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APPLICATION RESEARCH OF BIM TECHNOLOGY IN SHANGHAI CENTRAL BUILDING PROJECT

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Abstract: Nowadays, today, the civil engineering industry has already started very early to the development of digital and information. Great changes have taken place in the design and construction way, With the introduction of BIM technology, the status of the independent among project got changed, information between various modules to realize real-time interaction.

First, the article introduces the concept and core technology of BIM. Then take the Shanghai Tower as an example. The application of BIM technology in project information management, project cost management and project engineering schedule management is introduced. The research results fully demonstrate the superiority of BIM compared to the traditional project management model. Finally, the problems in the development of BIM are analyzed and the prospects are put forward.

Keywords: BIM technology; informationization; construction-management; cost -management

Background

With the advent of information technology and the era of big data, the realization of informatization in the construction industry is imminent. The organicization of collaborative work, information sharing and engineering information management is the future development trend of the construction industry. This is the fundamental way to achieve high efficiency and high quality of the construction industry and control manpower and capital costs. The way to achieve this is to apply BIM technology to the construction industry.

Based on the specific project, this paper demonstrates the application of BIM technology in China's construction project management. Research in architecture

The application of BIM technology in project management can be of great significance in enhancing the core competitiveness of enterprises, improving planning and design efficiency, improving engineering construction efficiency, reducing production errors, and improving production quality.

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1 Summary of BIM Technology Research

BIM technology is based on the 3D building model. The information of all stages and all departments in the whole life cycle of the construction project is connected through the 3D building models shared by various departments to integrate application and management to form a complete and comprehensive description. Each department of the project aims to extract the required information by accessing the same 3D building model with all building information attached. The characteristics of information integration management and sharing of BIM technology in the whole life cycle of the building can not only facilitate the coordination and transmission of the information and the use of the drawings and documents in the profession, but more importantly, it facilitates information sharing and extraction in different professions. And the timeliness and accuracy of use, effectively organize and track the transmission of information between phases and between departments and departments, greatly reducing the information, defects, and loss caused by repeated application of information transmission methods at this stage. , ambiguity and mistakes, greatly improved the efficiency and accuracy of the work of various departments.

The implementation of BIM technology needs to build an engineering information integration management platform that can be connected to all its participating departments, and establish an open-based information exchange standard on the platform, which is the most widely used IFC (Industry Foundation Classes) standard. 3D building information model, for all departments to organically integrate, manage and share all engineering information of relevant departments in each stage of the project construction management, and realize BIM-based construction project management.

In China, due to the late introduction of BIM technology and concept, it was not introduced by Autodesk until 2002, so it is still in the primary exploration stage. The road to promotion and popularization is not smooth. The narrow application scope only exists in individual cases. Only in less than 10% of construction companies have applied BIM technology, such as the South-to-North Water Transfer Project, the National Grid Pavilion, the Shanghai Tower, and other projects. The Shanghai Jinhongqiao International Center

Project was listed as a pilot project for BIM technology in 2011. In the Henderson Beijing World Financial Center project, BIM technology found 7753 conflicts before construction. In the Shanghai Central Building project, BIM technology was applied in the whole life cycle of the project, which is a milestone. This paper takes Shanghai Center Building as an example to introduce the application of BIM technology in project document information management, project cost information management and project engineering schedule management.

2 Application Research of BIM in Document Information Management of Shanghai Central Building Project

For most of today's engineering projects, its long engineering cycle and complex engineering materials place high demands on the document management of the project itself. The traditional document management methods are mostly paper documents with data display. 80% of the information generated during the entire project cycle is stored in the form of documents, which are stored in the form of tables, texts and graphics; this form of information is available to many project participants (owner, design, construction and supervision, etc.). The communication and interaction between the two poses a great test. As the project continues to become larger, more complex and difficult to construct, the existing document type information management model can no longer meet the project construction personnel's data storage. To the transformation of information management needs, it has produced a BIM-based information integration management system, which can effectively solve the problem of data transfer and conversion, greatly improving the efficiency of project engineering management.

This section will introduce the application of BIM in this project with the construction process of Shanghai Central Building as a case. The Shanghai Tower Building Project is located in the Lujiazui Financial Center in Pudong, Shanghai, and is a group of buildings with Jin Mao Tower and Shanghai World Financial Center. Figure 1 is a view of the building; the building is a multi-purpose skyscraper, the main purpose For public facilities such as office, hotel, commerce and sightseeing, the building has 124 floors above ground and the total height of the building is 632m. It is divided into 8 sections and a sightseeing layer along

the vertical direction of the building, which are arranged at the top of each section. There are equipment layer and refuge layer. The total construction area of the whole building is about 380,000 square meters. The total underground area is about 140,000 square meters. The total investment will reach 14.8 billion yuan. The underground part will be capped at the 2010 Shanghai World Expo. In 2012, the structure was capped and partially put into operation. It was completed and delivered in 2014.

Fig 1. Shanghai Center Building overlooking map

The owner of the Shanghai Tower hopes to build the Shanghai Tower into a green building that meets China's green three-star standard. To achieve this goal, the owners and designers, and the construction parties in different professional directions need better communication. Therefore, it is necessary to use BIM technology in the construction of the Shanghai Tower to ensure the smooth progress of the project. During the construction of the Shanghai Tower, the Luban PDS system was used to manage and share BIM data information. All participants of the project can access the system at any time. A total of 8 construction workers (4 on-site projects and 4 underground projects) use the Luban MC system. Luban system resident personnel are divided into 7 majors (water supply and drainage, air

conditioning water, fire water, air conditioning, smoke exhaust, strong electricity and weak points), which are uploaded to the MC system at the first time after the calculation is completed. . Figure 2 shows the user interface of the Luban MC system, and Figure 3 shows the BIM model map and indoor roaming display map of the Shanghai Tower.

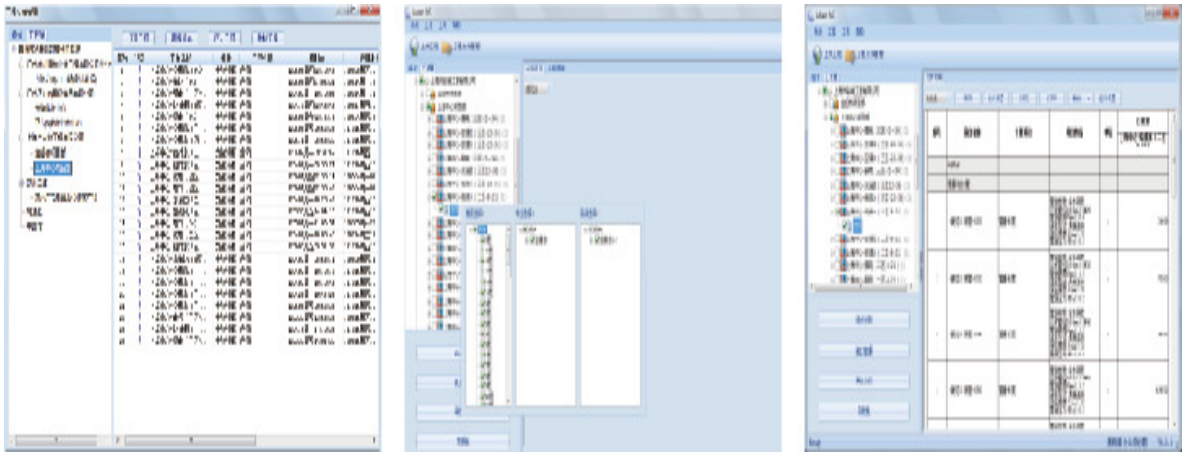

Fig 2 Luban MC system user interface

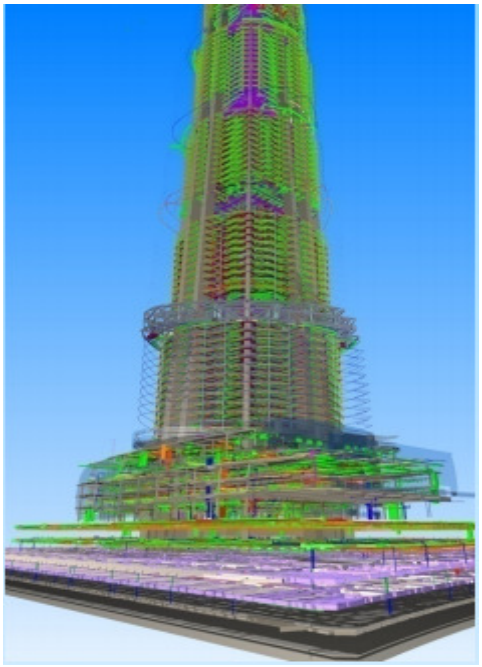

Fig 3 Shanghai Center Building BIM Model

Through the BIM model display and user interface, the project parties can clearly understand the various forms of information such as the structure and engineering overview of the Shanghai Tower, and various materials and calculation tables can be called at any time according to the user's own needs. Comprehensive and detailed presentation of the model

data information of the entire project, so that data information exchange no longer has information islands, and the efficiency of decision-making is promoted.

3 Application of BIM in Cost Information Management of Shanghai Central Building Project

It is a very important task for the project company to carry out the bidding budget before participating in the bidding of the project. After the project is awarded, the project cost is further refined and calculated as the target cost of the enterprise; the labor cost incurred during the construction of the project Actual costs such as machinery and materials will be used as the actual cost of the project company: Through the cost management system of the BIM project, various cost information can be comprehensively compared and analyzed to help complete the company's cost management.

At present, the cost management model adopted by most project companies is still an extensive management mode, which causes major flaws in the management of the project company, which seriously affects the development of the company. In addition, the way the enterprise manages the project cost through the finance department makes In the whole cost management process, the work of the finance department is cumbersome; for a single project, in order to comply with the management requirements of the finance department, various types of cost documents are provided, which causes the management process to be complicated and the cost data cannot be shared in time. For financial personnel, the cost data provided by the project undertaker sometimes does not match the information that they have mastered because the update is not timely; for the project manager, in order to understand the cost of the project, To fully understand the overall cost information of the entire project, this will make it impossible for the project manager to make reasonable adjustments to the project schedule in a timely manner, which has a great impact on the cost control of the entire project.

It can be seen that in order to meet the different requirements of various departments for project cost control, enterprises today urgently need a unified and standardized project cost management system for cost management; therefore, BIM-based cost management system

emerges as the times require BIM cost management. The system carries out unified project cost management to ensure timely communication of cost information between departments and eliminate existing island problems.

According to relevant statistics, in the construction of large and medium-sized projects, about 3% to 5% of the total cost of the project is caused by engineering changes and information exchange errors; and BIM information can completely avoid such costs. The production of the project, through the use of BIM information technology, the estimated cost savings of general engineering projects is between 74 million and 360 million, accounting for 0.5% to 3% of the total investment of the project; Considering the complexity of the central building and the construction characteristics of the volume, compared with the traditional engineering management mode, the conservative calculation shows that the project will save about 160 million yuan of waste due to construction rework after adopting BIM technology. Table 1 shows the economic indicators of the Shanghai Central Building estimated by the unit price of the collision number, and Table 2 shows the economic indicators estimated according to the change rate.

Table 1: Shanghai Center Building BIM Economic Indicators Estimation Results (Reference unit price by collision number)

project	Amount
Area of Sample layer 9F	4656.1m^2
Area of Sample layer 10F	4648.4m^2
Total area of the sample layer	9304.5m^2
Shanghai Central Building total construction area	570000m^2
Sample layer total collision number	1013
Reference average price	1190.48yuan
Sample layer total price	1,205,952.38yuan
Shanghai Central Building technical and economic indicators total price	73,877,463.29yuan

Table 2: Shanghai Center Building BIM Economic Indicators Estimation Results (Project change fee rate)

Shanghai Center Building Total Cost	120 Billion
Change ratio	3%
Change fee	3.6 Billion

It can be seen that the BIM system itself has the advantages of efficient exchange of information and timeliness, which avoids too many project plan changes, greatly reduces the costs incurred by changing the construction plan, and achieves efficiency and cost savings. the goal of.

4 Application of BIM in Project Progress Information Management

As the development of society is getting faster and faster, the number of projects is increasing, and the variables in the construction process are becoming more and more complicated, which makes the construction monitoring more and more difficult. However, in actual engineering, due to various reasons, there is always an inevitable difference between the actual progress and the planned progress, and this difference will accumulate as the construction continues. The difficulty of correcting construction deviations is also increasing with the construction process. If these deviations are not timely detected and corrected in time, the problem will continue to expand and eventually endanger the entire project. Therefore, with the continuous development of the project management concept, several new requirements have been put forward for the project progress monitoring; (1) The project construction progress inspection gradually reduces the manual operation and strengthens the mechanized monitoring level. (2) The project schedule monitoring should have dynamic functions, which can timely discover the progress deviation during the construction process and provide timely feedback; (3) The results of the construction monitoring should be sufficiently complete and clear enough to facilitate the judgment of the manager and decision making. Obviously, the traditional construction monitoring method is far from meeting the rapid development of the modern era and the increasingly advanced construction progress monitoring, establishing dynamic project management, timely understanding of construction progress and feedback, so as to detect the deviations in the construction and correct the errors

as early as possible. It is an urgent problem to be solved. By applying the BIM model-based construction progress detection system, the integration and sharing of various data information during the construction process can be completed, and the construction progress information can be visually displayed in the form of a 3D view, real-time realization. The update of construction information has improved the decision-making efficiency of project managers.

BIM information technology can be used to collect project construction progress in real time. The construction process can be presented through various electronic equipment terminals. By comparing with the original construction planning model, the engineering deviations appearing during the construction process can be found, and corrections or fine adjustments can be made in time; The BIM model system can also carry out construction simulation simulation, simulate the unfinished construction process, and timely discover the deficiencies in the plan for modification. The use of construction progress query can facilitate the project manager to find the lag in the construction process and prevent unnecessary waste caused by the extension of the construction period. Figure 4 shows the construction progress map, and Figure 5 shows the construction simulation.

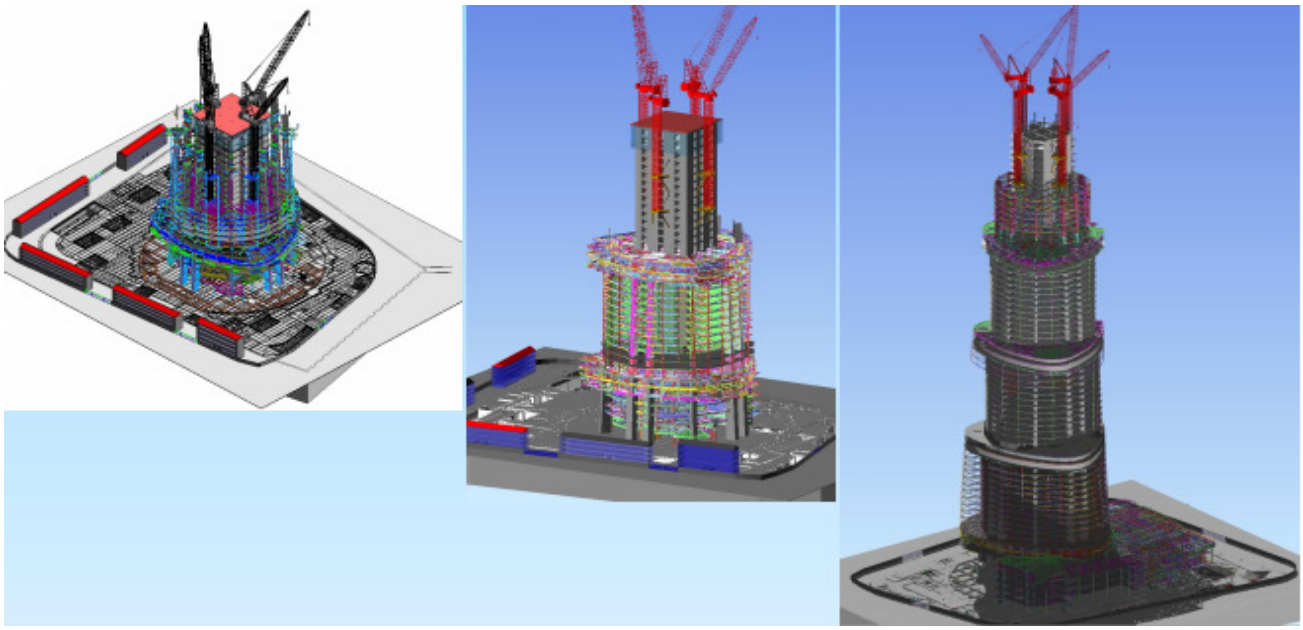

Fig 4 Project construction progress display

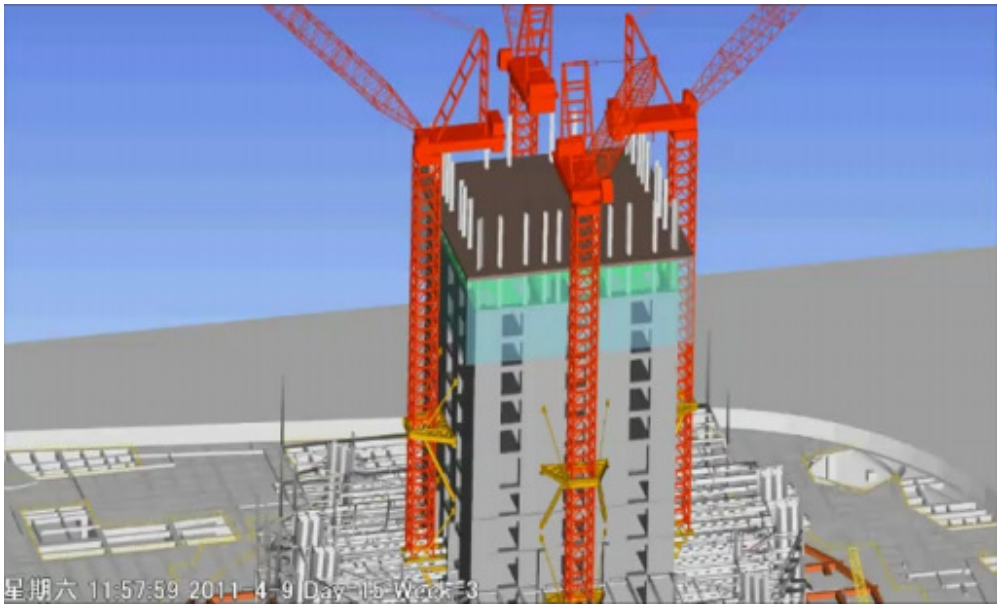

Fig 5 Construction simulation

It can be seen that BIM technology can visually display the various stages of the construction process, avoiding the uncoordinated construction process, ensuring that the entire project is carried out in an orderly manner according to the preset construction plan; at the same time, it is reduced as much as possible. Construction errors caused by unknown factors during construction will enable construction workers to understand the difficulties in construction and understand ahead of time.

5 Conclusion and outlook

This paper analyzes the specific application of BIM in project management through the actual case of Shanghai Center Building, including application in information interaction, cost management and construction schedule control and construction simulation, which fully demonstrates the superiority of BIM compared to traditional project management mode. Sex.

Nowadays, with the strong promotion of the government, BIM technology has been initially promoted and applied in China. However, there are still many factors that restrict the development of BIM technology in China. Therefore, the following suggestions are made for the existing problems:

(1) Design department perspective: The promotion of BIM technology means the introduction of new technologies and new equipment. The design department needs a lot of

funds and time support. It must solve the problems within the design department, increase the training of internal personnel, and fully accept the 3D construction. The concept of working together with the teams of the various units can constitute the possibility of working with other departments.

(2) Construction department perspective: continue to increase the introduction of BIM technology.

(3) Owner's perspective: Due to the lack of relevant professional knowledge, except for the owners of a small number of large-scale landmark buildings, most domestic owners do not understand BIM technology, so relevant training and talent introduction should be strengthened.

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