

Research on the Synergy Mechanism of Project Management Based on Bim

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Abstract: my country's construction industry has long been due to its serious waste of resources, frequent safety accidents, mutual closure of information between various participants, lack of effective project collaborative management during the implementation of construction projects, low production efficiency, serious product quality problems, and advanced technology. The lack of application and the lagging of its own technological progress have been blamed. The new collaborative management model of construction projects based on emerging technologies has become an important technical method and technical means to solve these problems. Building Information Modelling (BIM) is a modern information technology platform that can realize the design, construction and operation management of construction projects by creating and using digital models. It is integrated, intelligent, digitized, and model information. The relevance and other characteristics have created an information platform that facilitates communication for all parties involved in the construction project. In recent years, BIM technology has received increasing attention and practical application in the domestic construction industry, and has provided effective modern information technology support for the research and exploration of new construction project collaborative management models and related systems and mechanisms. This selection of "project management coordination mechanism based on BIM technology application environment" for targeted research has important practical significance and value.

1. Introduction

Under the trend of global competition, how to break through the development dilemma of the construction industry has become an urgent problem to be solved. Through the comparison of the production level between the construction industry and the manufacturing industry, people regard the application and promotion of information technology in the construction industry as a breakthrough in the development of the construction industry. In the 1980s, the popularization and promotion of Computer Aided Design (CAD) technology enabled architectural drawing to move from manual to electronic, which improved drawing efficiency and enabled designers to transfer more energy and time to the deepening of drawings. Design and improvement have improved the design quality. However, this technology has gradually discovered its own shortcomings and deficiencies in the global competitive environment during the decades of application. On the one hand, the final graphic file can only contain a small part of the information of the construction project; on the other hand, the information between different CAD drawings and specifications is split, and information coordination cannot be achieved. CAD applications for the purpose of improving drawing efficiency can no longer meet the information needs of the construction industry under the trend of global competition. In 2002, as the world's largest 2D and 3D design, engineering and entertainment software leader, Autodesk Co., Ltd. introduced the concept of Building Information Modelling (BIM). As the general term for digital modeling software, BIM parameterizes real building information in a virtual environment. Based on this digital model platform, from design, construction to final operation and maintenance, the whole life cycle information sharing and improvement of the entire construction project is realized. An important feature of BIM technology that differs from traditional CAD design methods is that through a three-dimensional co-working platform and three-dimensional information transmission methods, the collaboration of information in the entire process of design, construction, and operation and the collaboration of the working methods of the participants are realized. The development of

information technology in the construction industry has made up for the lack of information technology in the construction industry, created a collaborative work model for participants with BIM as the core platform, and is committed to ensuring the unity of goals in the whole process of construction. BIM provides information technology support for the improvement of production efficiency and the reduction of disputes in the construction industry.

2. The Design of the Macro-Coordination Mechanism of the Project Participants in the Bim Environment

The whole process of project management refers to the whole life of the project, from the beginning of the project conception to the whole process of scrapping and recycling of the project. This article refers to the entire process of collaborative management as macro collaborative management. In engineering project management, although the life cycle of engineering projects of different types and scales is different, they can be divided into four stages. Preliminary planning and establishment stage of the project: The main tasks and contents of this stage include: project conception, target design, feasibility study and approval of the project; project design and planning stage: the work at this stage: design, planning, bidding and bidding Various pre-construction preparations; the construction phase of the project: this phase includes all the work from the start of the site to the completion and delivery of the project; the use (operation) phase of the project. my country's basic construction procedures include six steps: project proposal, feasibility study, design work, construction preparation, construction implementation, completion acceptance and delivery. Each stage and process are inseparable. The coordination of the whole process of a construction project refers to the sharing of data and resources throughout the life of the project and the collaborative work of all parties. The processes of the original isolated construction project are integrated to form a coordinated system, which is one of the processes based on information collaboration. Inter-coordination, by eliminating various redundant and non-value-added word processes (activities) in the process, as well as all obstacles that affect the efficiency of the process caused by human factors and resource problems, the overall project process is optimized.

In the plan planning stage, BIM can assist the owner in commercial positioning and building effectiveness analysis. For example, the surrounding environment simulation and traffic analysis for building site selection; planning and optimization of green buildings, and building performance analysis from aspects of wind energy and sunshine. The application of BIM makes the scheme design more scientific and efficient. In the design stage, the application of BIM can show the design concept and design effect intuitively, effectively solve the collision problem of various professions in the design stage, reduce design changes in the construction stage, and help the owner by controlling the cost by engineering quantity statistics. Manage design units, improve design level and design efficiency, and lay a good foundation for bidding and construction. In the construction phase, the application of BIM can make the design results better guide the construction, simulate the construction plan through the three-dimensional model, show the construction progress, and help the owner accurately review the construction unit's engineering volume. The final completed model can also assist in acceptance and delivery. In the operation stage, the BIM model with rich project information will be handed over to the owner when the project applying BIM technology is completed. These models will play an important role in the long operation period of the project in the future. Usually the operating cost of a project is its The project cost is three times, so the BIM model mainly generated in the construction stage brings great value to the owners of self-operated projects.

2.1 Design of the Micro-Coordination Mechanism of the Project Participants in the Bim Environment

The theoretical research part summarizes the application of BIM in the whole life of the project from the global BIM standards/guidelines and academic literature. BIM is an information resource sharing platform, and the implementation of each application involves the collaborative work of multiple participants. This article refers to the collaboration of participants under each BIM

application as micro-collaboration. Based on BIM application screening, combined with BIM application cases released by Autodesk, six BIM applications including conflict detection, pipeline synthesis, engineering change, construction plan simulation, construction schedule simulation, and engineering calculation are selected to introduce the application value of BIM. These six application points include the basic application points of BIM, as well as BIM applications in three latitudes of 3D, 4D, and 5D. In addition, due to space limitations, this article only elaborates on the design of coordination mechanisms for change management, construction plan simulation, and construction schedule simulation.

Conflict detection: refers to the establishment of a BIM three-dimensional spatial geometric model, in the digital model in advance to warn the different professions (architecture, structure, HVAC, fire protection, water supply and drainage, electrical bridges, equipment, curtain walls, etc.) in space Conflict, collision problem. By discovering and solving these problems in advance, the design quality of the project can be improved and the adverse impact on the construction process can be reduced. **Pipeline synthesis:** In the CAD era, the engineering design is mainly undertaken by architects or professional engineers. Through the overlap of paper drawings of different professional designs, conflicts are found visually. Due to the backward technology, pipeline synthesis has become the main problem of engineering design. land. In the BIM technology environment, through the integration of 3D virtual models, professional designers can intuitively discover problems in the virtual environment, greatly improving work efficiency. In addition, through effective pipeline conflict resolution solutions, engineering changes in the later construction process are significantly reduced, construction efficiency is improved, change costs are reduced, and construction period is saved. **Change management:** Engineering Change (EC, Engineering Change) refers to changes made to a project that has been officially put into construction. During the implementation of the project, changes to part or all of the project in terms of materials, technology, function, structure, size, technical indicators, number of projects, and construction methods in accordance with the procedures agreed in the contract. Repeated changes during the construction process led to an increase in the construction period and cost, while poor change management led to further changes, making the cost and construction period goals out of control. **Construction plan simulation:** The purpose of construction plan simulation is to express, examine, and verify the rationality of the construction plan in BIM in important construction areas or parts, check the deficiencies of the plan, and assist the construction staff to fully understand and implement the requirements of the plan.

Construction simulation should take the actual construction operation as the simulation object, and express the simulated parts through BIM means, including three-dimensional multi-angle display, structural disassembly, process overlap sequence, professional cooperation, operation scale reservation, etc. The simulation display of the construction plan should be able to truly and fully reflect the key and difficult points of the construction, and play a good role in predicting and guiding the actual operation. **Construction schedule simulation:** The purpose of construction schedule simulation is to express, evaluate, and verify the rationality of the schedule plan in BIM mode under the requirements of the master control time node, fully and accurately display the plan image progress at each time point in the construction schedule, and Tracking expression of the actual implementation of the progress. **Engineering calculation quantity:** The engineering quantity is the engineering quantity of each sub-project or structural component expressed in natural measurement units or physical measurement units. The engineering cost is based on the engineering quantity. The accuracy of the engineering quantity calculation directly affects the accuracy of the engineering cost and the investment control of the engineering construction. Engineering quantity is an important basis for construction companies to prepare construction operation plans, rationally arrange construction schedules, and organize on-site labor, materials, and machinery. It is also an important evidence for the settlement of the project price to the project construction investor. The application of BIM was clearly defined when BIM was introduced in the project. During the implementation of the project, all participants need to perform their duties according to the needs of the application point. The micro-collaboration mechanism design in this section mainly refers to the

work interaction path of all parties in the actual project, combined with BIM as the information collaboration platform, to re-plan and define the work process of all parties. The following sections give a collaborative flow chart of change management, program simulation, and schedule simulation. The chart introduces the micro-coordination mechanism from the two latitudes of the occurrence stage and the participants. According to the implementation path of the BIM application in the project, first confirm the scope of the work content under the BIM application, determine the designed participants, formulate the implementation path, track the completion process of the task, and review the completed results.

3. Conclusion

This thesis starts from the backward technology development of the construction industry and the existing problems of project management, and studies the status quo of the development of information technology in the construction industry at home and abroad and the status of collaborative research on project management. Based on the collaborative management research and BIM research under the engineering project management procurement mode, the collaboration issues facing the implementation of BIM applications in current engineering projects are discussed. The solution of this paper is proposed to establish a set of project management flowcharts suitable for the characteristics of BIM collaboration, and to clarify the responsibilities and tasks of all parties. Based on this, combined with the characteristics of BIM ideas, a macro coordination mechanism of project participants in the BIM environment was designed. In addition, in order to better realize the application value of BIM, the micro coordination mechanism of project participants in the BIM environment was also discussed. Collaborative process under BIM application. The feasibility and practical results of the BIM coordination mechanism are demonstrated in the form of cases. Strive to provide solutions for the future collaborative development of BIM.

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