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Study on Construction Quality Control of Urban Complex Project Based on BIM

Junying Lou ^a , Jiang Xu ^b , Kun Wang ^c

Zhengzhou University School of Management Engineering

Zhengzhou University civil engineering College

Abstract

Urban complex of high efficiency, complex, intensive determines its modernization, urbanization, internationalization of the inevitable product. And it will become the city's landmark buildings and promotes local economic and cultural development. In the construction of urban construction should be quality-oriented, because of which BIM information sharing, features and functions for the construction of the project providing a lot of help to provide quality protection to ensure that construction quality standards.

Based on the construction of urban complex project, this paper analyzes the construction characteristics and construction quality control difficulties of the project. Then combining BIM technology and AR technology in the concrete application of the construction stage, the project construction quality is enhanced through prior control and process control and post control. Construction quality control for the future urban complex and the use of BIM technology aims to provide reference and improve project quality and construction industry production efficiency.

Key words: HOPSCA, Construction quality control, BIM technology

1. introduction

With China's rapid economic development, China's urban complex or commercial complex projects can be seen in various cities in the country. According to the relevant data as of September 2013, the number of urban complex on building has been four times as that has been completed. It is expected that the number of urban complexes will

* Corresponding Junying Lou
E-mail address: Junying_Lou@1406712611@qq.com

increase by 50% to 100% over the next three years. Urban complex, to a certain extent, ease the relative shortage of urban development, the plight of space resources, to give the public to provide high-intensity city activities. However, the development of real estate is no longer the focus of much attention, but the commercial real estate projects as urban sprung up, become the real estate sector upstart. The construction quality of the project directly determines the quality, function and effectiveness of the whole project, so the project construction quality control is the key content of this paper. As the project scale, the construction period is long, uneven construction management, construction process uncontrollable factors, the traditional construction quality control program can not meet the requirements. Therefore, the city complex construction quality control is a difficult task and challenge. BIM is a new technology and method, it can control the construction process, construction conditions and model links, to solve the communication problems between the parties.

In this paper, the difficulties in quality control of urban complex engineering construction are analyzed by means of literature research and summarizing research methods. Combining the BIM conditions of construction quality control system and its influence on construction quality control, urban complex engineering construction and exploration application, the quality of urban complex engineering Control methods and conclusions for the construction of complex engineering is valuable for quality control the future development of BIM technology .

2. Quality control platform based on BIM

2.1. data sharing

As shown above, BIM is an information sharing and exchange of media, more importantly, a novel work and cooperation philosophy. Therefore, based on the BIM model, the establishment of quality control system and the use of the construction stage can effectively protect the quality of construction.

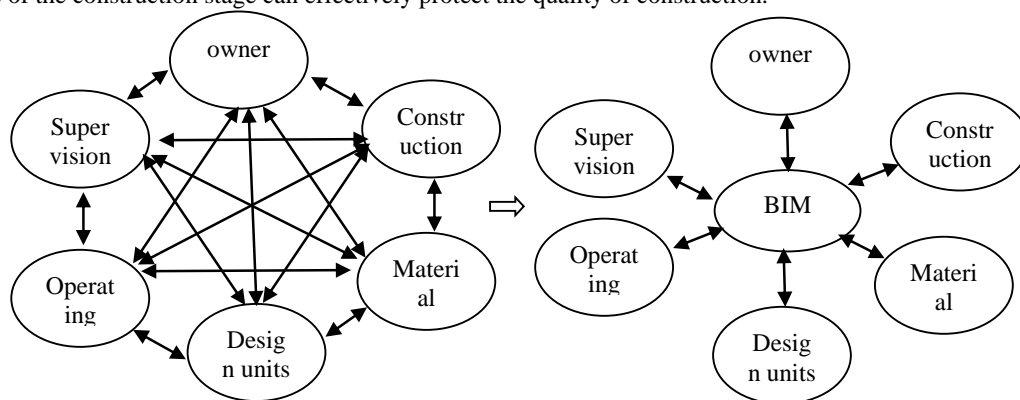


Figure 1 data sharing mode changes: (left) traditional mode (right) BIM mode

As figure 3, BIM is an information sharing and exchange of media. Therefore, based on the BIM model, the establishment of quality control system and the use of the construction stage can effectively protect the quality of construction.

2.2. Quality control platform structure

BIM technology-based quality management framework is the focus of the platform to achieve the function, which combined with AR technology to promote the construction quality control. First of all, establishing 3D information model and construction plan before the BIM database entry. In the implementation process, combine AR technology (computer use and interpersonal interaction) with real-time engineering quality information and join the database and quality plan for comparison. At the construction site, construction workers or supervisors can record real-time data from mobile terminals (tablets, mobile phones, etc.), take photographs and gather quality

information of each work plane, compare actual quality plan with PDCA, dynamic control or Six Sigma Method to correct the deviation quality. All quality data generated are loaded into the BIM model throughout the construction process. The quality control framework is shown below in figure 2:

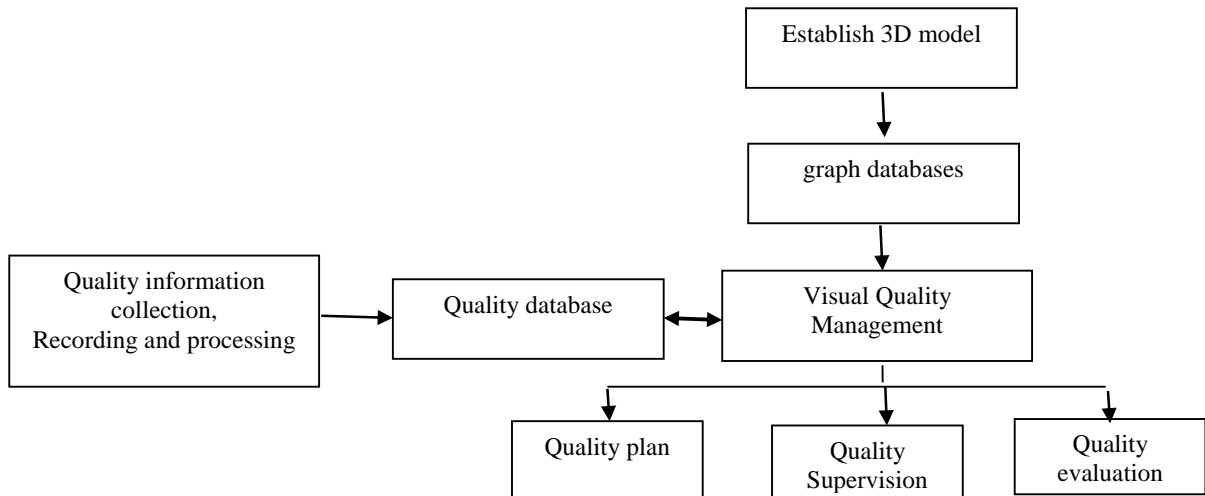


Figure 2 construction quality control framework based on BIM

3. Application of BIM in Construction Quality Control of Urban Complex

Normally, the whole construction process can be divided into several different stages according to different factors. According to the quality of the formation, dividing into the prior-control, in the control, ex-post control of the three construction stages to introduce the specific application of BIM .

3.1. Prior control

3.1.1. Three-dimensional modeling

The quality control of the entire project is based on a reliable three-dimensional model, but also the use of BIM for construction quality control. The establishment of accurate 3D model can be more intuitive, comprehensive and profound understanding of the information in the construction process to prepare for the construction. In the project, before the construction, design documents and wrong place can be found in the defect to improve the quality of the design of the project, prevent micro-gradually and solve quality problems from the source.

3.1.2 Collision inspection and drawing review

Through the use of BIM technology, high degree of three-dimensional visualization, simulation, optimization features, the pipeline between the professional collision check and comparison to the general pipeline layout design can find a lot of pipeline conflict. To improve the pipeline design and layout of integrated programs to avoid construction errors and rework and the quality and efficiency of construction by drawing co-ordination based on the BIM 3D model and collision checking. Parties, the professional BIM model and construction drawings of the problems put forward to the design unit of feedback to further drawings, to get an accurate drawings and three-dimensional model. BIM drawings flow chart is as follows in figure 3:

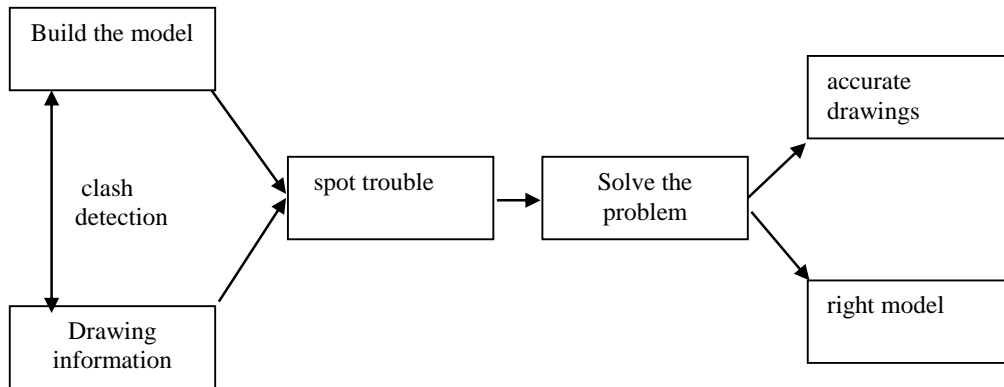


Figure 3 BIM drawing process

3.1.3. Construction site layout

The layout of the construction site should be dynamic with the development of the construction project. The two-dimensional layout drawings can not satisfy the dynamic layout. Therefore, the BIM model shows its advantages from two-dimensional to three-dimensional space dynamic arrangement with the process of time to form four-dimensional modeling. BIM are mostly used in the following areas:

1. Construction site maintenance and road traffic layout.
2. Material stacking.
3. Mechanical equipment layout.
4. Office area and living area layout.

After finishing the layout of the construction site using the BIM related software, the rationality of the roaming test layout can be used. Through on-site roaming, you can examine the layout of the scene from different angles, found missing details of the problem, optimize the layout for the construction of fully preparation to ensure the safety and quality of the project.

3.2 process control

3.2.1 Construction simulation

In general, building construction simulation represents the implementation of the construction process intuitive. Construction simulation and the actual construction of the combination of contrast effectively avoid quality problems through node structure simulation, construction process simulation and reserve hole positioning.

(1)Node construction simulation:Dimensional CAD drawings, the technical staff of the knowledge map and technology is a major obstacle. BIM high visualization and simulation, node structure and features can be clearly demonstrated to the scene of the construction workers.(2)Construction process simulation:BIM technology can achieve the construction process animation display.The BIM technology simulates the construction process to ensure that the project management and technical personnel master the construction process and construction methods, including the construction process changes and the use of construction technology for the construction process quality control.(3)Accurate positioning of the hole is not only convenient for construction, but also will reduce the later ticking construction, providing a strong guarantee for the quality of the project. Such as Luban software, Revit and other software can be reserved for accurate positioning of the hole, generate location reports to guide the construction site.

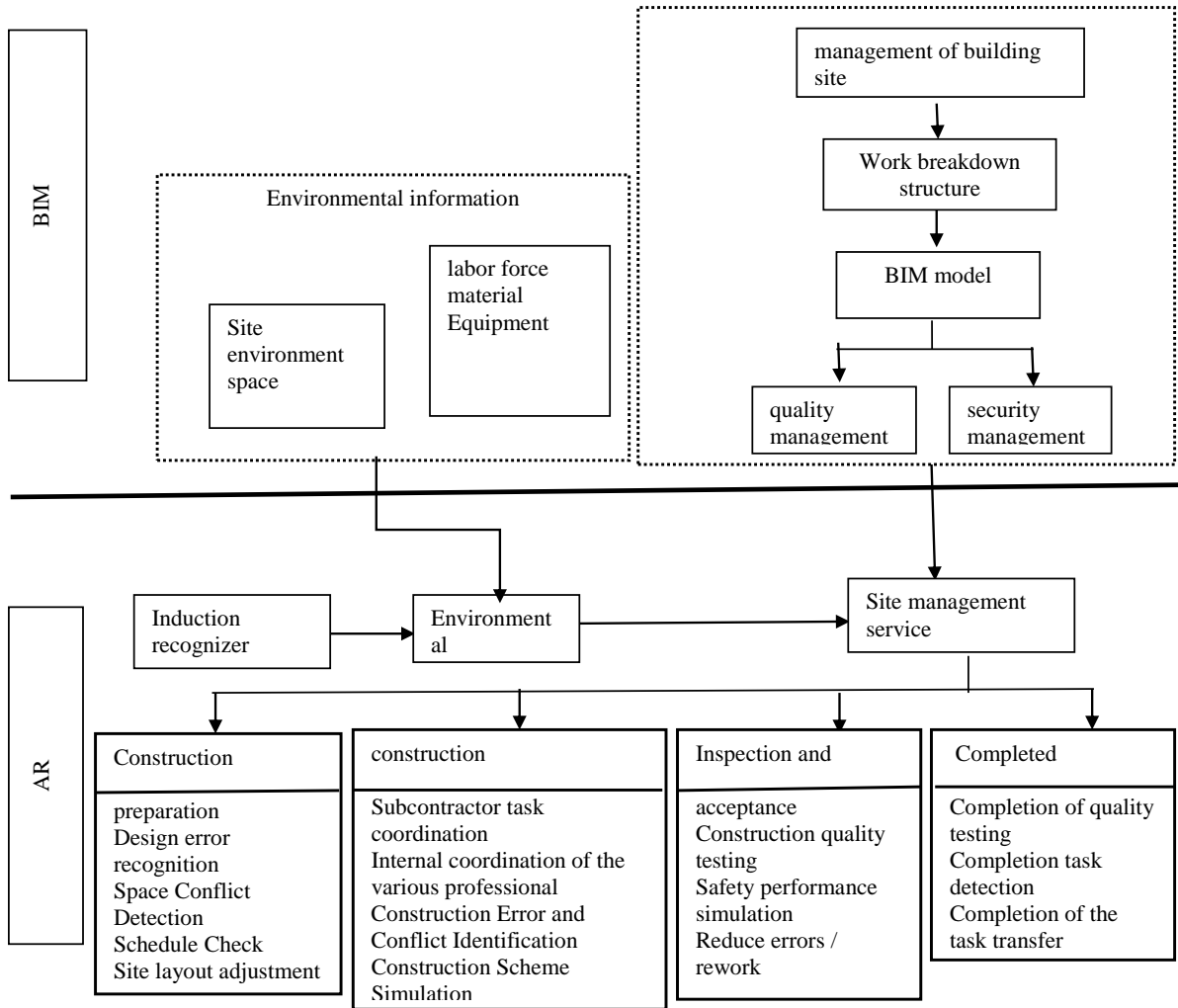


Figure 4 Construction site BIM and AR integrated organizational structure

3.2.2 Site Quality Management

As shown as figure 4,the structure in the construction of things in control,.To facilitate the construction site management personnel and the operation of construction personnel, increase the intensity of quality control, you can compile on-site BIM and AR integrated organizational structure to know the quality of the site management, construction quality control,because AR is a collection of real-world information data and simulation of virtual information will be seamless after docking to the real world.

(1) coordination of communication

Differing from the traditional construction control and coordination, the coordinated construction control method is based on the construction overall goal throughout the construction process. Through the analysis of the actual information on the site, the organization of the construction team and the technical staff of the construction of

communication arrangements, coordination of different construction needs all the main resources to complete their construction tasks, reduce or eliminate the construction of the conflict.

(2) Construction conflict identification and avoidance

The collision detection and construction simulation of BIM model are used to identify the conflict problems that can be found in advance, so as to determine the position of collision in advance and do well in prevention and control measures. In the case of rapid changes in construction, uncontrollable construction factors may lead to construction errors or changes in the cross-site, on-site management personnel can use AR technology and BIM model to match the construction program to modify and adjust.

(3) data collection and testing

This paper studies the construction quality control of the complex project, so it is the processing of the quality information data. AR technology can be used to collect quality data anytime, anywhere, upload to the BIM model of information systems, with the original model of the same stage of quality data for comparison, to ensure the accuracy of quality information. As figure 5, the quality information of the key nodes of the project is collected by AR technology, and compared with the information in the BIM model, the problem of construction quality is found in time.

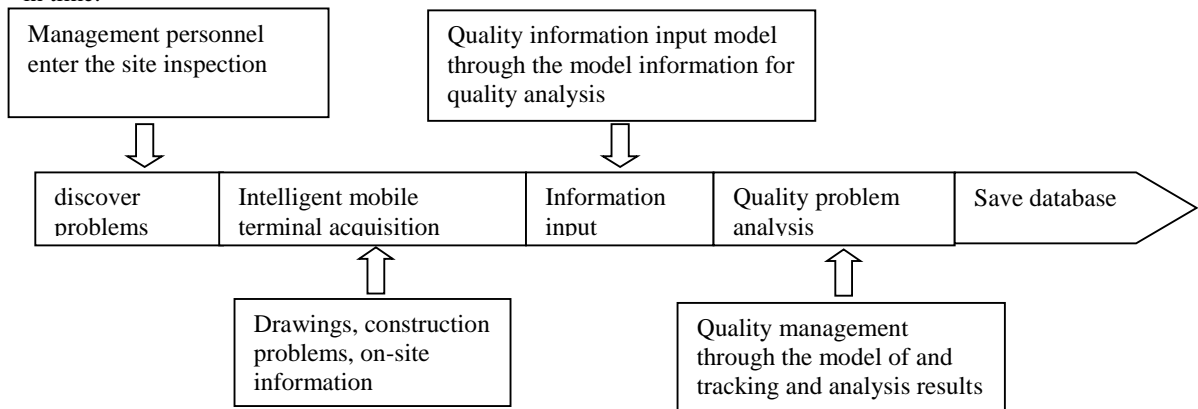


Figure 5 management process of construction site quality data

(4) construction quality inspection

The management of the construction unit or inspectors can complete the work and eliminate construction deficiencies and defects. On the procedure of quality inspection is not up to standard, the next procedure can be transferred to the next process construction only through the quality inspection. Specific inspection process as shown below in figure 6.

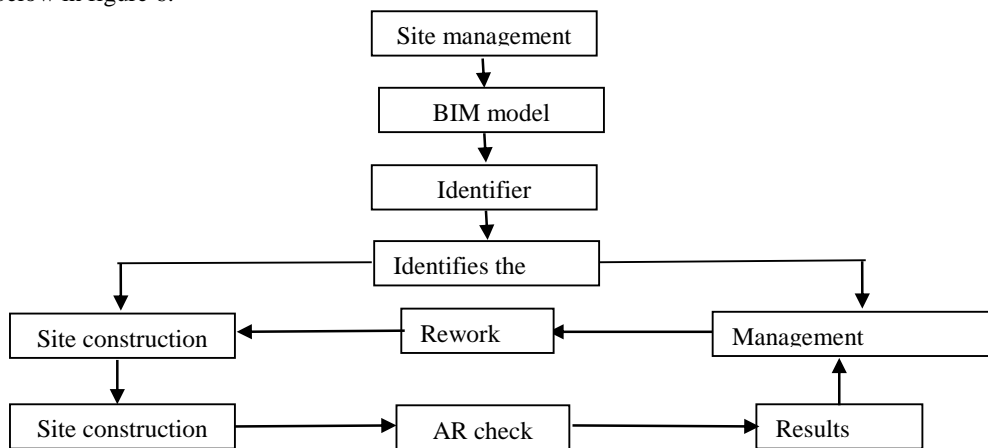


Figure 6 the quality inspection process combined with BIM and AR

3.3 post control

3.3.1 Quality acceptance

In the actual construction process, the quality of the construction site does not meet the requirements of rework and implementation of quality restoration until the quality acceptance. The quality acceptance system function module can be represented by the following figure 7.

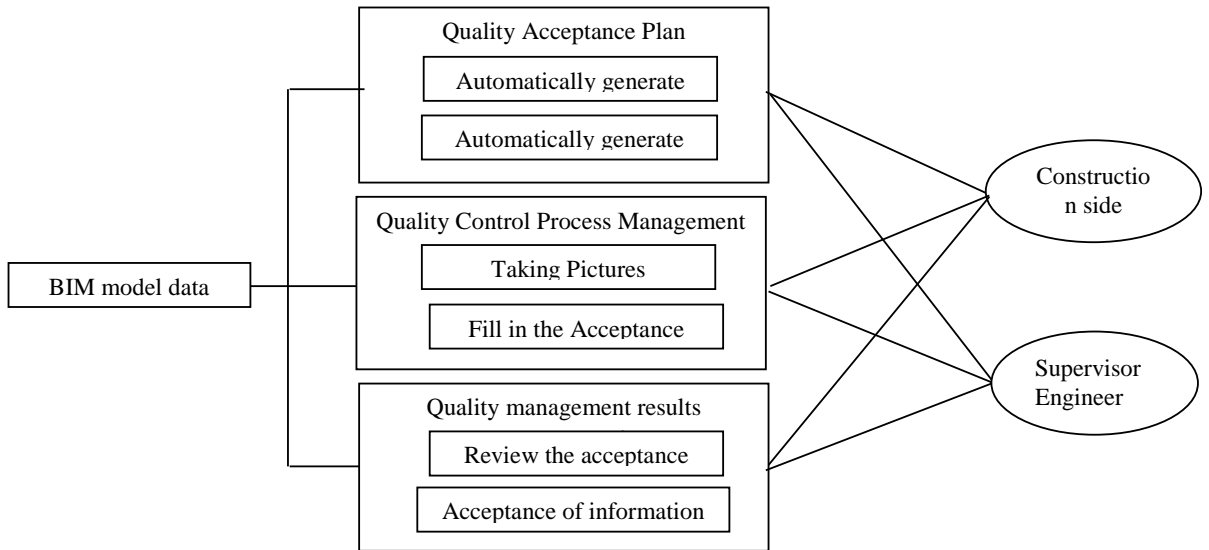


Figure 7 construction quality supervision system function module

After construction, to conduct quality acceptance, the construction side and supervision of construction quality should accord with the acceptance process, the specific operation is shown as figure 8.

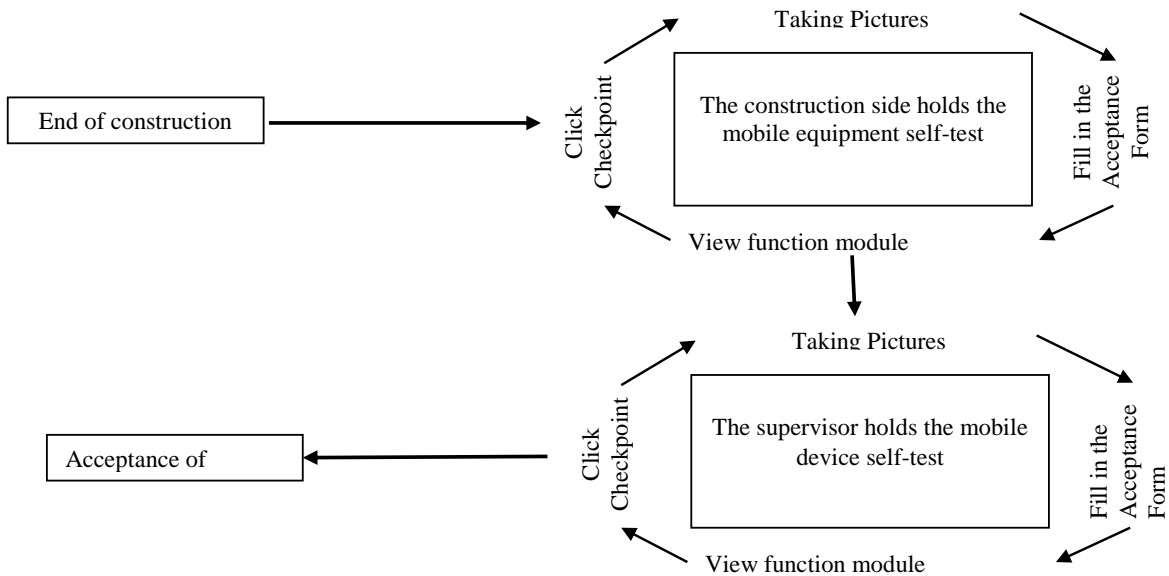


Figure 8 the process of construction quality acceptance

In the sub-project and inspection batch acceptance, the first part is their own checks. The construction inspector can mark the spot to be detected by BIM model auto-generated checkpoint, collect the real quality data of the site by using mobile equipment (AR), take construction photos, view the final three-dimensional model and construction quality in BIM model Information, complete the quality of the acceptance form, compare the quality of data. If not qualified, rework to repair, if accepted, the acceptance results will be entered BIM model system. Construction unit notify the supervising party to carry out quality acceptance. After receiving the notice, the supervising engineer shall organize the acceptance of the technical person in charge of the construction project. The construction unit upload the results to the system and recycle construction side of the acceptance if the acceptance is entered into the system. The construction acceptance process is similar to the on-site quality inspection procedure in the previous section, focusing on matching and contrasting the quality of the BIM model so as to control the quality results without deviation.

3.3.2 Quality information summary and analysis

Quality data is the basis of construction quality control and collected by the site management staff. The timely upload to the BIM information system and real-time data sharing to achieve urban complex project construction quality control. For urban complex project construction quality data, summary is very difficult relying on traditional methods of collection. On the fragmentation of information, BIM technology can be integrated, summarized and summarized for the latter part of the decision-making basis. The use of BIM technology provides electronic version of the quality inspection data and documents, not only saving time for inspection and finishing, but also more conduct to the quality of construction control, comparative analysis of quality data, good quality control. This paper introduces the application of BIM in advance, in fact and afterwards. Through studying the operation of BIM in the construction stage, it can play the function of quality control platform and deepen the structure of quality control platform, so as to achieve the expected quality control effect.

4. Conclusions

Urban complex is a city commercial center and the construction quality is vital to the personal safety and interests of consumers. With the construction technology, methods and processes are more advanced, the project construction quality is getting better and better. Because the urban complex of the Rooster independent, its construction quality is also of great concern, the quality requirements of natural than the average project is much higher. This paper is based on the BIM technology studying the construction of urban complex project quality control, Through literature reference and experience, the effective method of construction quality control is obtained with AR, and it is hoped to provide some reference for large-scale project construction and BIM application and development.

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