the cost, the application of BIM technology in the whole project was studied. The study found that BIM technology can help us build multi-dimensional structured database of engineering projects, store component-level data, improve engineering efficiency, improve existing cost management technology capabilities, transform existing management methods, and further strengthen cost control.

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