

# Application Analysis of BIM Technology in Construction Engineering Cost Management

Rui Ma\*

Shaanxi Provincial Land Engineering Construction Group Co., Ltd., Xi'an 710075, Shaanxi Province, China

\*Corresponding author: Rui Ma, marui8917@dingtalk.com

**Copyright:** © 2024 Author(s). This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), permitting distribution and reproduction in any medium, provided the original work is cited.

**Abstract:** With the rapid development of information technology, Building Information Modeling (BIM) technology has gradually occupied an important position in the construction industry. With the introduction of BIM technology, the cost control of construction projects can be greatly improved <sup>[1]</sup>. The use of this technology can not only reduce the project approval time but also improve the quality of the project. In addition, it can also help the construction personnel to solve the project changes, maintenance costs, insurance rates, and other related issues, so that the operation of the project is more efficient and economical. This paper will discuss the role of BIM technology in depth, and explore the advantages and disadvantages of each link through the research of the project, to provide a reference for the promotion of this new project. By constantly adjusting the application strategy, the goal is to meet the current market demand.

**Keywords:** BIM technology; Construction engineering; Cost management

**Online publication:** October 8, 2024

## 1. Introduction

BIM technology has been shown to greatly improve the operation situation of the construction industry today, which can not only greatly reduce the construction difficulty of the project, but also improve the construction quality of the project, thus effectively improving the overall operation effect of the project. Therefore, institutions at all levels should deeply grasp the development trend of BIM technology, and take a series of measures to strengthen their learning, implementation, summary, and improvement, to achieve the best construction quality, so that the operation of the project can achieve good results <sup>[2]</sup>. Through gradual and in-depth reform and application, we aim to effectively improve the cost control ability of construction projects and make full use of BIM technology.

## 2. Overview of BIM technology and whole-process cost management

BIM technology, namely building information model technology, is a digital expression process that integrates the physical and functional characteristics of a building project and provides a reliable basis for decision-making

in the whole life cycle of the project <sup>[3]</sup>. With the rapid development of the construction industry, the traditional cost management mode has made it difficult to meet the complex and changeable needs of modern building projects. The introduction of BIM technology has brought new changes and opportunities for the whole process of cost management. BIM technology conducts the fine management and optimization of the whole life cycle of construction projects through digital simulation, providing a new perspective and tool for cost management.

With its powerful information integration and sharing ability, BIM technology has broken the dilemma of poor information transmission and inconsistent data in traditional cost management. By constructing the three-dimensional digital model of building projects, BIM technology can organically integrate the information of various stages of architectural design, construction, operation, and maintenance, to realize the real-time update and sharing of information. This allows the project team to have a more comprehensive understanding of the actual situation of the project and thus make more accurate cost decisions.

In the whole process of cost management, the role of BIM technology is not limited to information integration and sharing. It can also support the project team for more accurate cost prediction and control. Through the BIM model, the project team can simulate the project cost under different design schemes to select the optimal design. In the construction process, BIM technology can monitor the project quantity, material consumption, and other data in real-time, provide real-time cost analysis for the project team, and help the project team find and control the cost deviation in time.

Additionally, BIM technology can also improve the efficiency and accuracy of cost management. Through automated and intelligent data analysis tools, BIM technology can quickly generate all kinds of cost reports and data analysis results, which greatly reduces the time and error rate of manual calculation. Simultaneously, BIM technology can also provide visual data display methods, making the cost information intuitive and easy to understand, and help the project team to better understand and analyze the cost data to effectively deal with the project construction process in the emergence of various practical problems.

### **3. Application advantages of BIM technology in construction engineering cost management**

BIM technology, with its data integration, sharing, and simulation optimization capabilities, has brought many advantages to construction engineering cost management <sup>[4]</sup>. First, it improves the data accuracy and comprehensiveness, greatly improves work efficiency, and realizes the overall management of design and construction. Second, simple and easy to operate, can quickly and accurately achieve any expected results, and can reduce unnecessary costs and risks to improve the efficiency of the project. Finally, easy for construction personnel to quickly and efficiently collect and process large amounts of data. BIM helps to optimize the construction technology, reduce the construction cost, and improve the overall benefit of the project. This emerging building model can help us to better master and optimize the construction process, to realize the long-term supervision and maintenance of the building <sup>[5]</sup>.

### **4. Specific application of BIM technology in construction engineering cost management**

#### **4.1. The application of BIM technology in the project decision-making link**

In the execution stage of a construction project, project decision-making plays a crucial role. Through the application of BIM technology, effective information can be collected and sorted out, and it can be compared with previous experience, to quickly develop a more reasonable and efficient implementation plan <sup>[6]</sup>. By using BIM

technology, the builders can not only more accurately estimate the cost per unit, but also better manage the cost of the project. This method can not only help them to master financial information, facilitate the control of the construction cost of construction projects, to bring more income for construction enterprises <sup>[7]</sup>.

#### **4.2. Application of BIM technology in the project planning stage**

The preliminary planning is very critical, so the relevant personnel should analyze the internal factors of the project, such as construction conditions, surrounding environment, and design purpose, to determine the main cost control direction of the project. Moreover, we should also actively listen to the opinions of the design and supervision departments or other relevant parties to better understand the operational risks of the project and take effective prevention and control measures. Using the simulation function of BIM technology, the whole process of the engineering project can be comprehensively modeled to better analyze a variety of different solutions. Based on these analyses, we were able to more effectively utilize professional risk assessment and analysis to provide a strong guarantee for the success of the project <sup>[8]</sup>.

The application of BIM technology can effectively improve the whole process of the project, which can integrate information into every link to achieve a more accurate and comprehensive control of the project cost. By using BIM technology to build the digital resources of the project, the method of big data analysis can be better used to guide and control the cost of the project. After precise data mining and in-depth research, we can quickly and effectively adjust and revise work plans and practical measures <sup>[9]</sup>.

#### **4.3. The specific application of BIM technology in the bidding stage**

BIM technology can help the cost personnel manage the cost more effectively and can use their professional knowledge and experience to provide effective decision support in the bidding stage to avoid the mistakes and losses caused by the lack of necessary data <sup>[10]</sup>. Through the analysis of the BIM three-dimensional model, the bidding process can more accurately and comprehensively grasp the bidding requirements of the project, and can accurately customize the most preferential bidding section according to the requirements of the bidding documents, to increase the chance of success of the project. The model database of BIM technology can greatly reduce the cost burden in the bidding process, and quickly and accurately estimate the overall planning of the construction project to improve the refinement and high efficiency of the bidding. Through the use of BIM technology, construction personnel provide a convenient database for project management and supervision of construction enterprises, enabling them to effectively monitor and manage the project, thus reducing the cost of project management and supervision, and effectively reducing the risks in project management <sup>[11]</sup>.

#### **4.4. The application of BIM technology in the engineering construction links**

The deepening of the project implementation, the change in the external environment, the fluctuation of the project cost, and the emergence of force majeure will bring great challenges to cost management. Therefore, the cost management personnel need to grasp the impact of the external environment accurately changes on the project construction to make the correct decision <sup>[12]</sup>. Through the application of BIM technology, the construction cost can be effectively controlled, the simulation calculation can be realized, and the construction organization design in the planning stage can be optimized, putting forward an effective risk resolution scheme, deal with sudden problems in time, and give full play to the important role of BIM technology in the engineering construction link, to realize effective cost management and decision-making <sup>[13]</sup>.

#### **4.5. Application of BIM technology in the completion and settlement link**

After micro-data analysis, BIM technology can quickly make data processing to the construction engineering

information system, and then completely change the traditional mode and method, and make the construction engineering results more accurate, scientific, and reasonable. BIM technology optimization parameter modeling can use 3D Boolean operation rules and spatial topology BIM system to implement comprehensive cost control, and greatly improve the project workload information processing accuracy, in the settlement management after project implementation, because the use of BIM technology can effectively solve all kinds of problems. Because the establishment of a BIM system can improve the management of engineering cost information database, especially the database factors and unclear factors have a strong role between each other, the rapid implementation of construction projects can be promoted under all kinds of contradictions and collisions<sup>[14]</sup>.

BIM technology application scope is very broad and can implement dynamic management of projects, but also for various types of workload units, the digital cost control, improve the overall efficiency of workload cost control, the construction quantity growth, all kinds of complex structure increased significantly. Using BIM technology for all kinds of construction quantities calculation tasks to accurate data processing can prompt budget personnel from boring manual calculation, and also can avoid human factors leading to error, for late completion settlement brings accurate data support. BIM technology can intuitively introduce the project cost working cycle into the 3D building model, implement dynamic management, and ensure the effective allocation of capital, human resources, resources, and equipment. Through 3D technology, it is easy to predict and analyze the construction requirements of different stages, and all parts of the construction process can be connected so that the construction team of the construction enterprise can complete all the construction operations at will during the completion of each construction process. In this way, the construction personnel do not have to worry about what problems will be in the construction process and also do not have to worry about illegal situations, therefore, the construction quality and safety of the construction project will be highly evaluated by all walks of life<sup>[15]</sup>.

## **5. Future development trend of BIM technology in construction engineering cost management**

### **5.1. Popularizing and deepening of BIM technology application**

With the continuous maturity and development of BIM technology, its application in the field of construction engineering cost management will be more extensive. We can foresee that BIM technology will no longer be just a design tool, but will become the cornerstone of project management, throughout the whole process of the construction project. From project planning to design, construction, and later operation and maintenance, BIM technology will play an important role in providing strong support for the cost management of construction projects.

### **5.2. Integration of BIM technology and advanced technology**

In the future, BIM technology will pay more attention to the integration of advanced technologies such as cloud computing, big data, the Internet of Things, and so on. The application of these technologies will bring higher efficiency, lower cost, and better quality for the construction project cost management. For example, through big data analysis, the cost of construction projects, cloud computing can realize fast data processing and sharing, and improve the efficiency of engineering cost management. The application of Internet of Things technology enables building equipment and materials to reduce cost and improve quality.

### **5.3. Promotion of BIM technology at the policy level**

The government attaches great importance to the development of BIM technology and has issued a series of policies to strongly support it. In the future, with the promotion of policies, the application of BIM technology

in construction engineering cost management will be further promoted and become a key driving force for the development of the industry. Additionally, the government will also encourage enterprises to carry out the research and development and application of BIM technology, to improve the level of construction project cost management and promote the transformation and upgrading of the construction industry<sup>[16]</sup>.

## 6. Conclusion

The application prospect of BIM technology in construction engineering cost management is broad, which will bring revolutionary changes to the construction industry. With the support of cloud computing, big data, and other advanced technologies, BIM technology will realize the intelligence and automation of project cost management, and improve the overall competitiveness of the construction industry. The construction industry should seize this opportunity, and actively promote and apply BIM technology to improve the efficiency of project cost management, reduce cost, improve quality, and help the sustainable development of China's construction industry.

## Disclosure statement

The author declares no conflict of interest.

## References

- [1] Li W, Zhu T, Che S, 2024, Application Analysis of BIM Technology in Construction Cost Management. *China Residential Facilities*, 2024(07): 73–75.
- [2] Quan Q, Li Z, 2023, Situation Measurement Analysis of Green Building Research in China. *Journal of Hunan City University: Natural Science Edition*, 32(5): 48–56.
- [3] Dong L, 2023, The Application of BIM Technology in Construction Cost Control of Engineering Projects. *Building Technology*, 7(04): 48–50.
- [4] Fan S, 2020, The Application of BIM Technology in Engineering Management and Construction Cost Control. *Building Materials and Decoration*, 2020(12): 206–207.
- [5] Xiao H, 2020, The Application of BIM Technology in Engineering Management and Construction Cost Control. *Residential and Real Estate*, 2020(05): 29.
- [6] Sun H, 2023, Cost Control and Management of Construction Projects Based on BIM Technology. *Architectural Design Management*, 40(10): 82–88.
- [7] Yin M, 2023, Analysis based on BIM technology. *Sichuan Construction*, 43(5): 298–300.
- [8] Feng Y, Liang L, Huang P, et al., 2023, Research on the application of BIM technology in architectural engineering Design. *Real Estate World*, 2023(22): 133–135.
- [9] Meng J, 2023, Discussion on Cost Management Strategies for Construction Projects. *Industry and Technology Forum*, 22(20): 219–220.
- [10] Huang X, 2023, Comprehensive application of BIM technology in bidding. *Shaanxi Architecture*, 2023(4): 74–76.
- [11] Li D, 2023, Application of BIM technology in the bidding of construction projects. *China Building Decoration*, 2023(6): 64–66.
- [12] Cheng C, Li J, Zhao J, 2023, Analysis of the application of IoT, BIM technology in the construction and maintenance of construction and municipal public works. *Anhui Architecture*, 30(8): 78–79.
- [13] Wu X, 2022, Application of BIM technology in the full cycle control of public building construction. *Engineering Construction and Design*, 2022(06): 213–215. <https://doi.org/10.13616/j.cnki.gcjsysj.2022.03.269>

- [14] Gao Q, 2023, Research on the Application of Fine Management Mode in Construction Project Management. *Real Estate World*, 2023(24): 94–96.
- [15] Zou J, 2023, The Application of BIM Technology in Construction Management of Building Engineering. *Metallurgical Management*, 2023(09): 82–84.
- [16] Jin Y, 2023, Analysis of Cost Pre settlement and Construction Cost Management in Construction Projects. *Marketing*, 2023(07): 98–100.

**Publisher's note**

Bio-Byword Scientific Publishing remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.