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Research on Construction Quality Management Based on BIM

Han Luyue[1,2, a], Bian Xiaowen[1,2, b], Gu Shoupu [1, c,*], Liu Chang[3, d], Pan Wei[1, e], Zhao Xia[1, f]

[1]*School of Civil Engineering, Binzhou Polytechnic, Binzhou, China*
[2]*New Era University College, Kajang, Selangor, Malaysia*
[3]*Binzhou Land Consolidation and Reserve Center, Binzhou, China*
[a]*316012636@qq.com,* [b]*179042508@qq.com,* [c,]**zhgljgsp@126.com,* [d]*395699231@qq.com,* [e]*840578273@qq.com,* [f]*yxzhaoxia@sian.com*
**Corresponding author*

Abstract: *In recent years, China's rapid economic strength has greatly promoted the development trend of the construction industry. With the full support of technology, the construction industry has also achieved incentives. BIM refers to "engineering building information modeling", that is, the entity model of engineering building information. The building information entity model is used to create the building model according to the relevant information and data information of the construction project. BIM technology should be adopted as the construction quality management method, which has obvious advantages. It can immediately predict, analyze, distinguish and harmonize the execution of construction projects*[1]*. The application of BIM technology in the whole process of construction projects can improve the management level of enterprises. According to the effective management scheme of information quality, the obstacles of information communication can be removed and the situation of information desert is land can be avoided. Therefore, the application of BIM technology has become the general trend of construction enterprises. At present, France, France and other capitalist countries are vigorously promoting their scientific research and application. BIM technology has already become a popular technology in the construction industry. The application of BIM can guarantee the high quality of all engineering buildings, make the building structure scientific, effective, reasonable, stable and safe, and promote the healthy development trend of the construction industry.*

Keywords: *BIM technology, Intelligent building, Construction quality management*

1. Traditional construction mode of architecture

1.1. Traditional management methods

The traditional new project quality management information mostly uses the engineering drawing record information; Storage of engineering drawings; The whole process of checking is complicated, the management labor is large and the management efficiency is low. Because of the high professional skills, the relativity of community owners' participation is low. BIM technology application is quite different from traditional quality management methods. BIM technology can accomplish the visualization and simple expression of information. The technical entity model includes not only the overall information of the project, but also some information. There is a large amount of information, and each level is not unrelated. There is information communication, thus preventing the situation of "information desert is land"[2]. Both parties participating in the new project can participate in the whole process of the new project, and then complete more comprehensive quality control.

Quality not only refers to the level that the essential characteristics of goods meet the requirements, but also includes the use value of goods or services. Quality not only affects the success and failure of engineering construction goods, but also directly affects the comfort and satisfaction rate of users. According to everyone's different roles in the production process, there are two quality ideas from the aspects of customers and users. According to the customer's ideas, the quality is decided by the customer's regulations, and the quality is understood to be relative to the applicable scope of the expected main use, which embodies the regulations that give users use value and then interfere with their satisfaction rate and preferences. Generally speaking, the quality should reflect the business use value of goods, which

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can meet or exceed the expectations of users.

1.2. Supernova "BIM5D", a new engineering management mode

Under the general quality view, the quality of engineering projects is generally summarized as the manufacturing quality, that is, the estimated output rate of quality machinery and equipment defined as the theme activity of construction projects, or the specific error is within the error range specified by the designer of goods or services projects. However, if we can't really reflect the practical value of commodities to consumers, then the technical standards and specifications are worthless. Therefore, this paper defines the project quality as the satisfaction rate of the business use value given by the project commodities in the project life cycle. In order to better make the quality strategic management based on BIM more scientific and reasonable, the basic theory of lean production and construction is introduced, and the quality is defined by the use value of service items. The fundamental purpose of the quality management method is to meet the requirements of customers.

Due to the development trend and practical requirements, it is necessary to scientifically study the collaborative management of construction quality of engineering projects according to BIM, so as to achieve the overall goal of project quality. Firstly, the collaborative framework of project construction management is analyzed. From the macro-economic point of view, the capital construction projects are divided into three subsystems: technical software system, collaborative management system software and support point service system. The entity model of collaborative management network architecture of engineering project quality based on BIM is created, and the whole evolution process of collaborative management of engineering project quality in each link of engineering project implementation is discussed[3]. Combining the basic principles of Logistic entity model and main parameters of coding sequence, the collaborative level of project management methods is judged and qualitatively analyzed to improve the collaborative basic theory of project management methods. Secondly, combining CSCW system software entity model and Web collaborative system software entity model, each control module of the software service platform of engineering project quality collaborative management system is established from the fields of collaborative standards, management information system, task management and information management methods. The architecture diagram of engineering construction quality control collaboration system based on BIM is improved. Thirdly, considering the advantages and disadvantages of collaborative management of project construction quality under BIM service platform, a performance evaluation management system suitable for contemporary construction engineering management is established, and the basic theory of cloud model is applied to the performance evaluation of project quality management method according to BIM, which solves the contingency and ambiguity problems in the review process. Finally, according to an example analysis of a public library project's collaborative management of construction quality based on BIM, it shows that the project has a high level of collaboration and excellent quality. According to BIM's 3D model collision detection, it can help the designers to find out the inaccuracies in the design results and optimize them reasonably. According to BIM's simulated engineering construction, it can also assist the project supervisor to arrange the construction process scientifically, so as to prevent the project quality problems caused by the contradictions among different technical jobs. According to BIM's scientific research on collaborative management of construction engineering quality, the basic theory, collaborative management service platform and collaborative management mode of basic construction projects have been improved, which has certain practical significance for the future construction management of similar projects.

2. Characteristics of BIM technology

2.1. Application mode of BIM

As far as the quality of raw materials for engineering construction goods is concerned, BIM entity model stores a large amount of information about building materials and machinery and equipment. According to the software system, the required information of raw materials and components can be quickly obtained. The technical quality of construction is to ensure that all engineering and construction commodities reach the standard, and the standardization of production process is the reflection of the company's engineering construction level. Especially when dealing with the application of new technologies, new materials, new technologies and new processes, proper construction sequence, methods and reasonable engineering materials will cause critical harm to the construction quality. BIM's standardized entity model provides a service platform for the establishment of standards and specifications. BIM software system dynamically simulates the production process of engineering

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construction, and technical engineers from various technical specialties collaborate to create standardized production process, which is created according to discussion and accurate calculation, so as to ensure the stability of key points of unique construction technology in the implementation process. Subsequently, the construction team will carry out the engineering construction according to the simulated operation links, so as to ensure that the transmission of construction technology information is not prone to errors, prevent the specific practice activities from being different from the scheme practice activities, and reduce the occurrence of unforeseen situations. At the same time, by integrating BIM model with other excellent technologies and special tools, such as laser mapping engineering technology, RFID radio frequency identification technology[4], intelligent machine transmission, digital camera camera, augmented reality technology, etc., we can track, record and analyze the on-site construction work. It is convenient to grasp the construction posture on the spot at the first time, deal with potential uncertain factors in time, prevent adverse effects and supervise the construction quality.

2.2. Multi-application and interactive use of BIM

According to IFC's quality information service platform, only BIM technology is used. Because the article focuses on the quality management method of BIM, it only briefly explains the technical completion of BIM without detailed analysis. BIM technology is usually closely combined with augmented reality (AR) technology to complete the quality control on the construction site. The methods of information collection, recording and processing are as follows: before construction, record the quality plan into BIM information service platform. On the construction site, accurately locate the precise coordinate position of the project under construction according to GPS or on-site precise measurement, use augmented reality technology (AR) technology to carry out scanners for specific situations, simulate the construction and 3D scanner technology, and on-site technical engineers directly use the mobile terminal to access ordinary websites with Ipad, smart phones and other portable devices, which will cause visitors to slide left and right and zoom in due to the limitation of the width of the mobile terminal. Only then can we collect the quality status of each workbench, and then compare the quality information of concrete and schemes, find out the errors, evaluate the quality information by using probability statistics methods such as Six Sigma, rectify the quality information that is not manipulated by statistical analysis, and submit the quality information generated in the whole process to the relational BIM model. The key point of quality management method is to track quality in real time, analyze the causes of quality errors, and then carry out quality manipulation. The following describes the quality management method framework of BIM.

3. Construction plan of construction project

3.1. Optimization of construction plan with BIM technology

Aiming at the optimization of the construction plan, the general project construction usually adopts the method of multi-aspect collaborative verification to discuss the problems in the construction drawing design scheme. However, for intelligent building projects, this kind of method is obviously far from enough. First of all, because of the large amount of labor, many technical specialties involved and many engineering subcontracts, some small details are easily overlooked, endangering the optimization of engineering drawings. Secondly, because of the lack of three-dimensional model of visual effects, each participant can't comprehensively and practically consider the correlation of indoor space. Only by knowing the participants' basic professional skills and work experience can we examine and approve the complicated design drawings and find out the existing deficiencies. Then, according to the written or written narrative, let others know that it is impossible for everyone to find out any problems in the design drawings in detail and accurately, and the quality of the design drawings can not be guaranteed.

BIM technology can complete the approval of engineering drawings from abstraction to reality. According to BIM model of BIM technology, the 3D engineering drawings of various subjects can be reasonably covered, so that every participant can access the project design from the virtual building space according to the 3D model of BIM, reasonably find out the blind spots that are easy to exist in actual visual effects, immediately find professional technicians in comprehensive engineering drawings, complete zero contradiction and conflict of design drawings, improve the quality of engineering drawings, reduce rework, and collaborate and communicate on information sharing resources.

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4. Management of construction process

During the construction period, the operation of new projects is complicated, so it is necessary to carry out effective management methods for each implementation stage, so as to prevent problems in the middle of the construction, endanger the construction progress and cause the project not to be carried out on time. B1M technology model can complete the storage and management methods of raw materials, industrial equipment, construction workers and other information, and integrate the sales market information to immediately check whether the goods on the spot can meet the quality requirements. The quality control management system includes: pre-control, process control and post-control of the whole process[5]. The introduction of BIM technology will improve the quality management ability, and its advantages are specifically reflected in the following aspects.

4.1. BIM technology management methods for construction workers

Compared with the traditional management mechanism, the application of BIM technology can further improve the production efficiency and quality management ability of managers and construction workers, reduce the construction period of new projects, use BIM technology to model engineering projects, and project managers can have a clear, visual and all-round grasp of new projects and apply information models.

4.2. BIM technology management method of construction machinery and equipment

Integrate the natural environment of the project, simulate the whole construction process, and select the best construction machinery and equipment[6]. According to the analysis of construction animation, we can get the entrance opportunity of construction machinery and equipment, and reduce the shutdown time and cost of construction machinery and equipment. In addition, according to the analysis of construction animation, we can make clear the reasonable layout plan of construction machinery and equipment, and further improve the management method of construction machinery and equipment in the whole construction process.

4.3. BIM building decoration materials technology management method BIM technology can create building decoration materials database query

The information can include ingredients of raw materials, distributors, quality inspection reports, product qualification certificates, etc. According to the close combination of the entity line model of the new project and the construction schedule, we can simultaneously obtain the types and main uses of materials used in the new project. In order to better maintain the balance of resource application and save the management cost of raw materials, the original division of construction section can be adjusted to make the supply of raw materials more scientific and standardized[7]. In addition, BIM technology can be used to complete the information management method of project archives, which saves time and effort in searching and managing archives, and further improves the production efficiency and quality. According to the unified archiving and backup data solution, the original complicated document management becomes easier and easier.

4.4. Model components in the whole construction process

BIM technology management method in the whole construction process BIM technology can quickly build the natural environment of virtual reality technology, simulate every whole construction process, and promote the division of construction section and construction surface. At the same time, the characteristics of different processes can be specifically analyzed, and scientific and reasonable production processes can be selected according to the engineering characteristics. In addition, by using 3D simulation technology, the quality problems in the whole construction process can be dealt with in time, and in the prevention work before the project starts, it can really prevent problems before they happen and reduce the probability of quality problems.

4.5. Technology sharing of BIM in the whole process management mechanism

The whole process management mechanism BIM technology can be used in every link of new projects. In the design of new projects, the constructor, the design scheme and the constructor work together for the prophase design of new projects, and many parties can fully communicate on the

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technical service platform[8]. Revit mobile phone software is used to distinguish whether there are contradictions among the technical specialties of the new project, so as to reduce the quality and safety hidden trouble caused by the contradictions of design specialties. In the construction of the new project, sharp quality information such as raw materials and industrial equipment is introduced into BIM technology model, and the construction quality can be supervised anytime and anywhere in the whole construction process. In the whole process of R project acceptance, BIM technology can more conveniently and quickly view sharp information. In the operation and maintenance management of engineering projects, BIM technology model can be used to check the location of quality problems, analyze the causes of quality problems, identify those responsible for quality problems and safety accidents, and identify the best solutions

5. Cost application of BIM technology

As we all know, the bidding process in the project budget is the most complicated, and its labor is particularly large. Especially in today's natural construction environment, both the tenderee and the bidder must repeatedly calculate the bill of quantities, in which the tenderee must additionally calculate the budget quota of the overall target to consume the bill of quantities, so many staff members must analyze the data information and make tables, but it happens that there are many staff members during the calculation[9], so the values of the bill of quantities are different. With the efficient application of BIM technology, BIM technology can be used to find the project budget, and then high-quality project budget can be made, thus reducing the calculation error rate and disputes. Traditional construction projects focus on the allocation of project plans, and the key to understanding cost control is project investment manipulation, which is embodied in the control of construction cost by contractors. Generally speaking, the primary problem in cost control is that it is not easy to determine the bill of quantities, which often leads to the situation that three parties must determine and measure the bill of quantities several times. During the construction period, because of the specific situation of the construction site, it is often necessary to change the data information. China's economic development trend is the market economy system, and the cost of labor, machinery and equipment and raw materials in the sales market is rapidly upgraded, especially in today's pursuit of perfect independent innovation. However, the price of fixed information of relevant parties is slowly upgraded, which causes the cost budget to fail to keep up with the specific manufacturing situation and immediately endangers the valuation[10]. In fact, the specific manufacturing quota system level of each company's construction project is far from the quota system level required by government departments. If only based on the budget quota consumption required by government departments, it will endanger the authenticity and effectiveness of project billing. The most obvious problem is that the communication among the cost information is hindered. In the cost work, the cost staff are all doing your own part of the content, lacking mutual communication, unable to find problems according to new projects, resulting in low cost management ability. The construction link is the critical period of the project. At present, the quality of project budget is closely related to the quality of project management, because the construction operation period is usually long, which will be harmed by many other factors, thus resulting in a high rate of error in cost management. Therefore, it is urgent to analyze and strengthen the application of BIM technology from this perspective. After all, because the cycle time at work is an informative and long-term whole process, there are many areas in this process that are harmed by many factors, such as. 360 material procurement assets have not been thoroughly implemented, and the cost of concrete products has already exceeded the standard, so BIM technology is needed to control the technical cost[11]. The application of BIM technology in the completion process is extremely important. It can further publicize the project budget information and reduce the occurrence of various disputes. In addition, BIM technology can also summarize detailed new project data information, and carry out overall data analysis on detailed information to establish information data information for cost control management.

6. Fabrication of prefabricated components

In intelligent building construction projects, many prefabricated components are often necessary. Most construction projects suffer from the hazards of places and assets in the whole construction process, and very few large and medium-sized prefabricated parts are built on the construction site. Therefore, many construction enterprises tend to order or immediately purchase prefabricated components manufactured by prefabricated component manufacturers. As everyone knows, at this stage, the primary problem between the technical department and prefabricated component manufacturers is the lack of adequate communication with each other. In the process of production, parts manufacturing enterprises

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often encounter situations that endanger the high efficiency of goods, such as delayed time, false report, change of construction business license, etc., in the process of transmission from construction company to technical department. The production, processing and transmission of prefabricated components based on BIM technology depend on the following functions of BIM technology: First, the technology department and the construction company have the right to share resource data according to the harbor and the cooperation framework agreement. Secondly, the BIM solid model is used to complete the 3D reconstruction of key points of prefabricated components, so that the staff of prefabricated components processing factory can clearly grasp the practical significance of the design scheme of prefabricated components, reduce the probability of errors in the manufacturing process of prefabricated components, and then complete the standardized company of prefabricated components interaction. Finally, according to the total number of construction materials obtained by BIM solid model, the spare parts manufacturing enterprises can comprehensively and accurately analyze the data information of cost budget and cost calculation, and make statistical analysis of the total number of raw materials. Use BIM technology to create and manage information of construction projects, and integrate multi-dimensional information covered in capital construction process in the form of structural and graphical interface[12]. BIM has the following functions: entity model interaction; Ensure the accuracy and consistency of entity model information and information; Automatic generation of design scheme data; Integrated analysis of design scheme; Rapid transformation and evaluation of scheme changes; Online communication and immediate communication; Computer controlled prefabricated components. The collaborative application of lean production construction system software and BIM technology is relatively highly compatible, and BIM is the key driving factor for the successful implementation of lean production construction. As a new way, BIM entity model is beneficial to the construction industry to complete the standard of lean production, eliminate consumption, simplify procedures and accelerate construction projects.

7. Conclusion

Nowadays, with the increasing attention of the construction industry to BIM technology, in order to better promote the stronger application of BIM technology in the construction industry, it is necessary to vigorously promote the discussion and application of BIM technology in both government and fields. The government should actively formulate BIM technical specifications and improve the application system and standards of BTM technology. At the same time, the government and fields should regard BTM technical expertise as the key content of vocational qualification examination and continuing re-education. In colleges and universities, the government should diligently improve the application system and standards of BTM technology. All in all, in the contemporary information age, BIM technology has already become the future development trend, and it is also the regulation of the contemporary era. However, due to the hazards of various factors, the application of BIM technology in China has not been fully promoted at this stage, and we have encountered many problems in the process of promotion. As everyone knows, with the rapid development of society, BIM technology must be the future development orientation. At the same time, BIM technology has provided a lot of economic benefits to everyone in the course of using it, so everyone must use this technology. The application of BIM technology not only improves the level of engineering quality management, but also further improves everyone's work efficiency and makes people's engineering quality management more perfect.

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