Research on Costing and Cost Control of Construction Projects Based on BIM Technology

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Abstract: At present, the economy is developing rapidly and the development of the construction industry in China has also improved. The requirements of the people for living and living conditions are gradually rising, thus promoting the development of China’s construction industry, and the implementation of construction projects inevitably requires professionals to explore and analyse the engineering drawings and their various aspects, so as to arrive at the appropriate cost through reasonable calculations. BIM technology is gradually being applied to the development of construction costing, which not only provides a more efficient way of carrying out costing work, but also reduces the consumption of human and material resources as well as the search and rectification of data.

Keywords: Construction engineering, Cost management, BIM technology, Application analysis.

1. Introduction

Based on the background of the new social era, we can see that information technology is widely used in various sectors of society. In order to better meet the requirements of the information society, intelligent buildings have gradually emerged as a new type of architecture, in which the application of BIM technology in the intelligent construction of buildings plays an irreplaceable role. With the application of BIM technology, the effective integration of construction information can be realised with the help of data models, and the construction situation can be presented to the enterprise intuitively and clearly, so that targeted responses can be made, which is of great significance both for the smooth development and quality improvement of construction, and for the growth of economic benefits of construction enterprises.

2. Overview Analysis on BIM

2.1 BIM Technology Concept

At present, many experts and scholars try to define BIM technology specifically, among which, the BIM concept proposed by the American Society of Engineers is the most accepted by the public: BIM technology is a combination of physical and functional models in construction projects, and is a digital construction model that supports the creation, sharing and management control of dynamic engineering and construction information during the whole life cycle of construction projects, in order to coordinate and manage collaborative operations of all parties. They systematically categorise BIM technology features into 11 areas, including: full lifecycle, computer-based technology implementation, storage of information, and human-computer interactivity features. Among these, interactivity is defined as the need for the calculation and operation of building information to be under open industry standards, the ability for designers to adjust BIM models according to the project schedule of the building project, the management and adjustment of building project construction by setting up targeted construction management measures, and the mutual collaboration between engineering staff and the construction project. Information is stored in a highly integrated data model, i.e. a building information model. In order to build a comprehensive information model for BIM, a variety of modelling and analysis software is required, mainly including: BIM scheme design software, analysis software considering construction progress, comprehensive analysis software for mechanical and electrical equipment, structural unit calculation software, visual analysis software, information release and audit software, model characteristics check software optimisation design software, cost analysis and management software, corresponding operation management software, etc. The construction of BIM models involves construction, structural engineering, cost engineering and construction management, and requires the coordinated management of multiple trades.

2.2 Analysis of the Main Features of BIM Technology

2.2.1 Visualisation

The visualisation features of BIM technology are mainly manifested in the application of BIM technology in architectural design, which can present the three-dimensional modelling of the design drawings visually to help the construction personnel to have a better understanding and grasp of the construction design drawings, so as to ensure the smooth development of the next construction. As we can see from the design of the past building construction drawings, the main method used is line drawing, in such a design method, the structure of the building cannot be clearly reflected in the drawings, often requiring the construction personnel to imagine themselves, coupled with the gradual development of the building shape in the direction of complexity, which makes it difficult for the construction personnel to understand the drawings. It has been verified by engineering practice that if BIM technology can be reasonably applied to the intelligent design of buildings, this problem can be effectively solved, with the help of data models can present a three-dimensional effect of a clear line construction, so that in the visual state to make more accurate decisions.

2.2.2 Simulativeness

The simulation nature of BIM technology is not only reflected in the simulation of building models, but also in the adaptation of things that cannot be manipulated. For example, BIM technology can be applied to the intelligent design of
buildings to achieve thermal simulation, daylighting simulation and energy saving simulation. BIM technology can also be applied to the intelligent construction of buildings to achieve 4D simulation of the construction process, which not only helps designers to better complete the construction plan design, but also plays a good role in the effective control of the project cost.

2.2.3 Synergy

Through the above analysis we understand that the application of BIM technology can complete the sharing of construction information, simply put, is to establish an effective transmission platform between the main body of the construction project, and then with the help of the network to achieve mutual information transfer and sharing, to promote effective communication and cooperation between the units, which is very beneficial to the smooth development of construction and quality improvement of the construction project. For example: in the construction of building projects often encounter changes, it is necessary for the construction personnel to communicate with the designers in a timely manner, and the problems will be solved effectively under the communication and guidance of the designers.

3. BIM Technology in the Application of Engineering Cost Management

3.1 Application of BIM Technology in the Design Phase

The engineering design stage is very crucial to cost management, and to a certain extent will have an important impact on the later cost control of the project. At present, the cost management method implemented in the domestic construction field is generally limit design, which is mainly in accordance with the estimated amount of engineering investment report for programme planning, which can ensure to a greater extent that the investment funds of the project can be used reasonably. However, this kind of limit design will make the design of taxi construction, water and electricity in the construction drawings independent of each other and cannot be unified, and because the design drawings in many construction projects are all traditional plan drawings, if the designers lack professional knowledge and are not strict with the quality of the drafting work, it may cause large mistakes due to some minor deviations, and if there are unexpected conditions during the construction period, it may If there is an unexpected situation during the construction period, the construction company may suffer a large loss of material, time and manpower. As BIM technology has the characteristics of information integration and sharing, its use in the design stage allows the management, design and construction units and related personnel to participate in the specific engineering design. At the same time, the design unit can also use the three-dimensional model in BIM technology to achieve a visual display of the overall construction project, and the parameters of the project can also be accurately reflected in the model. In this link, if some of the project parameters need to be changed, the model can be optimised to achieve efficient and accurate adjustment of the overall project, so that the engineering staff can conduct a comprehensive review of the design drawings and identify any problems in time to prevent economic losses due to design errors in the later construction, which brings great convenience to the development of project cost management.

3.2 The Use of BIM Technology in the Bidding Stage

In carrying out the cost management of construction projects, attention needs to be paid to the cost control work during the bidding period, which is very complicated and the workload is particularly heavy, especially in the current context of construction projects, both the bidding party and the tenderer need to pay more attention to the calculation of the project quantity to ensure its correctness and accuracy. In addition, the tenderer also needs to additionally calculate the amount of works consumed by the corresponding quota, which requires a lot of manpower and material resources, and the result of the data calculated in this way will also have a great deviation. In the bidding period, BIM technology can be used to integrate the relevant quantity data and produce the corresponding quantity list, thus reducing the errors in the calculation process and improving the efficiency of cost management.

3.3 Project Cost Management

In the specific construction project construction, cost can be said to be a key consideration, specifically, it consists of two parts, namely resource management and cost management. In the specific cost management work, the application of BIM technology can do a good job of design drawings, construction materials and structure of the sub-bridge, through the application of BIM technology to create a list, do a good job of calculating the precise cost data. In the subsequent construction, construction enterprises can prepare the corresponding equipment and materials according to the cost data, and carry out construction activities according to the content of the list, so as to ensure that the project cost can be effectively controlled within the scope of the list data.

3.4 Application of BIM Technology in the Construction Phase

The construction phase is the most important part of engineering construction and should be controlled effectively through efficient and high quality cost management to ensure the successful completion of subsequent construction tasks. The use of BIM technology in the construction process can make the cost control more effective. For example, the relevant staff can input the cost of manpower, materials and equipment needed in the construction process based on the BIM platform for calculation, which makes the cost control work more convenient in implementation. And the use of BIM platform for construction cost control is beneficial to the scientific and reasonable allocation of resources, so that cost calculation and estimation is more feasible, so that the unreasonable content of the construction plan can be timely optimised, and the resources can be fully utilised, resulting in a significant improvement in the cost control effect of the project. 2) Material control Construction materials occupy a large proportion of the project construction cost, therefore, in the construction. Therefore, strict control of materials in the construction stage is of great significance to cost control. In the traditional material control process, due to the low level of information technology, material cost control relies too much on human resources, which not only increases the burden of
staff, but also has a less than ideal management effect. With the use of BIM technology, control work can be carried out through the BIM platform, significantly improving management efficiency and providing better assurance in terms of accuracy. Technicians can use the 3D model to fully reflect the overall flow of the building, determine the construction volume, prepare procurement plans and allocate materials in accordance with the construction schedule, so that cost management can be fully implemented.

4. Application of BIM Technology in Construction Cost Control

4.1 Ability to Forecast Costs Prior to Commencement of Works

The tenderer can make a rough cost forecast based on the materials provided by the tenderer and the drawings of the project. This approach relies excessively on the materials provided by the tenderer and in most cases does not correspond to the preliminary projections and is not meaningful. Therefore, BIM technology is needed for construction projects, as the data in the BIM database can provide assurance for various management needs and enable potential problems to be identified and dealt with in a timely manner. The BIM database is mainly used to quickly and accurately calculate the task volume of construction projects through the sharing of other databases, enhancing the efficiency and allowing cost forecasting for construction projects to be guaranteed.

4.2 Building Construction Cost Planning Stage

The construction project cost planning stage is the key stage of construction cost control, to manage and arrange the construction personnel, mechanical equipment and material deployment of the construction project, based on the existing construction project information and the prepared construction plan, the limited personnel, materials and mechanical equipment will be arranged in a reasonable and efficient manner, the use of BIM technology in the cost control stage has the following characteristics: (1) All project construction information of the construction project is saved in the digital model in the form of big data, and the engineering personnel can access the historical information of the project at any time, avoiding the reliance on the experience of the engineering personnel; (2) through photography and relevant engineering information input, the BIM model can automatically identify the construction progress of the construction project. By comparing the real construction progress with the planned construction progress, key factors such as construction volume and construction cost can be quickly analysed, and then the adjusted construction plan can be allocated to the next project plan; (3) BIM technology incorporates advanced project management theory and diverse building information models (structural model, piping model, construction model, steel model, etc.), which can be used in the construction (3) BIM technology incorporates advanced project management theories and diverse building information models (structural, piping, construction, reinforcement, etc.) to discern the reasonableness of the construction project at the early stage, and to optimize the construction process, collaboration. The optimisation of the construction process by mobilising all aspects.

4.3 Application During the Construction Phase

The construction phase is also a critical period for controlling project costs. The main reason for this is that there are many influencing factors during this phase and therefore the correct use of BIM technology during this phase allows the construction of a project to be managed and controlled by analysing different data. Project costs can be controlled at any time depending on local conditions and this provides a solid foundation for project cost control in Mureai. When using BIM technology, all aspects of project construction can be analysed and studied and the consumption and output of the project can be fully analysed to better control project costs. For example, in the North East, which is affected by ambient temperatures, insulation needs to be designed for construction projects. During this time, BIM can be used for timely planning to ensure smooth development of subsequent projects and to ensure the cost and quality of the project construction. There are many aspects of the construction phase, such as the selection of building materials, the use of construction equipment and the work of people and technology, that are difficult for construction projects.

5. Conclusion

All in all, BIM technology has good application value and application space in construction engineering management, and there are many interactions between the two. Construction project managers can carry out construction project management by improving the efficiency of effect display, project management accuracy, resource control efficiency and construction management efficiency, laying a solid and stable foundation for the smooth development of construction projects.

References