



## The Application of BIM Technology in Building Construction Quality Management and Talent Training

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### ABSTRACT

In this paper, the main problems in the construction of the construction technology, such as the construction layout, the construction quality management, the construction safety management and the combination between talent training and modern information demand are discussed. The main reasons for the existence of these problems are briefly analyzed. Then, it introduces how to bring the BIM application in construction engineering and talent training.

**Keywords:** BIM technology, construction quality management, talent training, education

### INTRODUCTION

In our daily life, the quality of construction project has always been the focus of the public because it is related to the safety of all people. Although the production technology continues to improve, building materials and equipment in the constant innovation and progress, the quality of housing construction has gradually been resolved, but the new problems have gradually emerged. In view of the existing problems in many construction projects, BIM technology can improve the engineering quality assurance and production efficiency by providing effective solutions.

### QUALITY MANAGEMENT PROBLEMS IN TRADITIONAL CONSTRUCTION

For a housing construction project, the quality of front-line construction workers is the decisive factor in the quality of the project, which greatly affects the quality and progress of the project (Wang, 2016). However, the current situation of our country, the engineering construction personnel by the majority of migrant workers. They lack of appropriate technical support and professional background, after entering the job has not experienced vocational and technical training, construction professional quality is low, which leads to a lot of quality problems of housing construction (Shen, Tzempelikos, Atzeri, Gasparella, & Cappelletti, 2014).

Part of the construction unit only to pursue additional benefits, which is caused by the actual construction of the construction unit when the choice of quality of building materials is not enough attention, even if the state of housing construction work of building materials has a strict division and strict regulations, The completion of the quality of the project will also be a certain problem (Skandhakumar, 2016).

In terms of China's current housing construction, the state has formulated relevant policies and regulations to ensure the safety of such projects. However, even so, in the process of the project, the construction personnel have certain problems and differences in construction management of design drawings, understanding of the

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### **State of the literature**

- BIM is based on three-dimensional (3D) digital technology and integrates all of the information in the construction project lifecycle while providing a detailed expression of project-related information. With recent advances in BIM, the technology has been used more and more widely in the field of housing construction. Research has shown that, in the design stage, BIM technology can be used to place the various parties involved in housing construction in a unified 3D design environment, thereby reducing the risk of "information islands" and design conflict due to different priorities and/or miscommunication. This improves architectural design quality, minimizing the need for later design changes.
- Engineering budget analysis based on BIM is more efficient, flexible and accurate than conventional budget estimation procedures. During the construction stage, BIM technology can be used to manage the entire construction process dynamically, improve construction quality reduce construction costs, speed up the construction process and reduce future building-maintenance costs significantly.

### **Contribution of this paper to the literature**

- The purpose of this research is to present and verify a BIM-based method for calculating the auxiliary materials required for the main construction phase of housing construction based on the given housing-construction specification.

norms exist, these quality standards and specifications often have not been seriously implemented, resulting in a lot of project construction quality is not up to the requirement (Xu, 2016).

Housing construction quality perception is the quality of housing construction is an important aspect of the judge. However, before the construction of the project, the traditional construction technology cannot be accurately predicted the completion of the perception of the effect of the project (Hu, 2016). Following the housing project completed, there are some do not meet the design intent of the place, even in the actual operation there will be a lot of defects, leading to substandard quality, such as the installation of the interior of a building in a lot of equipment, in the latter part of the maintenance process, there will be a lot of difficulties, resulting in equipment service life short, quality low, fail to meet the expected requirements.

In the housing construction project, often the staff of the various units of professional differences, so that the coordination of work there are some difficulties, but the process of such projects is relatively more systematic and more complex, so the required professional and work are different, but they need to be able to coordinate each other's work to be completed (Ghaffarianhoseini, 2016). This will occur some wrong in the actual work of the various professional and the coordination, resulting in such projects often need to re-construction, and engineering project continuity is not enough. Seriously, it will cause different professional staff work contradictions, which will have a great impact on the final quality of the project.

## **THE MAIN REASONS**

There is a view that people in the pursuit of life, no matter what we do, is to maximally protect their own interests, but the person is not alone, for the society, the need to do their utmost obligations. As a company, the biggest purpose of its existence is the pursuit of maximum economic benefit, as for this point, no one will criticism about it, however many companies over the pursuit of economic benefits and in order to maximize their own interests in the construction process without considering the construction quality problems. In this industry, it is common that the quality problems of the project which are caused by the company's selfish behavior.

Even if the current construction project of buildings has been through a series of theoretical research and professional accumulation and formed a complete set of management methods gradually. However, in practical

work, it cannot achieve the expected effect of management in theoretical research. This is also due to the actual work in various aspects of restrictions, which will result in the low efficiency of its quality management, therefore the ultimate goal cannot be fully realized.

Generally speaking, the environment of housing construction project construction is in the open-air, so the quality of housing construction project is affected by a lot of natural factors, at the same time, congenital conditions as well as the impact of human factors are also great. However, many construction sides often neglect the influence of natural environment factors on the construction quality of housing construction projects. Meanwhile, the construction company may inadequately grasp and has a low degree of understanding towards the natural environment, they often do not have timely response measures when the construction process suffers from bad weather, resulting in a large impact on the natural environment of the project.

### APPLICATION OF BIM TECHNOLOGY

BIM technology can use several techniques to provide support, that is, construction simulation, information statistics, so that the management of the various processes reflected in the contents of the visual, which can strengthen the management of its control. BIM technology for quality management, in addition to the product itself can reflect the quality management, but also to the process of technical quality management. BIM technology on the one hand can make the real-time monitoring for construction process, on the other hand, managers can be established through this technology module needed to find their own equipment and other related information in the first time, and compare products and construction site. The technology can play a very good role in ensuring the quality of construction (Bae, Lee, Park, 2015).

For quality control books, including mainly before and afterwards, while in advance and in the control of the main link to the application of BIM. For its simulated construction of electronic technology, the construction site in the construction of its environment, the overall layout, schedule, process and materials to play a certain role in the purchase, which can facilitate the staff to find out the risk of construction problem (Cao, 2016). Therefore, it is also possible to improve the relative potential risk, so as to be able to feedback in the simulation process, to effectively avoid the construction of housing construction quality problems. This has some advantages over previously used pre-control, through the current advanced technology, but also to allow project managers to make more perfect forecasts to improve their efficiency. BIM not only in the pre-control play a role, but also to control the things play a certain role. At the same time, in after control, it can also play a role in its actual problems, because it can be marked in the simulation software where the problem clearly, so that it can be more convenient to analyze the problems, the use of remedial of the measures, on the other hand, can also make a relatively good experience of this accumulation, so for the next job, but also can play a better job preparation. Therefore, the use of this technology can not only play a role in its control, but also for the quality of project management services (Grunewald, 2016).

The main factors affecting the quality of the project are: human, equipment, materials, methods, conditions, if these factors can be well controlled, the quality of construction can be guaranteed (Chong, 2016). The use of BIM is mainly to play an effective role in controlling these factors.

The construction project manager and the operator on site are the main controlling parties. BIM to a large extent can help these people to do the work better, more effectively, fundamentally solve the quality problems of the construction. The simulation of the construction site is an important content of the technology, the management of the construction project can according to the simulation diagram of the construction site of a pre-integrated grasp, combined with their ability to predict possible quality problems in the management of research on possible future problems in construction measures in the problem appears before. The ability of the operator on the construction site has a direct impact on the quality of the construction project. The application of BIM technology to the construction site of the different people, reasonable division of labor, so that everyone can play its biggest role in the process of construction, and make their own analysis on the key and difficult work, to avoid the possible risks in the process of construction.

For the construction of the scene of the construction machinery, we can also use BIM technology to simulate them, a variety of mechanical composition of the method to a certain change. This is also conducive to more effective on the layout of the corresponding changes, so as to find process design and project characteristics, can be more efficient and cost-effective layout.

The material used in the construction of the project is the basic material of the whole project. Whether the material is selected correctly and the reasonable use can directly affect the quality of the project. Therefore, the material control is the key link of the whole project. BIM technology can be a comprehensive analysis of the needs of the construction and the progress of the project, and give the most reasonable choice of a material to ensure that the entire construction process normal and effective. The application of BIM technology can record the specific information and sources of materials, and classify them according to the different types of materials, as the basis for the later engineering inspection.

For construction projects, the use of BIM technology, can be more easily in the electronic simulation of various construction methods to simulate the construction, at the same time, can be combined with various strengths and weaknesses in the simulation analysis, it is more consistent with the process of construction project. Simultaneously, it can also be used for the construction of the program reasoning demonstration, so that it is expected to correspond with the actual, thus ensuring the quality of housing construction projects.

In the use of BIM technology, some environmental factors taking into account the project, analysis the possible weather, geographical factors, and thus calculate the possible environment of the project caused by the change, which can advance preventive measures in the BIM simulation, can be more stereo showing the effects of such environmental factors may occur, but also more convenient management personnel to identify problems, which can save time, improve efficiency.

### BIM IN PDCA CYCLE

Domestic enterprises have formed the PDCA cycle according to their own experiences in construction projects and related research, and PDCA Cycle is one of the important ways to controlling the construction quality. BIM applied to the cycle comprehensively, so that ensures the better quality of construction project.

In the planning process, all participants can determine their respective quality, security, schedule and cost plan through BIM in a relatively unified plan. Participants in each specialty will be able to complete their own plans and constitute a unified project management plan. Within the same planning framework, the plan among each participant can be more continuous and reasonable (Andujar-Montoya, 2015).

BIM technology plays a significant role in the formulation of construction scheme and technical support, in general, to plan and implement plan are two different participants, the cooperation between the two is particularly important.

The application of BIM technology can be easily and quickly compare the expected situation and the actual situation of the project, thus more clearly in the actual implementation plan mistakes, which can know whether the project management aspect can achieve the expected plan standard. Even if there is deviation, can also be combined with the current implementation of timely adjustments to ensure that the next stage to achieve the desired objectives.

BIM method for the problems in the construction process is to take preventive measures before it occurs, Specific operation is the first time the progress of the project construction, quality, safety, cost and other status to the relevant departments. The relevant departments in conjunction with the relevant direction of the planning staff, on-site personnel and technical personnel, for possible problems or problems that have been analyzed in a timely manner, put forward the corresponding measures. The construction of housing construction management personnel can mark the place where the problem and related problems are described in the BIM model, to treatment of the problem at that time, and the problem of late rectification guidance, tracking verification, statistical analysis can play a very good control effect.

At present, the application of the technology is still in the exploratory stage in the practical engineering, and with the gradual popularization of the technology in the construction industry, the building industry in our country is facing many challenges about design, construction, final-period management. New technology needs new talents, at the same time, the cultivation of the professional technical personnel is also faced with challenges in China.

## THE COMBINATION BETWEEN TALENT TRAINING AND INFORMATION DEMAND

The development of the BIM technology make demand for talent of BIM is gradually obvious, comparing with the personnel engaged in the work of building now, BIM professionals really understand to the real connotation of BIM, expertly handle the software, and possess the professional knowledge about the model management of project. Such talents into the industry, can have a positive impact on the present project personnel and speed up the promotion of BIM technology in our country. It is put forward different degree of challenge to the civil engineering talent cultivation of our country present, especially for higher vocational students, cultivating students' practical ability is considered very important in the process. It would be a big challenge how to cultivate the BIM technology for the higher vocational students in civil engineering classes (Zeng, Wu, Pang, Sun, & Chen, 2017).

For the current civil engineering teachers, the BIM technology also is in the stage of learning. In the learning process, we found that it is very difficult to fully master the BIM technology for any one teacher. This is related to the professional education of teachers own, they cannot lecture for any speaker courses from the beginning to the end like that the traditional teaching, because the BIM technology itself is the need to set up a professional team, and work along with different professional personnel within the team, for example: construction projects from the initial survey and design, construction management, cost budget, equipment management, at the end of the operation management, it will become an independent course in the original curriculum system Settings, even divide into different professional so that they lose the contact between the students and the teacher. If teachers want to put the BIM technology completely impart to students, it will need to establish contact from teacher, that is to say, it needs form the BIM technology team or professional teaching and research section from surveying, construction technology, cost, property management, and other professional teachers, and then just a few teachers to complete teaching of BIM technology. With the constant promotion of BIM technology at present stage, the teachers still need further professional training. Only in this way can we get and learn the cutting edge of BIM technology in the earliest time, and can we better use of cultivating professional talents of BIM in the teaching.

At this stage, most of civil higher vocational students enter into the enterprise after graduation, their work is still reading drawings, surveying and setting out or collating the engineering data. But with the promotion of BIM technology in enterprises, this work may not be needed someone to complete, and the traditional construction management will also contain a lot of works about rework, calculate the amount, progress control, etc. When the design phase has been using BIM technology projects, if we need to perfect the work, we should continue to use the BIM construction model in construction stage that requires construction companies have many professional about BIM. It will be a biggest employment direction for students of the civil class higher vocational school that they can use the model to solve collision, schedule control, data archiving work at the construction site.

China's high vocational colleges mainly aim at cultivating applied talents, the students have only a remote possibility to work in the research or design after graduation. In this background, the school should follow the market change, according to the gap is bigger of BIM technology talents in engineering construction at the present, should adjust the training program, teaching content, teaching mode, and actively promote in the promotion of BIM among students, and then increase employment opportunities for students. Moreover, the school should guide students to change ideas and cultivate the spirit of teamwork and break the boundaries in the process of learning. BIM community, was created by the architectural design, construction equipment, construction technology and other professional, was able to finish a complete works of building model, and then use the model of BIM in the process of building construction and complete the corresponding management work, it requires students not only learn course such as construction, project management but also contact with the BIM technology.

Most of the students just learn modeling software or just learn cost software or relevant construction management software to study phase in the school, but how to apply to the BIM technology that is the biggest challenge for students, so many countries also intensify promotion of the education of BIM technology. The SVILLE cup of building information model application skills contest for students of colleges and universities in the country, has successfully held six sessions (Turk, 2016). The professional game of BIM technology is built by China education association, undertook by the technology company of Shenzhen SVILLE, and get support from the ministry of the discipline steering committee of construction management and engineering cost, the discipline teaching steering committee of the national vocational education of civil engineering. The competition not only requires the student to use the SVILLE software but also to achieve the collaboration of the BIM between constructional major of colleges, at the same time ,to enhance students' practice and innovation ability and improve the cooperative ability among the students' team. It will need professional and more comprehensive textbooks about BIM, but existing teaching material's content is mostly introduced the use of drawing tools, do not explain the steps and the content of cohesion between instruments. Higher vocational education mainly raises student's operational ability, to solve the practical problems on the job, so this kind of materials can not satisfy needs about the teaching of BIM technology, it requires to write with project as the lead, " the architecture design of BIM " "the structure design of BIM "and other series of teaching materials and comprehensive practice instruction, to real learn and master the BIM technology in the process of creating and managing project model.

The traditional way of teaching, especially the software courses, tend to firstly introduce the tool and then let the student practice independently, if professor teaching only one software and a few tools, so this method cannot let the students master the BIM. Therefore we need to change our teaching method, firstly, that will require the teacher to find a project and then explain in detail to students about the project from the initial planning, design and construction management in the late, so that students can really learn to the complete BIM technology. In general, the development of BIM technology put forward different demands and challenges for enterprise, teachers, students, but also provides us with opportunities. How to learn and make good use of new technologies is that cannot solve the problem in a short period of time. It will be along with the constant development and improvement of BIM technology, eventually to promote the rapid development of the whole building industry.

## CONCLUSION

In the process of Housing construction project construction, the quality management issues generally have some personal ideas, so it is difficult to improve the use of tools to improve the way. At the same time, the improved method of using the tool, the problems in BIM can be effectively solved, the use of the method and technology of BIM and were compared to find out the difference, and put forward the disadvantages of the methods used in the past and the advantages of BIM.

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