Application of BIM Technology in Electronic Bidding System of Engineering Projects

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Abstract. BIM is a system model based on the information of many engineering projects. It can describe and calculate the geometric information and spatial distribution of the whole engineering component and the quantity of the project. It has the characteristics of visualization, digitalization and parameterization. BIM technology is widely used in the whole life cycle of construction projects, such as decision-making, design, bidding, construction and operation. It can not only help enterprises save resources, reduce costs, but also enhance competitiveness and increase benefits in the bidding process. Firstly, this paper expounds the characteristics and background of BIM technology, mainly introduces the application of BIM technology in bidding management of Engineering projects, and analyses the improvement and benefits of BIM technology to engineering bidding. It also provides a reference for engineering electronic bidding management, which has certain theoretical value and practical significance.

1. Introduction

BIM technology, as the most advanced comprehensive construction technology in the world, is based on the construction engineering model and carries on the sharing and transmission of relevant information data in the whole life cycle of project planning, operation and maintenance, so as to enable engineers and technicians to correctly understand and efficiently respond to various building information, and to provide design teams and including construction transportation. All parties, including the construction units, provide the basis for collaborative work and play an important role in improving production efficiency, improving construction quality, saving costs and shortening the construction period. Integrating BIM technology into the bidding process of engineering construction can not only manage the project cost finely, but also solve the difficult problems of traditional bidding construction scheme, progress plan, construction layout, important construction scheme and technology, quality and safety, especially for major projects, traditional bidding can not reflect the technical strength of bidders.

The popularization and application of BIM technology has greatly promoted the refinement and management level of bidding management. In the process of bidding, the tenderer can compile an accurate bill of quantities according to the BIM model, so as to complete the list, calculate quantities quickly and accurately, effectively avoid missing items and miscalculation, and minimize the disputes caused by the problems of quantities in the construction stage. According to BIM model, the bidder can quickly obtain the correct quantity information. Compared with the bill of quantities in bidding documents, the bidder can formulate better bidding strategy.

2. Concept of BIM Technology

BIM that is translated as building information model, is short for Building Information Modeling. Among them: Building covers design, construction and operation, reflecting the significance of the whole process of construction. Information is all kinds of information integrated by software, not only geometric information, but also progress, cost and other types of information. Modeling: Based on the three-dimensional form of architecture, it integrates all kinds of information. It is the basic platform of building information management. That is to say, BIM is an information integration application platform for the whole life cycle of construction engineering. The whole life cycle of construction project includes decision-making, design, bidding, construction, operation and maintenance. BIM integrates all kinds of information in the construction process, and allows users to exchange and share these information, so that all participants in the project can operate information in the digital virtual real building model and model in the information, as shown in Fig.1. This paper focuses on the key points and difficulties in the application of BIM in the bidding stage, as well as the key application value of BIM in the bidding management process.

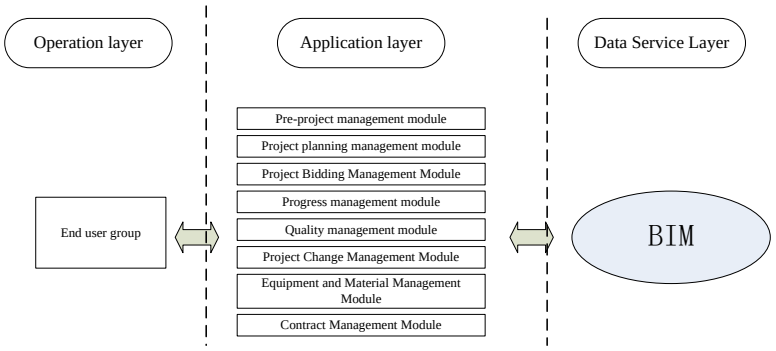

Fig.1 BIM Information System Model Framework

3. Tender stage

Now many owners have found that BIM can bring benefits to themselves. Usually, when they bid, they will have requirements for BIM capacity of construction units. The application of BIM technology in the bidding stage is mainly reflected in the compilation of bidding control price. With the maturity of BIM technology, the amount of engineering calculation is becoming more and more accurate. BIM calculation software, which is mainly represented by Guanglianda and Swell, has continuously improved its professional level, bringing revolutionary reform to the calculation of project cost. Traditional engineering calculation is mainly based on manual calculation, but with the complication and huge amount of modern buildings, the limitations of population calculation methods are becoming more and more prominent, which not only takes a long time, but also consumes a lot of human capital. Compared with the traditional cost calculation method, BIM has incomparable advantages in this respect compared with the traditional two-dimensional design volume report statistics. After using BIM technology to establish three-dimensional model, relevant software can automatically generate specific engineering data, which greatly increases the accuracy of engineering budget estimates. At the same time, compared with the redundancy of Engineering calculators, BIM modeling is not only faster, but also requires much less staff.

In the bidding control link, accurate and comprehensive bill of quantities is the core key. The calculation of engineering quantity is an important work which consumes the most time and energy in the bidding stage. BIM is a database rich in engineering information, which can provide real physical and spatial information needed for engineering calculation. With this information, the computer can quickly carry out statistical analysis of various components, thus greatly reducing the

cumbersome manual operation and potential errors brought about by statistical engineering according to drawings, in efficiency and accuracy.

Significant improvement in sex was achieved.

(1) Building or reusing BIM models in design phase

In the bidding stage, the establishment of BIM models for various specialties is an important basic work for the application of BIM. The quality and efficiency of BIM model directly affect the effectiveness of subsequent applications. There are three main ways to establish the model:

To rebuild BIM model directly according to construction drawings is also the most basic and commonly used method.

If we can get the electronic files in AutoCAD format of two-dimensional construction drawings, we can convert DWG two-dimensional drawings into BIM model by using the function of map recognition and mapping provided by the software.

Reuse and import the BIM model provided by the design software to generate the BIM computational model. This is the most reasonable way to look at the whole BIM process, which can avoid a lot of manual work and possible errors caused by re-modeling.

(2) Fast and accurate calculation based on BIM

BIM-based calculation can greatly improve the efficiency of Engineering calculation. BIM-based automatic calculation method liberates people from manual and tedious work, saves more time and energy for more valuable work, such as inquiry, risk assessment, and can use the saved time to prepare more accurate budget. The accuracy of engineering quantity calculation is improved based on BIM calculation. Quantity calculation is the basis of drawing up project budget, but the calculation process is very complicated. Cost engineers are prone to many calculation errors due to various human reasons. BIM model is a database that stores information of project components. It can provide the information of project components for cost personnel, thus greatly reducing the workload of identifying component information manually according to drawings and the potential errors caused by it. Therefore, BIM's automatic calculation function can make the work of engineering calculation get rid of the influence of human factors and get more objective data.

4. Bidding Stage

BIM application in bidding stage is being strongly supported by the state. The Ministry of Housing and Construction expressly stipulates that the bidding documents adopting BIM technology should have clear requirements and set up additional points. Local governments have also introduced relevant incentive policies, such as in Shanghai, where the investment is more than 200 million and the construction area is more than 20,000 square meters, BIM must be used. Due to the tense bidding time of most projects, bidders are required to complete the calculation of engineering quantity efficiently, dexterously and accurately, and to spend more time on bidding quotation techniques. Compared with the traditional dull text description, the vivid image of the tender with BIM technology can make the evaluation experts and owners obtain the construction plan and construction characteristics of bidders in a more rapid and intuitive way. BIM can simulate the construction process, at the same time, it can simulate the operation, safety analysis, light analysis and other characteristics that traditional tenders can not reflect. This visualization feature of BIM technology can not only be displayed in the form of pictures, but also in the form of animated video using 3D technology. These are good for the bid to achieve higher scores. Of course, in addition to the presentation of construction schemes, BIM technology can also be used in the bidding stage to carry out systematic cost analysis and management of its own construction schemes. In order to improve the accuracy of construction unit quotation, and formulate a better bidding

strategy.

(1) BIM-based simulation of construction scheme

By means of BIM, the project virtual scene can be roamed intuitively, and the scheme experience and demonstration can be carried out in the virtual reality. Based on BIM model, the design scheme of construction organization is demonstrated, the important links in construction are visually simulated and analyzed, and the construction installation scheme is simulated and optimized according to the time schedule. In order to improve the feasibility of the plan, some important construction links, key parts of new construction technology and construction site layout are simulated and analyzed. In the bidding process, through the simulation of the construction scheme, it is visually and visually displayed to Party A, as shown in Fig. 2.

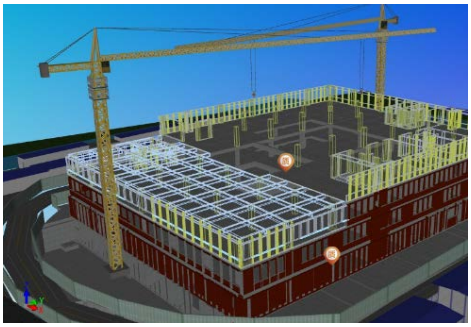

Fig. 2 Simulation of construction schemes

(2) Visual Model Schedule Simulation Based on BIM

Construction is a highly dynamic and complex process. Currently, the network plan for expressing the progress plan is often used in construction project management. Because of its strong specialty and low visualization, it is difficult to clearly describe the construction progress and various complex relationships, and it is difficult to visualize the dynamic process of construction. By linking BIM with construction schedule and integrating spatial and temporal information into a visual four-dimensional model, the construction process and virtual image progress of the whole building can be visually and accurately reflected. Four-dimensional construction simulation technology can reasonably formulate construction plan, accurately grasp construction progress, optimize the use of construction resources and scientific site layout, and unify the management and control of the construction progress, resources and quality of the whole project in order to shorten the construction period, reduce costs and improve quality. In addition, with the help of 4D model, construction enterprises will gain competitive advantage in project bidding. BIM can let the owner intuitively understand the main construction control methods of bidding units, whether the construction arrangement is balanced, whether the overall plan is basically reasonable, and so on, so as to make an effective evaluation of the construction experience and strength of bidding units, as shown in Fig.3.

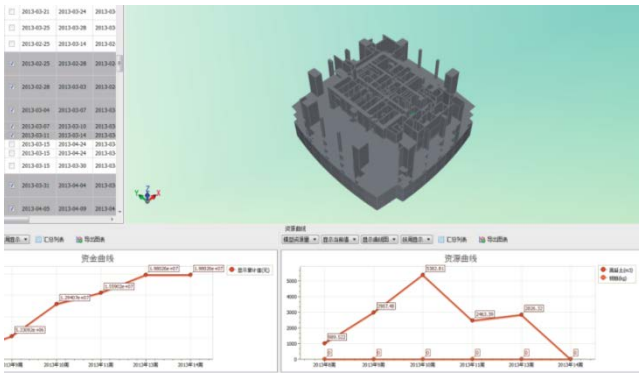

Fig. 3 Progress Modeling and Funds/Resources Curve

(3) Resource optimization and capital planning based on BIM

BIM can be used to simulate construction progress, optimize resources, forecast output value and draw up capital plan conveniently and quickly. The cost management and analysis of different dimensions can be realized by the association of schedule plan and model, and the correlation of cost data and schedule. Combining the three-dimensional model with the schedule plan, it simulates the funds and resources needed for each construction schedule task, and forms the corresponding fund and resource curve of the schedule plan, which is convenient for choosing a more reasonable schedule. By dividing the flow section of BIM model, we can quickly calculate the resource demand plan of manpower, material, mechanical equipment and capital according to the automatic correlation of flow section. WYSIWYG is not only helpful for bidders to formulate reasonable construction plans, but also can be visually displayed to Party A.

5. Conclusion

The application of BIM makes the electronic bidding system break the inherent mode of traditional bidding. On the basis of the existing electronic bidding system, it further deepens the use of network and information technology. According to BIM model, bidders or agencies can compile accurate bill of quantities, effectively avoid missing items and miscalculation, etc. Bidders can quickly obtain correct information of quantities according to BIM model and formulate better bidding strategies. BIM technology improves the quality and efficiency of bidding and tendering, while effectively guaranteeing the comprehensiveness and accuracy of the bill of quantities, and promoting the scientificity and rationality of bidding quotation. The joint promotion of BIM by the government and bidding units can achieve twice the result with half the effort.

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