Research on the fine management of engineering cost based on BIM5D

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Abstract. The implementation of the project is a complicated system. With the complexity and accuracy of all kinds of project construction and calculation of engineering quantity requirements continue to increase, the common project cost management system has not met the construction project management requirements. This paper combines the mature and effective theory of fine management in manufacturing management and introduces BIM5D model and its core technology. It aims to explore fine management mode of project cost based on BIM5D, change the present situation of the project cost management, and ultimately to achieve the goal of increasing the value of project management.

1. Research background and significance

1.1 BIM5D Technology
BIM (Building Information Modeling) technology originated in foreign countries in the 90s of last century. Its basic idea is that when using computers to do architectural design, it no longer operates on basic elements such as line segments, arcs, circles, but rather operates on building components with attribute information. BIM technology is a new technology that leads the construction of information technology to a higher level. Its comprehensive application will have a huge and far-reaching impact on the progress of construction industry, and greatly improve the integration degree of construction engineering. At the same time, it also brings great benefits to the development of the construction industry, so that the quality and efficiency of the design and the whole project are greatly improved and the cost is reduced.

The BIM data model is based on the 3D modeling technology, which integrates the attribute information of the building components and encapsulates the multidimensional and multi-attribute information carrier. BIM 5D carries out the 3D geometric model and the construction time and cost of building entities. The contents include spatial geometry information, WBS node information, time range information, contract budget information and construction budget information. Thus, the shortcomings of BIM only concerned with geometric properties and component attributes are solved, and the modeling ability and application scope of BIM information model are extended.

1.2 Research status at home and abroad
As a new information technology, BIM has been effectively utilized in construction projects. Many scholars at home and abroad have studied it. The successful case of BIM also proves its value in construction projects. The United States promulgated the US National BIM standard in 2007 -- NBIMS, and the Singapore government researched and developed the e-Plan Check project in 2000, and it has developed into the largest BIM service system in the world. Tamera has proposed an
integrated application of 4D, 5D technology and benefits for project teams and project owners\textsuperscript{[5]}. Zhang Shujie drew lessons from the data storage and high efficiency of BIM technology, analyzed the great application value of BIM technology in engineering cost management, and put forward some suggestions for realizing the problems faced by these values\textsuperscript{[6]}. He Guanpei thinks that BIM can be applied to the field of construction cost budget. The use of BIM can quickly assess the cost change caused by design change and improve the efficiency of project cost management\textsuperscript{[7]}. Huang Hua puts forward a new way to effectively control the cost in the design stage from the technology -- Based on the cost management mode of BIM, and the concrete implementation scheme of this model\textsuperscript{[8]} . Liu Hong's contract management module in BIM5D model realizes the whole contract management in the whole construction process through the overall dismantling of the contract text and the connection with the cost and schedule module. \textsuperscript{[9]}

2. Fine management of project cost

There are 4 problems existed in project cost fine management: early prediction of low accuracy and slow speed of information processing, party data changes quickly, stage of information distortion due to the long life cycle, the whole process of the parties and the perspective of information management. The main content of the fine management of construction cost is to reasonably determine and control the project cost effectively, pay attention to the refinement of the cost contents of the participants at all stages, give consideration to the correlation between the whole processes of the project cost, and effectively control the actual construction results of the pre-decision. The whole process of construction project is divided into 5 phases and 8 steps corresponding to the main content of each stage of project cost management, including investment estimation, design budgetary estimate, construction drawing budget, contract price, contract settlement and the completion of project accounts\textsuperscript{[10]}. Each stage repeatedly involved many subjects; each stage has different influence on the main content of cost management.

3. Fine management of project cost based on BIM5D

The information technology capability of BIM5D technology can improve the accuracy of prediction, speed up the processing of information, facilitate data sharing of participants, and transmit information at all stages. The fine management of project cost can improve the efficiency and effect of the project cost management, and it is of great significance to the current project cost management. There are abundant functions in BIM5D software such as, three dimensional mapping, 3D dynamic simulation, visual collision inspection, virtual construction and visualization technology. Besides, the data model of Revit design software can be plugged directly into the BIM5D software through plug-in components.

Therefore, the application of BIM5D technology in the project cost management integrates civil engineering, mechanical and electrical integration can, steel, cloth and other professional field model. And the interface is so comprehensive that it can undertake Revit, Tekla, Magi-CAD, Glodon, the international standard IFC and other mainstream model file. Meanwhile, it relies on a strong engineering count of core technology, to achieve accurate data, assist engineers to have a better conduct of fine management in schedule, cost control, quality and safety problems. A brief introduction to this system is shown in figure 1 below.
4. Concluding remarks:
The application of BIM 5D in project cost can participate in the project from many aspects of management, to solve the engineering problems due to the long life cycle, the whole process of the parties so as to achieve fine management.

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