

Research on the Application of BIM Technology in Construction Project Management

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Abstract: As we all know, China is a big country in infrastructure construction, and has accumulated rich experience in architectural art and engineering management in the process of urban construction development. With the continuous development of the times, the introduction of information technology has significantly improved the overall quality and efficiency of China's construction engineering management at this stage. In particular, as a revolutionary technology to promote the rapid development of the technology industry, the comprehensive application of BIM technology will have a huge impact on the development of the entire industry. Therefore, this paper will explore the specific application of BIM technology in construction project management, analyze the characteristics of BIM technology, explore the application value of BIM technology in construction project management, summarize the application problems of BIM technology in modern construction project management, and put forward corresponding optimization countermeasures, So as to promote the application and development of BIM technology in construction project management in the next stage.

Keywords: BIM Technology; Construction Project Management; Application

1. Introduction

Construction project management is an important work with high difficulty and complexity, and its own system is strong. It needs effective cooperation of multiple departments in the construction process to ensure the further improvement of the overall construction management efficiency. The introduction and application of information technology in the field of construction project management has further increased the overall management efficiency and management quality. For example, the effective application of BIM technology in construction project management has further reduced the errors in construction project management, prevented the occurrence of adverse effects such as substandard project quality and schedule delay, and improved the economic benefits of enterprises. Therefore, this paper analyzes the specific application of BIM technology in construction project management, so as to ensure the follow-up construction project management, and the work is completed with high quality, efficiency and safety concept.

2. Overview of BIM technology and its importance in construction project management

BIM technology is a kind of digital building information modeling technology. It uses the three-dimensional model generated by the computer to integrate the information related to building design, building materials, project progress, project cost and so on. Moreover, BIM technology plays an important role in construction project management.[1] It can help construction project managers realize information sharing and cooperation, improve construction project quality and save costs.

2.1 BIM technology overview

The concept of BIM technology first appeared in the 1970s. BIM (Building Information Modeling) refers to the use of computer software to build a building model, which contains all the information of the building, such as structure, equipment, building materials, lighting, etc. BIM technology includes not only the production of building models, but also the management, cooperation and utilization of building models.

2.2 The importance of BIM in construction project management

BIM technology plays an important role in construction project management. First of all, BIM technology can help construction project managers achieve information sharing and collaboration. Because the building model contains all the design information, the building engineering team can exchange and update the information in real time, which helps to avoid incomplete or repetitive information and error information.[2] Further strengthen the collaboration among engineers, architects and project managers.

Secondly, BIM technology can improve the quality of construction projects - BIM technology can realize the visualization of engineering information, and construction project managers can check whether the building design meets the requirements through 3D models, such as whether the building structure and detailed design are reasonable, and whether there are conflicts. Because BIM technology can accurately predict the construction results, find and solve problems in advance, and effectively avoid engineering quality problems[3].

In addition, BIM technology can save costs, because BIM technology can detect engineering problems in advance, and engineers and designers can modify and optimize before manufacturing and construction, effectively reducing errors and waste, and reducing engineering costs. BIM technology can also fully control the construction materials and equipment, which can make it easier for managers to understand the project cost and material use efficiency, so as to better grasp the project cost.

In general, BIM technology is a comprehensive and powerful management tool and plays a vital role in construction project management. It can help managers better understand the project, further improve the project quality and efficiency, and ultimately achieve higher returns and higher satisfaction [4].

3. BIM technical characteristics analysis and application principles

3.1 Analysis of BIM technical characteristics

3.1.1 Comprehensive information

BIM technology not only records the geometric information of the building, but also records all the construction relationships, labor costs, material resources, project progress, energy consumption and other information in the building, which can be used to support the management and decision-making of the whole life cycle of the building.

3.1.2 3D model

The model built by BIM technology is a 3D model, which can help architects better understand and check the building, and customers can also use the model for real-time communication and design confirmation.

3.1.3 Strong collaboration

BIM technology is conducive to the collaboration between various departments of construction. Through sharing BIM models, architects, designers, structural engineers, electromechanical engineers and project managers can not only see the same document, but also edit and change the same document, thus enhancing the collaboration between various departments.

3.1.4 Visualization

BIM technology can generate a large number of visual reports based on the 3D model of the building, such as construction relationship diagrams, progress charts, etc. These charts enable managers to understand the project status more intuitively and make better decisions as decision makers.

3.1.5 Data unification

BIM technology can integrate data from different data sources into a single building model, which can avoid data duplication and data inconsistency, and also better manage building information.

3.1.6 Information interactivity

BIM technology can integrate BIM model with other attribute data, analysis program and construction project management system to realize data interaction and data analysis in BIM model.

3.1.7 Sustainability

BIM technology can also simulate the data of building materials and energy consumption, so as to achieve the sustainability of building materials and energy use, and provide better design ideas for architectural designers.

3.2 Application principles of BIM technology

3.2.1 Application principles of the whole life cycle

BIM technology should run through the whole life cycle of the construction project, including the stages of architectural design, construction, operation and maintenance. Through the tracking and management of all information in the whole life cycle of the building, including materials, equipment, labor costs, energy, etc., the design quality and operation efficiency of the building can be improved, and the project cost can be reduced.

3.2.2 Information sharing principle

BIM technology should support information sharing and collaboration between construction engineering teams and give full play to the advantages of collaboration. By sharing the BIM model, architects, designers, structural engineers, electromechanical engineers and project managers can not only see the same information, but also edit and change the same information, thus enhancing the cooperation between various departments and improving the efficiency of information sharing.

3.2.3 Principles of digital management

The application of BIM technology needs digital management, and all construction engineering information needs to be saved and processed in digital form. Digital management can process the information of construction projects more accurately and efficiently, including building model creation, management, update, collaboration and other aspects, making project management more efficient and convenient.

3.2.4 Visual management principles

The application of BIM technology needs to realize visual management. All information should be displayed in an intuitive way, such as building relationship diagrams, progress charts, etc. These charts enable managers to understand the project status more intuitively, and as decision makers, they can make better decisions.

3.2.5 Data consistency principle

The application of BIM technology needs to ensure data consistency. Even at different stages and between different teams, data should be consistent. For different data sources, there should be a standardized data structure to achieve data consistency and traceability.

4. Application value of BIM technology in construction project management

BIM (Building Information Modeling) technology is an important technology in modern construction project management. It not only provides more accurate visual effects in the design process, but also allows multiple industry professionals to work together, thus improving the efficiency and quality of construction projects. The application value of BIM technology in construction project management will be discussed in detail below.

First of all, BIM technology can help construction engineering teams better coordinate and manage their work, because BIM technology allows multiple industry professionals to work together in real time in the same project.

Secondly, BIM technology can also enable the construction engineering team to better manage and optimize resources. In the traditional construction project management, it is often necessary to manually process various data and documents, which is often a time-consuming and error-prone work. BIM technology can provide a unified platform for teams to better coordinate resources, data and information, thus improving the efficiency and accuracy of construction projects. In addition, BIM technology can also provide better project visualization, so that the team can better understand and manage the project.

Moreover, BIM technology can improve the quality of construction projects. Because BIM

technology can provide more accurate building information, engineers and architects can better evaluate the feasibility and safety of design schemes. This can greatly reduce design errors and problems in construction, thus improving the quality of construction projects.

At the same time, BIM technology can also reduce errors because the entire engineering team uses the same platform and cooperates.

In addition, BIM technology can also reduce the cost and time of construction projects. In the traditional construction project management, the team may need to spend a lot of time and resources to process various documents and data, which is often a time-consuming and laborious process. BIM technology can help teams better coordinate resources and optimize work processes, thus reducing waste and reducing costs. In addition, BIM technology can also enable engineers and architects to better evaluate the feasibility of design schemes, thereby reducing design errors and problems in construction, thereby reducing time and cost.

5. Problems in the application of BIM technology in construction project management

Although BIM technology has been widely used in construction project management, there are still some problems and challenges in its practical application. The following will introduce the existing problems of BIM technology in the application field of construction project management from the aspects of technology, management and culture.

5.1 Technical problems

BIM technology requires the application of professional software and a large amount of data input and calculation, which requires the support of teams with corresponding technical capabilities, including architects, designers and engineers. At the same time, the application standards of the technology in different countries and regions are different, and the corresponding training and certification costs are high, which may limit the application scope of the technology.

5.2 Management problems

In the process of BIM technology application, it is necessary to coordinate the cooperation of different professional teams, including architects, engineers, construction personnel, suppliers, etc. How to achieve efficient collaboration and communication among teams is an important issue for the application of BIM technology. In addition, if multiple application software are involved in the application of BIM technology, corresponding data integration and management work is also required, which puts forward higher requirements for the coordination and management ability of the team.

5.3 Cultural issues

The application of BIM technology needs to establish a culture of information sharing and cooperation, but this requires the construction and development of an open and trusted working environment, which is also one of the challenges faced by BIM applications. At the same time, in some countries and regions, due to policy, legal and cultural factors, the cooperation culture and information sharing and communication habits of the construction industry are not mature enough, which also limits the application of BIM technology.

5.4 Data security issues

During the application of BIM technology, a large number of sensitive data and information will be generated, which need to be properly protected to avoid disclosure and infringement. Therefore, it is necessary to establish an effective data security mechanism, including data backup, safe storage and authorized access, to ensure data security and privacy protection.

5.5 Problems in benefit evaluation

Although BIM technology can improve the efficiency and quality of construction projects, it also requires corresponding investment and cost expenditure. In practical application, if the benefits and returns of BIM technology cannot be effectively evaluated and proved, the team's recognition and

utilization rate of the technology may be reduced.

5.6 Problems in maintenance and update

BIM technology needs to be updated and maintained continuously to cope with changing market demands and technology trends. If there is no corresponding maintenance and update work, it may lead to backward technology and inability to cope with new market changes.

6. Application of BIM technology in construction project management

This technology enables the construction engineering team to use the same information model at all stages of the project and work together throughout the project process. BIM is not only a 3D modeling tool, but also a way to change the construction industry. In this paper, the application of BIM technology in construction project management will be described in detail. By analyzing the application of BIM technology in different fields of construction project management, it will help to further strengthen the application awareness of relevant technical department personnel, improve the overall application effectiveness, play a certain role in promoting the development of BIM technology application in the next stage, and show high application value

6.1 Building information management

Building information management is the core of BIM. The construction project based on BIM technology uses a unified digital information model, which includes various parameters and attribute information of the construction project, such as the geometric volume of the building, material information of the building elements, location, performance, etc. These information can be shared in the whole project, so as to better track the progress of the project, manage resources, monitor costs, and maintain the building within the life cycle of the building.

6.2 2D/3D model

The 2D/3D model in BIM technology is digitalized and can provide rich information, such as detailed information of design and structure, function and performance. For architects, architectural engineers and other relevant project members, this model can help them better understand the structure and design of buildings, enable them to work together better and improve the quality of buildings.

6.3 Cooperative design and construction

The use of BIM technology for collaborative design and construction can greatly improve the communication efficiency between construction teams. This technology can enable the construction team to work together in the whole project process, and achieve better communication and cooperation by sharing the same building information model.

In addition, BIM technology enables architects and other designers to work together at all stages of construction projects, so as to better coordinate design and construction and improve the quality and efficiency of construction projects.

6.4 3D visualization

The 3D visualization feature of BIM technology can help architects and other designers see their designs and ideas more intuitively. Architects can simulate various lights and perspectives through 3D models to better understand the appearance and internal structure of buildings.

In addition, the 3D visualization feature of BIM can help architectural engineers detect potential problems in the design stage, so as to solve problems in advance and avoid the increase of the project's later costs.

6.5 Construction safety plan

The construction safety plan using BIM technology can help the construction team identify potential construction safety problems and optimize the construction process. The construction safety

plan can use BIM technology to conduct 3D safety assessment and risk assessment during the construction process to ensure the safety during the construction process and reduce potential injuries and property losses.

6.6 BIM and Internet of Things technology

BIM technology can be combined with the Internet of Things technology to achieve intelligent management of construction projects. BIM technology can integrate information in various fields of architecture from design, construction, investment and operation, while the Internet of Things technology can connect various equipment and systems in buildings to realize intelligent management. This combination of technologies can make buildings more efficient, economical and safe, and improve their lean management ability for building managers.

6.7 Application of BIM in building maintenance

The BIM technology can be used to predict the maintenance and repair requirements of buildings at the design and construction stages of buildings. Building maintenance data can be collected and stored throughout the life cycle to support the continuous maintenance of buildings.

In addition, BIM technology can enable building maintenance personnel to use digital models to locate faults, quickly determine repair locations, and improve building maintenance efficiency.

6.8 Building energy management

BIM technology can help building managers better manage the energy use of buildings to improve the energy efficiency of buildings. Secondly, BIM technology can help building managers understand the energy use of buildings through visualization, optimize the use of energy based on data, reduce energy waste and save energy costs for buildings.

7. Conclusion

To sum up, BIM technology is widely used in construction project management, including but not limited to information management, collaborative design and construction, 3D visualization, construction safety, BIM and Internet of Things technology, building maintenance and energy management. These applications will enable the construction engineering team to work together better, improve the quality and efficiency of the building, and reduce the cost of construction engineering. In order to further promote the management and application of BIM technology in construction engineering and reflect its application value, it is necessary to maximize the management efficiency of BIM technology in construction engineering by summarizing the existing problems of BIM technology in the field of construction engineering and exploring its specific application fields, implementing personnel training, application mechanism construction, strengthening application awareness and other key points, on the basis of understanding its concept, content, value, characteristics and principles, To lay a solid foundation for promoting the development of management in construction engineering with this technology.

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