Research on Construction Project Quality Management Strategy Based on Bim Technology

Yuhai Miao

City Institute, Dalian University of Technology, Dalian, Liaoning, 116000, China

Keywords: Bim technology, Engineering quality management, Buildings

Abstract: BIM technology is an information technology that can run through the whole life cycle of buildings. It can not only optimize the construction technology and management of construction projects, but also provide scientific decision-making basis for construction projects. In recent years, in the field of construction engineering in China, quality problems frequently appear, which has brought a very adverse impact on people's lives. Compared with traditional construction projects, the application of BIM technology can significantly improve the quality and production efficiency of construction projects, and play an important role in the quality control of construction projects. The construction industry is the focus of promoting China's modernization at present, so the construction and management of construction enterprises have an increasing influence on China's social construction and people's lives. Modernization of construction industry is the direction of reform and development of China's construction industry, and informationization is one of the main features of modernization of construction industry. In view of this, this paper discusses the application of BIM technology in construction engineering quality management and analyzes its application strategies.

1. Introduction

BIM technology is a new construction technology with the development of computer technology and information technology in recent years [1]. This technology is also called building information model technology, and the construction party can use this technology to assist the display equipment, and present the plane drawings in a three-dimensional model [2]. BIM technology has been applied for a long time, which can use 3D model to describe drawings and digital information, and create a more intuitive feeling for people. The information resource platform is more ideal [3]. The quality of housing construction is not only the key factor of competition among developers, but also directly related to the safety of life and property, investment benefit and living comfort of buyers. Improving the construction quality has become an urgent demand at present [4]. BIM technology is an information technology means that can run through the whole life cycle of a building. It can not only optimize the construction technology and management of construction projects, but also provide scientific decision-making basis for construction projects [5]. In order to reduce these quality risks, enterprises should start with the construction quality management, apply BIM technology, and use this technology to improve the development effect of management work, reduce the occurrence of quality problems, and create qualified construction projects [6]. Compared with traditional construction projects, the application of BIM technology can significantly improve the quality and production efficiency of construction projects and play an important role in the quality control of construction projects [7].

BIM technology can realize visualization and modeling of building information, play an important role in project quality control, and is widely used in construction projects. There are many problems in the traditional quality management. Because of the complexity of the construction project itself, it is easy to have loopholes in management, resulting in different degrees of quality problems, which have a serious impact on people's lives [8]. The application of BIM technology in construction safety management can provide great help, so the construction party needs to strengthen the effective application of BIM technology in construction project quality

  DOI: 10.25236/cseem.2020.005

management [9]. Construction safety management of construction projects will have an important impact on the economic and social benefits of construction projects, and it is also a topic of general concern in the current society [10]. Construction units use BIM technology to transform plane drawings into 3D models and present them on display devices in a visual way, which not only provides great help for the quality management of construction projects, but also provides a strong security guarantee for the development of construction projects [11]. Modernization of construction industry is the direction of the reform and development of China's construction industry, and informationization is one of the main features of modernization of construction industry [12]. In view of this, this paper discusses the application of BIM technology in construction engineering quality management and analyzes its application strategies.

2. The Significance of Bim Technology in Construction Quality Management

2.1 Reduce the Burden of Construction Management Personnel

The application of BIM technology in project design stage can check whether there is conflict between equipment and structural engineering, and judge whether there is cross collision between equipment and pipelines, which can greatly reduce the quality hidden trouble caused by collision rework. BIM technology is an advanced construction management technology with the development of computer technology and information technology in recent years. It can bring great convenience when applied to the quality management of construction projects. BIM technology can firstly simulate construction in advance and mark before construction according to the integration of construction drawings and site simulation layout of various specialties, as well as possible problems in key working procedures in the construction process and various construction points that should be paid attention to. Secondly, the BIM technology 3D simulation animation can be used to make more effective construction technical disclosure for front-line construction personnel. Thirdly, in the construction process, it can also guide the construction personnel to carry out construction technical guidance according to the design requirements. In the construction process, using BIM technology, the location, time and problems of quality information can be imported into the building information model constructed by BIM technology, and tracking can be carried out to meet the needs of dynamic control and process control [13]. Engineering quality is the sum of characteristics that reflect that the project meets the requirements of relevant standards or contracts, including its safety, technology, use functions and all obvious and implied capabilities in durability and environmental protection. In the application of BIM technology, related technologies and equipment are relatively backward. Many construction units and managers lack comprehensive understanding of the application of BIM technology, so they still focus on traditional management technologies and methods, and do not increase investment in technology and equipment. Once there are quality problems in the operation and maintenance of construction projects, building a building information model using BIM technology can realize timely and effective inspection of the parts where the quality problems occur, clarify the severity of the problems, analyze the causes of the quality problems, and solve and deal with them in a timely and effective manner.

2.2 Improve the Level of Target Control of Construction Projects

In the construction safety management of construction engineering, the influence of management personnel on the management quality is the most direct. In order to use BIM technology to carry out the construction project quality management, we must pay attention to the quality of construction safety management personnel. With the development of science and information technology, the quality control methods of construction projects have increased obviously. With the promotion of government and design institutes, BIM technology is widely used in construction project management, which can achieve very good economic and social benefits. The construction of a building project is a complex process. In the actual project development process, there are many factors that will affect the quality of the project and produce various quality problems, thus affecting people's normal use of buildings. In terms of construction quality of construction projects,

the integrated information management advocated by BIM technology in the whole life cycle of construction projects will greatly improve the engineering quality and construction safety during construction [14]. Whether it is for the integration of the construction drawings of various specialties, guiding the construction of key processes, and dynamically tracking the test results in the completed construction areas, it will play a significant role in promoting the management objectives of the whole project.

In the process of strain monitoring, a series of observations on specific measuring points usually constitute a stochastic BIM model with discrete attributes. The building environment depends on outdoor climatic conditions, heating conditions of various indoor heat sources and indoor and outdoor ventilation conditions. Figure 1 shows the profit-cost curve of BIM.

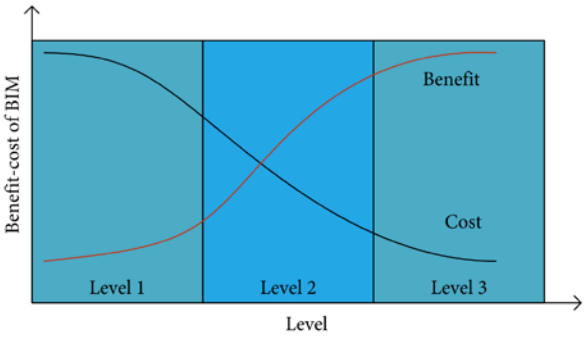

Fig.1 The Benefit-Cost Curve of Bim

As a product of the information age, BIM technology has the basic functions of information technology, which can realize efficient information transmission, efficient information exchange among various departments, and timely obtain the latest project information, thus providing a solid foundation for efficient construction quality management. In practical application, BIM is not only a process, but also a result, which is characterized by coordination, visibility and optimization. BIM technology has incomparable advantages in quality control of other construction projects, and can better meet the requirements of building quality control. In the application of BIM technology, the requirements for the quality of personnel are relatively high, and the management personnel of construction units are not qualified in terms of quality, which directly leads to the abnormal application of BIM technology. The application of BIM technology has changed the traditional quality management mode, which can effectively solve most construction difficulties, effectively improve the construction quality of construction projects, help to create qualified construction projects and achieve all-round quality control, and has very important practical significance.

3. Application Strategy of Bim Technology in Construction Project Quality Management

3.1 Identify Risk Factors

In the construction safety management of architectural engineering, the construction safety index is an important foundation of the construction safety management. Only by defining the relevant indexes can the management work be carried out smoothly and its quality be guaranteed. According to the different functional areas of the construction site, it is divided into different areas, and the operation area and living area are set up separately to ensure the safe distance between them. Using BIM technology to design and review drawings can effectively improve the rationality of the design scheme. In the design work, the most prone to problems is the design conflict between various systems. Because many systems are involved in the construction project, the pipelines of these systems are complicated, so it is necessary to have efficient coordinated design to reduce the conflict between systems. After using BIM technology to build its building model, the construction party can adjust the data in the model, understand the construction safety and construction risks of the project, and work out more scientific and reasonable construction safety indicators. BIM technology can be used to implement safety management measures in construction project quality management. Construction supervisors use mobile phones and other equipment to take pictures and

video to record the construction quality information of engineering projects, and import it into the building information model. After that, we analyze and compare the quality plan with the actual situation, find out the existing problems, analyze the causes, judge the seriousness of the problems, and give targeted solutions and treatment measures.

The architectural model created based on information design can use collision detection and other formats to actively solve the design problems and quality problems that may arise in the project. Table 1 shows the optimized performance parameters of building project layout before and after optimization.

Table 1 Performance Parameters Of the Optimized Topology of the Architectural Project Layout Before and after Optimization

	Before optimization	After optimization
Number of rows	31	36
Number of columns	15	20
Monitoring points	465	720

The use of different building materials determined by the structural shape of engineering buildings will lead to changes in multi-storey buildings and buildings. According to the information design work, the urban civil building model can use collision detection and other formats to actively solve the design problems and quality problems that may appear in the project. The simulation comparison of topology stability optimization is shown in Figure 2.

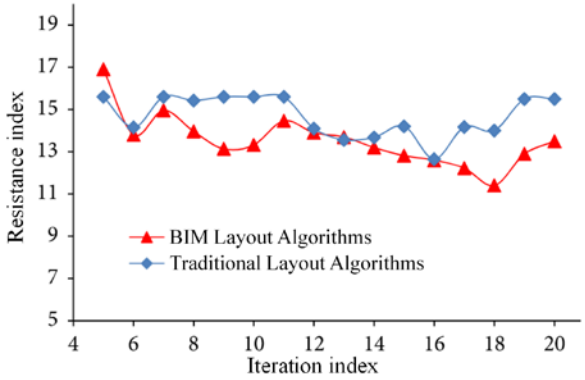

Fig.2 Simulation Comparison of Engineering Construction Layout Optimization

In the construction process of architectural engineering, safety risks are widespread. If these risk factors can be identified and controlled, effective safety management can be realized. Therefore, in the construction safety management work, the construction party can use BIM technology to establish a three-dimensional model of its project and display the construction links of the project. In the stage of operation and maintenance, the quality information of as-built building information model is used for operation and maintenance, and the information of products, materials, models and specifications in the model and the quality inspection report are used to realize the quick and effective treatment and maintenance of quality problems [15]. In the process of construction, safety accidents are very likely to happen, and BIM technology can effectively prevent safety accidents. Through the visualization function of BIM technology, managers can find all kinds of holes and embedded components in advance, reserve holes and embed components in time during the construction process, effectively avoiding the impact of later repair construction on project quality, and achieving the purpose of pre-construction quality control.

3.2 Coordinate Construction Arrangement

The construction of architectural engineering is a very systematic and complex work, so its safety management is also complex and will be affected by different construction processes and departments. In actual construction management, BIM technology can be used to visually simulate steel bar construction. Managers can arrange steel bars more reasonably, and even complex steel bar joint positions can be seen at a glance. Managers can make a more reasonable construction plan

according to these contents. The application of BIM technology in construction project quality management requires the participation of relevant managers, and the quality of managers will have a great impact on the application effect. BIM technology can only help with technical disclosure by visualizing design drawings. Strict construction according to drawings still requires managers to strengthen their understanding of design requirements and improve the quality awareness of the whole engineering team in construction according to drawings. The application of BIM technology in construction can effectively improve the accuracy of lofting. In the process of on-site quality management, managers can take pictures of the actual situation of on-site construction with camera equipment, focus on shooting some quality positions, and then input these contents into the BIM model.

4. Conclusions

BIM technology, as an important technology in the quality management of construction projects in China, can improve the efficiency and effectiveness of safety management and ensure the safe and high-quality construction of projects. The application of BIM technology has changed the traditional quality management mode and can effectively solve most construction difficulties. BIM technology is a main method of project quality control, which needs to be combined with other quality control methods to improve the effectiveness of quality control. Construction supervisors use mobile phones and other equipment to take pictures and video to record the construction quality information of engineering projects, and import it into the building information model. After that, we analyze and compare the quality plan with the actual situation, find out the existing problems, analyze the causes, and give targeted solutions and treatment measures. The application of BIM technology in construction project quality management requires the participation of relevant managers, and the quality of managers will have a great impact on the application effect. BIM technology will lead building information technology to a higher level, greatly improve the integration degree of construction projects, and have a significant impact on the efficiency improvement, scientific and technological progress and project quality control of the construction industry.

References

[1] Tian Qiong, Tan Xiantong, Zhou Ji. Application of BIM technology in construction quality management of construction projects. Value Engineering, vol. 39, no. 8, pp. 31-32, 2020.

[2] Cao Jianghong, Ji Fanrong, Xie Benzheng, et al. BIM-based prefabricated building quality management. Journal of Civil Engineering and Management, vol. 34, no. 3, pp. 108-113, 2017.

[3] Yu Chunyi, Lin Jie. The application of BIM technology in highway construction quality management. Building Science, vol. 274, no. 5, pp. 154-154, 2020.

[4] Cao Jianghong, Ji Fanrong, Xie Benzheng, et al. BIM-based quality management of prefabricated buildings. Journal of Civil Engineering and Management, vol. 34, no. 3, pp. 108-113, 2017.

[5] Liu Xinghong, Zhang Hanyu. Research on Quality Management of Prefabricated Buildings Based on TQM Theory and BIM. Construction Economy, vol. 39, no. 10, pp. 26-31, 2018.

[6] Zhang Jingxiao, Wang Yin, Li Hui. Research on result-oriented BIM engineering ability training path. Journal of Engineering Management, vol. 57, no. 6, pp. 27-32, 2017.

[7] Zhang Jingjie, Han Yu, Ma Guoxin, et al. Construction Workers' Danger Perception Training System Based on BIM. Journal of Civil Engineering and Management, vol. 34, no. 1, pp. 88-93, 2017.

[8] Zhang Ailin, Zhang Xiuying, Li Lu, et al. Application research on information integration dynamic management system of prefabricated building construction stage based on BIM technology.

Manufacturing Automation, vol. 39, no. 10, pp. 152-156, 2017.

[9] Cao Xinxin, Lu Xiaoshu, Wang Yu. Production quality management of fabricated building components based on BIM-RFID. Journal of Civil Engineering and Management, vol. 35, no. 4, pp. 102-106, 2018.

[10] Zou Aihua, Liu Liang, Wu Zizhong, et al. Applying BIM technology to dynamically manage standardized construction sites. Building Technology, vol. 47, no. 8, pp. 716-718, 2016.

[11] Wang Guoqiang, Wang Jianping, Sun Penglu. Research on BIM Cost Control of Contractors in Construction Phase. Construction Economics, vol. 402, no. 4, pp. 46-49, 2016.

[12] Wen Yanfang, Ren Tao, Wang Ting. BIM-based construction project lowest price winning bid method. Journal of Civil Engineering and Management, vol. 35, no. 2, pp. 76-81, 2018.

[13] Shi Qingwei, Pang Yongshi, Jiang Yuhan. Simulation of building construction safety risk early warning and decision-making model based on system dynamics and BIM. Journal of Civil Engineering and Management, vol. 33, no. 2, pp. 87-93, 2016.

[14] Chen Lijuan, Lu Ya. Research on BIM Technology in the Cost Control Method of Reconstruction of Buildings after Earthquake Disaster. Chinese Journal of Earthquake Engineering, vol. 41, no. 1, pp. 239-244, 2019.

[15] Xing Xuejiao, Zhong Botao, Luo Hanbin, et al. BIM-based automatic review system for architectural professional design compliance and its key technologies. Journal of Civil Engineering and Management, vol. 36, no. 5, pp. 129-136, 2019.