

The Rapid Construction Strategy of Architectural Engineering Based on BIM Technology

Hong-Gang Kang*, Feng-Jian He, Guang-Yuan Fan

China Construction Fifth Engineering Division Corp.,Ltd.Changsha,Hunan 334000,China

*Correspondence to: Hong-Gang Kang,China Construction Fifth Engineering Division Corp.,Ltd.Changsha,Hunan 334000,China,E-mail:305369839@qq.com

Abstract: With the continuous development of information technology, the construction industry is gradually undergoing digital transformation. Among them, Building Information Modeling (BIM) technology, as an important digital tool, is widely used in construction engineering. This article aims to explore the rapid construction strategy of architectural engineering based on BIM technology, analyze the advantages of BIM technology in improving construction efficiency, optimizing construction processes, and reducing construction costs, and propose corresponding implementation suggestions.

Keywords: BIM technology, construction engineering, construction strategy

Introduction

In recent years, China's construction industry has continued to develop rapidly, but at the same time it faces problems such as low construction efficiency and serious waste of resources. In order to solve these problems, an increasing number of construction companies are beginning to try to introduce BIM technology, aiming to improve construction management levels and achieve rapid construction through digital means. Therefore, researching the rapid construction strategy of architectural engineering based on BIM technology is of great practical significance.

1. Application Advantages of BIM Technology in Construction Engineering

1.1 Improving Construction Efficiency

In construction engineering, the efficiency of construction directly affects the project's schedule and

costs. Traditional construction methods often rely on 2D drawings and manual coordination, which proves inadequate when dealing with complex structures and multidisciplinary intersections, leading to inefficiency. However, the introduction of BIM technology has brought revolutionary changes to improve construction efficiency. Firstly, the three-dimensional models provided by BIM technology allow construction personnel to better understand design intent and construction requirements intuitively, reducing the need for the conversion process from 2D drawings to 3D entities, thereby expediting construction decisions and instructions. This intuitiveness not only enhances the efficiency of construction personnel but also reduces rework rates caused by misunderstandings. Secondly, BIM technology's clash detection feature can identify conflicts between various professional designs before construction begins, avoiding stoppages



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and modifications encountered during construction. This proactive conflict resolution significantly reduces uncertainty during construction, ensuring continuity and efficiency. Furthermore, through virtual construction and schedule simulation provided by BIM technology, construction teams can simulate and optimize the entire construction process before commencement, identifying potential construction bottlenecks and risk points and formulating countermeasures in advance. This ensures that problems during actual construction can be swiftly addressed, ensuring smooth progress. Lastly, BIM technology enables precise engineering quantity calculations and cost management, providing accurate bases for material procurement and progress payment. This prevents construction delays due to material shortages or insufficient funds, further enhancing construction efficiency^[1].

1.2 Optimizing Construction Processes

In traditional construction, construction processes often rely on 2D drawings and manual coordination, prone to errors especially in handling complex structures and multidisciplinary intersections, resulting in inefficiency. However, the introduction of BIM technology brings significant advantages to optimizing construction processes. Firstly, by constructing three-dimensional models, BIM technology facilitates the integration and collaboration of various professional designs. This means that designers from different disciplines can work on the same model, avoiding conflicts and misunderstandings caused by information silos in traditional methods. This collaborative design not only improves design efficiency but also lays a solid foundation for subsequent construction processes. Secondly, BIM technology enables construction simulation and optimization. By simulating the construction process, potential issues and conflicts can be identified before construction, allowing for early formulation of solutions. This prevents stoppages and rework caused by discovering problems during actual construction, thus optimizing construction processes and reducing waste. Additionally, BIM technology facilitates dynamic management of construction schedules. By updating model information in real-time, construction progress can be accurately tracked and compared with planned schedules. This helps in promptly identifying schedule deviations and taking

corresponding corrective measures to ensure that construction progresses as planned.

1.3 Reducing Construction Costs

Cost control is a key factor in the success of construction projects. BIM technology, as an advanced digital tool, plays an important role in reducing construction costs. Firstly, the accurate quantity calculation function of BIM technology can significantly reduce material costs. Through BIM models, construction personnel can accurately calculate the types and quantities of materials required, avoiding waste and surplus materials. This precise material management not only reduces material costs but also helps in reducing warehousing and transportation expenses. Secondly, BIM technology can optimize construction schemes, thereby reducing construction costs. By using virtual construction and clash detection features of BIM models, construction personnel can identify potential issues and conflicts before construction begins and formulate solutions in advance. This prevents stoppages and rework caused by discovering problems during actual construction, thereby reducing additional costs incurred from modifications and rectifications. Furthermore, BIM technology improves resource utilization efficiency, reducing construction costs. Through resource management features of BIM models, human resources, materials, equipment, and other resources can be allocated and scheduled rationally, ensuring their full utilization. This avoids waste and idleness of resources, improves construction efficiency, and consequently reduces construction costs. Lastly, BIM technology facilitates transparency and refinement in project management, providing strong support for cost control. Through information sharing and dynamic updating features of BIM models, project managers can grasp key information such as construction progress and costs in real-time, enabling timely cost analysis and forecasting. This helps in identifying the risks of cost overrun and taking corresponding cost control measures to ensure that project costs are within budget^[2].

2. Strategies for Rapid Construction of Architectural Engineering Based on BIM Technology

2.1 Establishing a Comprehensive BIM Model Management System

In modern architectural engineering, Building Information Modeling (BIM) technology has become

a key driving force for industry advancement. To maximize the benefits of BIM technology, it is essential to rely on a comprehensive and detailed BIM model management system. This system is not only about constructing on the technical level but also signifies a profound change in the entire project management process. Establishing a comprehensive BIM model management system means efficiently integrating and accurately conveying information from project planning to construction, operation, and other stages. This requires clearly defining the application goals and strategies of BIM from the beginning of the project, ensuring that various professional teams work under unified standards and specifications. By establishing strict modeling rules and data management processes, the loss and ambiguity of information transmission can be significantly reduced, thereby enhancing the collaborative efficiency among project teams. Furthermore, establishing a BIM model management system also signifies an upgrade to traditional project management methods. It not only enables real-time updating and sharing of data information but also provides decision-makers with more scientific and accurate bases through data analysis. This data-driven management approach helps reduce decision-making errors and enhances the project's ability to respond to risks. In summary, establishing a comprehensive BIM model management system is an inevitable trend in the development of the construction industry and an important guarantee for achieving rapid and efficient construction of architectural engineering. Through the construction of this system, we can expect the construction industry to take more solid steps towards informatization and intelligence.

2.2 Strengthening the Integration of BIM Technology and Construction Management

In modern architectural engineering, the integration of BIM technology and construction management has become the key to improving project efficiency and quality. Strengthening this integration not only signifies a combination at the technical level but also represents the innovation of management concepts and methods. Firstly, BIM technology provides construction management with a brand-new perspective and tools. Traditional construction management often relies on 2D drawings and manual coordination, which can be limited when dealing

with complex structures and multiple professional intersections. However, the characteristics of BIM technology, such as three-dimensional models, time dimensions, and cost dimensions, allow construction management personnel to understand the project status more intuitively and comprehensively, thereby making more precise and efficient decisions. Secondly, strengthening the integration of BIM technology and construction management helps achieve refined management. Through the BIM model, construction management personnel can grasp key information such as construction progress, resource consumption, and costs in real-time, promptly identify and address potential problems. This management method not only improves work efficiency but also helps reduce resource waste and the risk of cost overruns. Furthermore, the integration of BIM technology and construction management also promotes the digital transformation of project management. In the digital age, data has become the core of project management. As an integrated database of all project information, the BIM model provides construction management personnel with abundant data sources. By mining and analyzing this data, construction management personnel can understand project patterns, optimize management strategies, and improve project performance. Finally, strengthening the integration of BIM technology and construction management also helps enhance the collaborative capabilities of project teams. BIM technology provides a shared information platform, enabling project parties to communicate and collaborate in real-time. This collaborative work method breaks down information barriers in traditional management, improving the overall efficiency of the team. Strengthening the integration of BIM technology and construction management is an inevitable trend in the development of the construction industry. Through this integration, we can expect comprehensive improvements in project management in terms of efficiency, quality, cost, and collaboration, injecting new momentum into the sustainable development of the construction industry^[3].

2.3 Enhancing the BIM Skill Level of Construction Personnel

In architectural engineering, construction personnel are the direct executors of projects, and their skill levels directly affect the quality, efficiency, and safety

of the project. With the widespread application of BIM technology in the construction industry, enhancing the BIM skill level of construction personnel has become a key factor in ensuring the smooth progress of projects. Firstly, as an advanced digital tool, BIM technology provides a more efficient and accurate information management method for construction. Construction personnel mastering BIM skills can better understand and execute project designs, reduce errors and rework during the construction process, thereby improving work efficiency and quality. Secondly, enhancing the BIM skill level of construction personnel helps achieve information sharing and collaborative work on projects. As an integrated information platform, the BIM model can integrate information from various stages and disciplines of the project. Construction personnel with BIM skills can better communicate and collaborate with other professional personnel, breaking information silos, reducing redundant work, and resource waste. To enhance the BIM skill level of construction personnel, construction companies can take the following measures: First, strengthen BIM skills training, regularly organize construction personnel to participate in BIM training courses and seminars, and learn BIM basic knowledge and operation skills; Second, establish a BIM skill assessment mechanism, using BIM skill level as an important basis for construction personnel promotion and salary evaluation;

2.4 Introducing Intelligent Construction Equipment

With the rapid development of technology, intelligent construction equipment has become an important means for modern architectural engineering to improve efficiency, guarantee quality, and enhance safety. In the pursuit of rapid construction of architectural engineering, the introduction of intelligent construction equipment is particularly important. Intelligent construction equipment integrates advanced sensors, control systems, and artificial intelligence technology, enabling automated, precise, and efficient construction operations. For example, intelligent measurement robots can quickly and accurately complete measurement tasks on construction sites, improving measurement accuracy and efficiency; intelligent concrete mixing stations can automatically adjust concrete proportions based on real-time data to ensure concrete quality; while intelligent tower

cranes can enhance lifting operation safety and efficiency through automatic recognition and obstacle avoidance systems. The introduction of intelligent construction equipment not only greatly improves construction efficiency, shortens construction periods but also reduces errors and safety risks associated with manual operations. At the same time, the application of intelligent equipment also helps improve the environmental performance of construction sites, reducing emissions of pollutants such as noise and dust. However, the introduction of intelligent construction equipment also faces challenges such as high equipment costs, and the need for professional personnel for operation and maintenance. Therefore, when introducing intelligent construction equipment, factors such as project needs, cost budgets, and team capabilities need to be comprehensively considered to develop a reasonable introduction plan. Overall, the introduction of intelligent construction equipment is one of the important ways for the construction industry to achieve rapid construction and high-quality development. Through the rational selection and use of intelligent equipment, we can expect significant improvements in efficiency, quality, and safety in architectural engineering.

Conclusion

The strategy of rapid construction of architectural engineering based on BIM technology has significant advantages in improving construction efficiency, optimizing construction processes, and reducing construction costs. However, there are still challenges and issues in practical application, requiring joint efforts from governments, enterprises, and researchers to continuously improve and innovate the application strategies and methods of BIM technology. This is essential to promote the sustainable and healthy development of the construction industry.

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