Application of BIM Big Data in Construction Engineering Cost

Xinyao Huang*
Jiangxi Institute of Applied Science and Technology, Nanchang, Jiangxi 330100, China

*Corresponding author: xinyaohuang@jxcsedu.com

Abstract. At present, BIM technology is applied in China to improve the level of project management, and it is an irreversible trend to popularize BIM technology in the construction industry. In the era of big data, project cost management has also become a refined management with the development of technology. Therefore, BIM technology improves the frequency of using big data in project cost management, thereby reducing project management costs and improving project value. BIM technology has been widely used in construction cost management, so we will make an in-depth study on the application of BIM to construction cost based on big data construction projects.

Keywords: BIM, Big data, construction costs.

1. Introduction
With the rapid development of our society, information data has shown a rapid growth trend. In addition, today's construction projects are becoming more and more complex, which requires higher level of traditional cost management. However, the cost personnel in many cities still adopt the calculation rule of bill quota quantities, which results in that the traditional cost management mode does not match the needs of today's society. This also limits the development of the cost management level of construction projects, and has an impact on the development of the construction industry. Therefore, we will use BIM technology to combine the project cost with the large database in BIM model, and change the traditional cost management mode.

In the past, many experts and scholars have studied the application of BIM in cost based on big data construction projects, and have made great achievements. For example, in 2019, Kong Fanda [1] analyzed the application of BIM technology in detail, and played a greater advantage role in municipal engineering cost management; In 2019, Li Yonglie [2] used BIM technology to control the construction process; In 2019, Xiao Feng [3] analyzed the relationship between project budget and project cost, discussed the impact of project budget on project cost from various angles, and proposed to play an active role in project budget; In 2019, Chen Gang and Zhou Yang [4] studied the application of BIM technology in project cost management; In 2019, Wang Yumei [5] explored how to use effective financial fraud audit measures to prevent the company's financial fraud and establish a sound financial mechanism for enterprises; The analysis of Lu Xia [6] in 2018 is based on the engineering cost management of big data and BIM technology; In 2017, Liu Zhuxu [7]'s research BIM was applied to the refined management of engineering cost in the whole process of construction projects; The value of
BIM technology application in Wang Bin [8] in the refined management of project cost in 2017; In 2017, Gao Tianyun [9] studied the project cost management based on big data and BIM; In 2017, Qiao Xiaogang [10]'s construction project cost control under BIM-based engineering cost big data; Based on the research of the above professionals, this paper will further discuss the application of BIM technology in refining the project cost based on big data construction projects.

2. Basic concept

2.1. Meaning of big data
Big data is a collection of data beyond the collection, storage, control and analysis capabilities of traditional software. Therefore, its main significance is not to collect a large amount of data, but to adopt a new model to deal with these data professionally and draw some useful conclusions for itself. Construction project based on big data is not simply combining construction project with a lot of data. It is an information collection system, through which managers can analyze the huge data of the construction project and clearly understand the relevant data and potential problems of the project.

2.2. Technical meaning of BIM
BIM (Building Information Modeling) is the abbreviation of architectural information model. Its main function is to build a three-dimensional model of a building, and then use software to quickly export the information quantities of this model. We can integrate these quantities information into a complete big data-building information database. The contents of this big data information base contain information such as building material information, size and status. Therefore, we will collect and analyze the big data in the process of building the model with BIM technology, which greatly increases the frequency of using the big data of construction projects and further provides a platform for construction projects.

![BIM technical flow chart](image)

**Figure 1.** BIM technical flow chart

2.3. Advantages based on big data and BIM technology
Get rid of the traditional construction project cost management mode: the cost personnel analyze and calculate according to the plane drawings, and get the project cost results. This mode is inefficient and consumes unnecessary manpower, financial resources and material resources. The construction project cost based on big data and BIM technology collects the data of the whole project by establishing a virtual three-dimensional model, and the collision of architectural design schemes can be clearly understood through the three-dimensional model, which is also the analysis and processing of data. Cost personnel
can directly calculate the data of the construction project according to the established 3D model. Compared with the traditional cost management mode, it is faster and more efficient.

3. Present situation of construction project cost
In the construction project, the project cost management is a very important link. With the development of economy, the area of construction projects is becoming larger and larger, and the technical requirements are becoming more and more complex. This brings great challenges to our traditional project cost management mode, so we need to carry out scientific cost management, effectively control the construction cost of the project, and make the project develop economically and efficiently. However, the following problems still exist in the construction project cost.

3.1. Cost data lacks refinement
With the development of modern technology, the area of construction projects is getting larger and larger, and the problems that cost management needs to face are also increasing. Cost management needs to deal with more and more data information, so there will be a shortage of funds and talents. In this case, the cost personnel will inevitably lack refinement when dealing with the data, and can't accurately grasp the information of the construction project, which leads to errors in the early budget of the construction project cost management from the beginning, which increases the investment cost of the project and causes certain losses to the capital of the enterprise. Therefore, the traditional cost management method has certain defects, so it is difficult for us to meet the cost management needs of today's construction projects only by cost management manpower in large-scale projects.

3.2. It is difficult to realize the whole process cost management
The cost management of construction projects highlights the characteristics of refinement in the whole process, but the traditional project cost management mode is difficult to realize the whole process of refinement management. It pays more attention to the construction budget and completion settlement, but neglects the process management from the beginning of the project to the completion, so the traditional management mode is very rigid. And a scientific management mode is to manage the whole process of the construction project, so we need to make every component, every time, every process and so on in the project management process.

3.3. It is difficult to share data
In the traditional project cost management mode, because there are many units involved in the construction of the project, it is easy to make budget errors and it is difficult to share data comprehensively for such huge data information, which will easily cause economic losses and affect the overall benefits of construction project cost management. Professionals are getting the information of construction projects, which cannot be quickly and accurately conveyed to other workers or units because of the limitation of technical level, thus affecting the management level of construction project cost. At the same time, due to the restriction of technical level, designers can't solve the problems in the project quickly, and the progress of the whole project will be reduced. Therefore, data sharing cannot be realized, and the management level of construction project cost will be lowered, which cannot arouse people's attention to it.

3.4. The level of project management is low
Engineering management is a comprehensive concept, and the level of construction project cost management is a branch of engineering management. With the rapid development of construction technology, the components of each construction project are getting bigger and bigger, so the traditional cost management model has become increasingly difficult to manage the whole project. So nowadays, with the rapid development of society, we need to improve the traditional cost management mode so as to improve the engineering management level of the whole industry.
4. Based on big data and BIM technology applied to cost

4.1. Application of investment decision-making stage
In the investment decision-making stage of construction projects, the main work is to compare the schemes of construction departments and planning and design units, and decide an optimal scheme. Traditional project cost management is based on the engineering data of two-dimensional drawings, which is easily influenced by unpredictable factors and leads to wrong judgments. Therefore, it is necessary to estimate the unpredictable cost in the investment decision-making stage of construction projects, especially in some construction projects with new materials and new technologies, which will often produce unpredictable cost in the construction stage, and then it will be more expensive than the initial estimated cost. The virtual construction and database using BIM technology have the characteristics of a large amount of data, which can predict various situations that may occur in the construction stage and reduce the proportion of unpredictable expenses [2]. See Figure 2 below for details. BIM data repository has a large amount of data, which can quickly compare different schemes and get the most economical engineering construction scheme. Therefore, based on big data and BIM technology in investment decision-making stage, the accuracy in investment decision-making stage can be improved.

![Figure 2. The proportion of BIM that can reduce unforeseen expenses in the investment decision-making stage](image)

4.2. Application in planning and design stage
In the planning and design stage of construction project, in order to better control the construction cost of the project, we can use BIM technology for control. Through the BIM technology, the drawings are sorted out to get a professional and effective information database, and then a model is established to truly display the results of planning and design, so that the appearance of the construction project can be felt more intuitively. It can ensure the design economy and effect of the project, and the investment basis is more real and effective. In addition, BIM technology can realize data sharing, so that every department can participate in the design stage, and make reasonable analysis on the design scheme of the project, and put forward suggestions for modification, thus reducing unnecessary expenses in the later construction stage.
4.3. Application of Bidding Stage

In the bidding stage of construction projects, it is necessary to invest a large number of professionals to calculate the quantities. BIM technology simplifies the bidding process and changes the bidding process of construction projects. The construction unit and consulting unit directly count the project quantities from the model provided by the design unit, then combine these quantities with the project characteristics, and finally work out the list quantities of the project. In this way, there will be no missing items or miscalculations in the bill of quantities, which effectively reduces the disputes caused by the bill of quantities. According to this process, the tenderer can send the model of the project to those interested bidders, and the bidders can quickly get the quantities according to the virtual model, and make a better bidding plan according to the virtual model.

4.4. Application in construction stage

The main task of project cost management at this stage is to reduce the cost of construction projects. Compared with other stages of the construction project, the cycle duration of the construction stage of the construction project is longer. It is for this reason that there are many uncertain factors in the process of construction stage, such as: The market price of construction rises, the construction progress is delayed, and so on. These uncertain factors always affect the cost of the whole project. If we apply BIM technology to control it in the construction stage, we can effectively integrate the data in the construction stage on the BIM model, which is beneficial to the communication in all aspects of the construction project.

Using big data and BIM technology in the construction stage can also verify the accuracy and rationality of construction drawings. We can use BIM technology to build two-dimensional design drawings into a virtual three-dimensional model. In the three-dimensional model, we can clearly see the collision between civil engineering and electromechanical or the collision between electromechanical and different specialties. In this way, we can understand the problems existing in the drawings before construction and modify the design scheme in advance. So as to avoid rework of construction and delay of project schedule caused by design scheme.

In addition, when the project is changed by the design unit, the BIM technology is used to modify and adjust the project change instead of the project construction. Update and summarize the quantities that need to be modified to the database of BIM model, so that the design changes are more reasonable. Meanwhile, different departments and units can use BIM software to grasp the situation of the project in real time. In a word, BIM technology can be used for all-round management and supervision in the construction stage, so as to effectively control the cost in the construction process and the construction progress of the project.

4.5. Application in completion stage

In the stages of investment decision-making, bidding, design and construction, the construction project has been scientifically and finely managed based on big data and BIM technology, which has laid a foundation for the project cost management at this stage. Because during the gradual completion of the project, the data information base of BIM model will be continuously improved, and the real quantities of this building can be fully displayed at the final completion stage, which reduces the difficulty of project settlement and greatly improves the efficiency of project settlement. At the same time, when the construction project is completed and settled, BIM technology is used to turn the project into a virtual building, so that the project information is open and transparent. Can reduce the problems between the construction unit and the construction unit caused by design changes or. In addition, enterprises can store the data of construction projects as the basis of future projects.

5. Conclusions

In the era of rapid economic and information development, our lives are gradually flooded with big data, and many industries have entered the era of big data. The construction industry is also developing rapidly. If we want to use big data to develop construction project cost management, we also need BIM
technology and big data. Because BIM technology is developing rapidly in the construction industry, we need to make good use of the characteristics of BIM technology and combine the characteristics of construction project cost management based on the era of big data to make the construction project cost more accurate and reasonable. However, this is a long development process, which needs to be supported by the policies promulgated by relevant countries, so as to make the technical level of construction project cost higher in China.

Acknowledgments
This work was financially supported by Science and Technology Research Project of Jiangxi Provincial Department of Education: Research on Carbon Emission of Building Decoration Engineering Based on BIM Technology (GJJ203009).

References
[1] Kong Fanda. Application analysis of BIM technology in municipal engineering cost management [J]. Green Building Materials, 2019: 164.
[2] Li Yonglie. Application of BIM technology in construction management of building engineering [J]. Green Building Materials, 2019: 205+208.
[3] Xiao Feng. Research on the influence of project budget on project cost [J]. Engineering Construction, 2019: 159.
[4] Chen Gang, Zhou Yang. Research on the Application of BIM in Project Cost Management [J]. Residence, 2019: 134.
[5] Wang Yumei. Applicability Analysis of BIM in Construction Project Cost Management [J]. Economic Outlook around Bohai Sea, 2019: 82 - 83.
[6] Lv Xia. Analysis of project cost management based on BIM technology of big data [J]. Engineering Construction and Design, 2018 (04).
[7] Liu Zhexu. Research on the Fine Management of the Whole Process Project Cost Based on BIM [J]. Science and Technology Information, 2017 (22).
[8] Wang Bin. Application Value of BIM Technology in Fine Management of Engineering Cost [J]. Engineering Construction and Design, 2017 (6): 186 - 187.
[9] Gao Tianyun. Research on project cost management based on big data and BIM [J]. Low Carbon World, 2017 (23).
[10] Qiao Xiaogang. Construction project cost control under BIM-based engineering cost big data [J]. Shanxi Architecture, 2017, 43 (08).