

Technical Application and Practical Exploration of BIM in Intelligent Construction

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Abstract

The application of BIM Technology in today's construction related industries and fields has been very well, and a complete application method has been formed. At the present stage, the construction industry is characterized by informatization, industrialization and integration. It is constantly developing towards intelligence and systematization, and all emerging technologies need to be integrated with it. Therefore, how to better realize the application of BIM Technology through the technology that has formed a complete system is an urgent key problem to be solved at this stage. Based on the analysis of industrial development status and system construction, this paper aims to explore the application system of BIM Technology in the whole process of intelligent building construction, study the development and practice of BIM Technology in intelligent construction, and summarize the application of intelligent construction technology and the development trend of building industrialization in the future.

Keywords

BIM technology; Intelligent construction; Technology application; Exploration and practice.

1. Introduction

With the development of BIM Technology, Internet of things technology, cloud computing technology and other emerging construction technologies at this stage, the construction industry and related industries will usher in comprehensive innovation and adjustment. Intelligent building came into being in this development process. 5g, cloud platform, Internet of things, big data analysis, intelligent manufacturing and other emerging integration technologies of modern construction industry make the construction and operation and maintenance of intelligent buildings possible. With the people's demand for building function, performance and service conditions, the construction industry has to carry out a new revolution with the support of current technology. Intelligent buildings rely on new integration technologies in the construction fields such as Internet of things, big data, cloud computing and artificial intelligence for the basic realization guarantee in all stages of design, construction, operation and maintenance.

2. Development of BIM Technology Application

With the rapid development of science and technology, the application of BIM technology to build information model can effectively improve the construction efficiency. The engineering practice of Daxing airport in China has proved that the application of BIM Technology can

reduce many engineering problems (Figure 1) [1]. In the construction stage, the project information management platform can be established on the basis of BIM application, and the visual coordination and parametric characteristics of BIM can be used to reduce the coordination of various works in the construction process and reduce the construction period. In the design stage, BIM Technology can be used for three-dimensional plane model planning, drawing review, scheme simulation, engineering quantity calculation, collision inspection and Simulation of the construction process of high-risk scheme. In the operation and maintenance stage, BIM Technology can be applied to space management, equipment management and concealed works management. It can quickly and directly find out the specific location of equipment maintenance, reduce the search time and reduce the loss of equipment maintenance cost. Through the model, we can understand various potential safety hazards in concealed works, so as to make the project operation management efficient and concise.



Figure 1. Application of BIM Technology in Daxing Airport (Revit full discipline design model)

BIM Technology application capability is related to all relevant systems of the construction industry [2] [3]. A series of policy guiding ideas such as informatization development strategy and informatization development level mentioned in the outline of national medium and long term reform and development plan (2010-2020). Forcing the construction industry to find an effective means and technical path to truly cover the current situation. BIM Technology, a relatively mature and highly recognized emerging construction technology in the industry, has become an important tool for the information reform of the construction industry and has attracted the attention of major domestic construction enterprises.

3. Application of Intelligent Construction Technology Based on BIM

Combined with the modern information technology based on BIM, the intelligent construction technology of large steel structure building based on BIM is applied, and the key points are shown in Figure 2 [4].

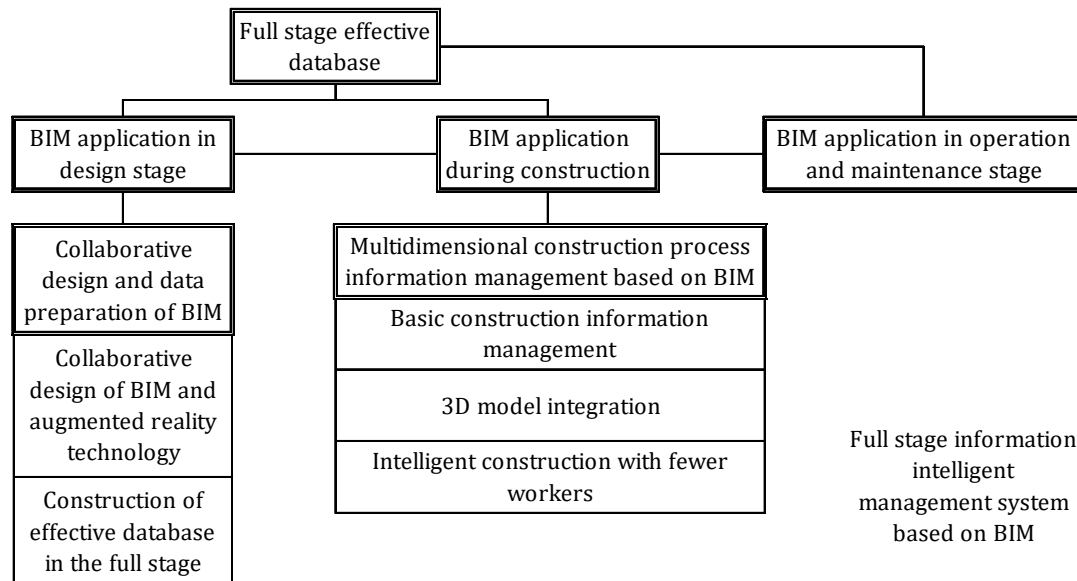


Figure 2. Application key points of intelligent construction technology based on BIM

3.1. BIM Based Collaborative Design and Data Preparation

At present, BIM is used in the construction stage. In order to ensure the quality of the whole building system, attention should be paid to building details from the design stage. The forward design of BIM can give full play to the coordination of BIM Technology, display it with augmented reality technology, and establish a collaborative design platform based on BIM and augmented reality technology for multi-disciplinary collaborative design.

3.2. Information Management of Multidimensional Construction Process Based on BIM

Based on BIM technology and various new technologies, the intelligent safety monitoring system in the construction process is developed and applied, and the structural health monitoring system, three-dimensional visual dynamic monitoring system and video monitoring system are integrated to realize load and environment monitoring, overall response monitoring of the structure, local corresponding monitoring of the structure Visual safety monitoring and video safety monitoring during the whole construction process. The pre assembly and construction management of steel structure based on BIM Technology can assist in selecting the optimal scheme of steel structure, realize the standardization and industrialization of buildings, ensure the construction period and provide sufficient data support for the operation and maintenance stage.

3.3. Less Works Intelligent Construction

In order to resist the challenge of personnel safety management caused by epidemic and other sudden disasters and the severe situation of delayed construction period caused by personnel shortage, it is necessary to update the traditional construction mode and gradually realize the intelligent construction mode of fewer workers or even unmanned by using information technology and intelligent equipment.

4. Practice and Exploration of BIM in Intelligent Construction

4.1. Forward Design Based on BIM

Digital construction is based on BIM "forward design". The forward direction is relative to the reverse direction, that is, the core work of design is completed under the working framework of BIM. The BIM platform is used to establish a unified three-dimensional visual data model for

collaborative design and drawing management of various disciplines, so as to achieve seamless data connection between disciplines and support multi-stage and multi participant model coordination and deepening. BIM model is the best means and tool to carry and realize information sharing and collaboration. Through the "three integration" construction of prefabricated buildings, it can realize rapid information sharing and efficient collaboration.

BIM based standardized component composition "forward design". Based on standardized condominium modules, it is combined into various standard buildings. All disciplines combine positive design to realize the "digital twin" in the whole process of construction.

BIM based civil engineering deepening "forward design". In the detailed design stage, the model shall be disassembled based on the design progress node, and the structural practices and other contents in the design drawings shall be improved according to the model depth required by the BIM informatization guidelines, so as to completely include the component information required for construction, and other information of components shall be added according to the needs of subsequent construction, Make the BIM information model of civil engineering design further meet the construction standards.

Professional and whole process collaborative design. Different professional designers can divide their work and cooperate on the same platform and design according to certain standards and principles, which improves the standardization of design results. Using parametric rapid modeling technology, a professional component library is established, and the design intention is driven by parameters to automatically establish the model. Once the design scheme conflicts with factory manufacturing and on-site construction, the optimization design can be carried out on the same parametric information model. Solve possible problems in component production and on-site construction in advance, so as to achieve efficient coordination of component design, factory manufacturing and on-site installation.

4.2. Intelligent Construction and Intelligent Site

Digital construction technology is the mutual integration of virtual entity twin construction, first virtual construction, then entity construction. Through digital virtual construction, the production objects, production factors and management factors are linked and online in real time through various terminals, and the management processes of construction production, business and technology are guided and optimized to improve the overall operation efficiency, management efficiency and decision-making efficiency of engineering construction, so as to realize lean entity construction.

Quality monitoring. The on-site quality inspection work completes the cycle of inspection, rectification and recheck online through app, and the data can be automatically synchronized to the web page for synthesis. For the potential safety hazards of the project, relevant personnel can realize quality and safety linkage inspection through the mobile terminal. Realize the real-time cloud storage of on-site supervision records and safety diary records on the construction site, and multiple people can cooperate online at the same time.

4.3. Application limitations of BIM Technology

The development of BIM Technology in China is very short, and some problems have been encountered in the application process. These problems mainly include the following two aspects.

(1) BIM application software

In recent years, BIM software on the market has various types and different functions. The construction unit requires BIM to be applied to the actual project in the construction process, but in the actual use process, BIM Technology is mostly used in the design and bidding stage. There are relatively few BIM application software in the construction stage, and most of them are applied to the construction site after analysis and adjustment by other software. At present,

most BIM software only meets the application of one or several aspects, and there are few comprehensive BIM software, especially the integrated BIM software that can run through the design stage to the operation and maintenance stage.

(2) BIM data standards

With the application and development of BIM Technology, the difficulty of data exchange has become a common situation. China does not widely use the international IFC (Industrial basic standard) data standard. At this stage, China has little research on foreign standards. Combined with China's actual construction projects, the expansion and supplement of data standards is still not in place. China's BIM data standardization needs to be summarized in more detail.

5. Conclusion

The participation of BIM based intelligent construction technology will greatly improve the informatization degree of buildings, combine the Internet of things, digital twin and other new technologies for informatization intelligent management, optimize the organization and management mode and improve the management efficiency.

BIM Technology is applied to comprehensively optimize and intelligent management in engineering design stage, construction stage and operation and maintenance stage, give full play to the advantages of BIM Technology, and accelerate the integrated application of BIM Technology in the whole life cycle of new building industrialization. The construction of BIM application system in the whole process of intelligent building construction forms a complete BIM Technology Application System. Firstly, we should start from the macro level, clarify the specific objectives of each process in each stage, and determine a new BIM Technology Application System in the whole process of intelligent building construction in combination with the industrial needs of traditional methods and achievements.

While building the overall system, we should not only highlight the ability of project management, but also pay attention to the integration of the overall system and relevant technologies in the whole process of intelligent building construction. Build a benign system supported by all emerging technology systems and integrated with the needs of modern development. We should meet the requirements of pre design, make the overall system more interactive and inclusive, and provide support for the application of follow-up practice system. Finally, promote the overall construction of BIM Technology System in the whole process of intelligent building construction.

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