

Research on Information Management of Traffic Highway Construction Safety Based on BIM Technology

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Abstract: The construction of traffic highway includes design, construction and operation management, which involves a variety of data and information in these processes, while the traditional highway engineering progress is shown in the form of statistical tables, charts and reports, which is difficult to be directly linked with the specific location and pile number of the project and directly displayed. BIM model provides visual project construction management in the overall planning, design, progress and other aspects. At the same time, when the project is completed, this management information will also provide important data information for the use and operation of the highway. In this paper, the application of BIM Technology in highway construction management is investigated in the form of questionnaire survey and on-site interview, which comprehensively reflects the actual situation of BIM application in highway engineering. According to the actual situation, the future BIM Technology will provide good technical support for the informatization of construction industry, which can effectively promote safe construction.

1. Introduction

At present, due to the needs of the country's economic development and urbanization process, my country's engineering development is constantly accelerating construction. The construction industry is a pillar industry in our country. In the current construction industry, transportation and highways are developing rapidly, but the construction of transportation highways is relatively complicated, requiring high technical requirements, a large amount of engineering projects, and usually a long time. Construction often faces many challenges, which increase the difficulty of traffic road construction and the difficulty of safety management. It is difficult for the construction department to effectively manage related links [1-3]. In view of the current situation, relevant personnel will be required to strengthen the transition to traditional construction management techniques to improve the quality and safety of project construction. Therefore, BIM information model technology has gradually gained the favor of construction units in the transition of management technology, and it has also achieved good application effects in the actual implementation process.

The progress of traditional highway engineering is presented in the form of charts, reports and statistics, and it is difficult to directly relate to the specific area and station number of the project [4-6]. The design, construction and operation of traffic highways include a variety of data and information, and timely tracking of the dynamic changes and overall application of these data can improve the application value of traffic highway construction, and also provide information for the construction of traffic highways. Important data will help the development of road engineering and construction industry data. The use of BIM model technology in highway construction projects can obtain



visualization and visualization of highway construction management from all directions of overall planning, design and progress. At the same time, after the project is completed, these management data obtained during the construction process can also be used later road operations are proposed [7-8].

This paper analyzes the application of my country's existing BIM technology in the construction of traffic and highways, and found that compared with other countries, my country's highway construction management system is not mature enough, so this paper discusses the management of BIM technical data in the construction of traffic and highways [9-10]. The article is based on the reality of BMI technology in the construction and management of my country's transportation and highways. It is expected that the future BIM information technology will establish a building data integration platform, improve the quality of project construction, strengthen the transformation of traditional construction management technology, and achieve greater progress in the implementation process. The results provide good technical support.

2. Traffic Highway Construction Safety and BIM Technology

2.1. Traffic Highway Construction Safety

In the current construction industry, the development of traffic roads is rapid, but the construction of traffic roads is more complex. At present, there are the following main problems in the highway pavement construction: (1) the safety management in the highway construction is not perfect, there are some problems, with the continuous development and improvement of China's economy, many construction units are cutting corners in order to reduce the cost of each part of the building, monitor the income and continuously reduce the construction cost. All aspects reduce the cost, reduce the investment in safety building equipment, and continue to ignore the safety building management. At the same time, some safety control and defense measures are not paid enough attention to. The construction unit's own safety management system is not perfect. In recent years, 90% of the safety accidents are caused by the neglect of safety management and the imperfection of management system. (2) The safety awareness of highway construction personnel is relatively weak. In the traffic highway construction, the construction personnel are usually directly involved in the construction process, they should have very high safety awareness, but many construction workers in the construction unit do not realize the safety, and even lack of safety awareness. For example, in order to reduce the cost, the construction unit employs some injured or elderly people in the local area, or recruits some personnel without the experience of highway construction, which greatly improves the safety risks and the difficulty of construction management. (3) In the process of highway construction, it will be affected by some other factors. One of the most important factors is natural factor. For example, heavy rain, fog or other natural disasters will greatly increase the difficulty of safety management. These uncertain external environmental factors greatly aggravate the security problem.

2.2. BIM Technology

BIM Technology is to build a building model according to all kinds of relevant information in the construction project, and then use digital information to simulate the real-time data of the building. In the life cycle of construction project, BIM Technology will be applied in various stages and different participants to provide the latest, sufficient and accurate information to support the progress of the project, to support the information exchange and sharing between project participants and software, so as to ensure the continuous improvement of project design, construction, efficiency and quality. According to the amount of BIM model information, BIM Technology can be extended from traditional three-dimensional information (such as geometric information such as building length, width and height) to four-dimensional (construction project simulation), five-dimensional (cost analysis) and even six-dimensional (operation and maintenance of buildings in the whole life cycle). At present, many countries in the world are actively promoting the development of BIM Technology in China. The value of BIM Technology is constantly recognized by the industry from technical basis to technical application. Although BIM Technology has broad application prospects, there are still many problems to be solved:

(1) the development of BIM software is carried out in an independent framework, so it is difficult to establish consistent data for participants from different platforms, which makes it impossible for participants to conduct cross regional cooperation based on the same BIM model; (2) Due to its powerful application functions, BIM Technology needs hardware tools with powerful computing and graphics processing functions. (3) The cost of purchasing hardware for the first time is very high, and the software update and function improvement related to BIM will continue to increase the hardware requirements, thus further increasing the cost of hardware.

3. Experimental Ideas and Design

3.1. Experimental Ideas

With the continuous and rapid development of the construction industry, the appearance of cities and villages and the living environment of the people have been greatly improved, and the employment pressure is much less than before, which has made a great contribution to the construction of a harmonious society. However, the project cycle of the construction industry is usually relatively long and the resource consumption is large, and the impact of the construction process on the ecological environment is also great. Project informatization means that the traditional way of project management is no longer used, but computers and networks are used to achieve the purpose of environmental protection, standardized management and resource saving. This method is a multi-level technology implementation tool from a function to technology integration, from a single application program to network connection. Therefore, it is very important to choose the right information management tools for the information management of traffic and highway construction projects, and BIM information technology will provide good technical support for the establishment of building information integration platform, and effectively promote safe construction.

3.2. Experimental Design

In the design, this paper adopts the method of questionnaire survey and on-site interview to investigate the application of BIM in traffic highway construction units (construction units, supervision units and construction units). The objects of investigation include the owner's representative, director, project manager, chief engineer, measurement engineer, on-site construction personnel, data clerk and other project management personnel. 431 questionnaires were distributed on the spot, 397 questionnaires were collected and 340 valid questionnaires were sent out. The questionnaire adopts the form of single choice, multiple-choice and open-ended questions to understand the cognition degree, application situation, work difficulties, obstacles and expectation of BIM of the survey objects, so as to master the application status and promotion obstacles of BIM in highway engineering. The job categories of the interviewees are shown in Table 1, including the high-level, middle-level and grass-roots staff of each participating unit of the project, which can comprehensively reflect the actual situation of BIM application in highway engineering.

Table 1. Distribution of job categories of respondents

Category	The proportion (%)
Engineering Technology	43
Technology Management	37
Project Management	13
Other	7

4. Discussion

4.1. Application Analysis of BIM Technology in the Safety Information Management of Traffic Highway Construction

BIM technology was born with the United States, and gradually developed in Europe, Japan and South Korea. At present, the development status and implementation level of BIM technology in these countries have reached a certain standard. In mainland China, most colleagues have only heard of BIM, and many experts believe that BIM is a kind of software. Certain projects and technicians have used BIM at different project levels and to varying degrees. Various types of collaboration between construction companies (owners, real estate developers, design, construction, etc.) and BIM consultants are the key methods for implementing BIM projects. It can be seen from Figure 1 that about 51% of the respondents who answered “never contacted” accounted for about 51%, 31% said they had studied some, 12% said they had been promoted to study, but only 6% said they had Well mastered. This shows that professionals in this industry are not easily affected by BIM, and the practice and application of BIM are insufficient. The emergence of BIM tools aims to reduce the complexity of traditional project construction and increase the productivity of project construction. It can be seen from the survey data that the implementation and operation of BIM in my country's highway engineering projects is relatively slow, and there is no application capability of BIM software and practical experience in BIM projects.

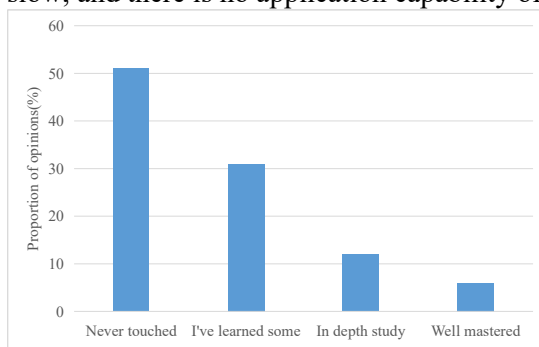


Figure 1. Respondents' understanding of BIM

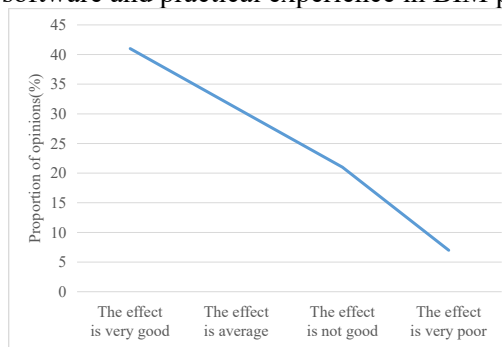


Figure 2. The BIM application situation of the surveyed company

Furthermore, in the research and analysis of the BIM application of the companies where the survey subjects are located, it can be seen from Figure 2 that 41% of people think the effect is good, 31% think the effect is average, and 21% think the effect is not good. , 7% felt that the effect was not satisfactory. The above results indicate that highway engineering-related companies have many problems in the process of BIM learning and application, but most companies have a positive attitude towards the application and promotion of BIM; in addition, only a few companies in the industry have good applications of BIM technology. Companies still have shortcomings in the application of BIM technology and project practice.

4.2. Suggestions on Information Management of Traffic Highway Construction Safety Based on BIM Technology

4.2.1. Government policy guidance and incentives

One of the obstacles to the promotion and implementation of BIM is the lack of sufficient management awareness, and the government's policy guidelines and incentives are the important motivation to connect business leaders with project leaders. The introduction of new technology is closely related to the national policy guidelines and incentive measures. When BIM Technology is used in highway engineering, government departments can guide the formulation of relevant incentive policies, create demonstration projects, and provide policy environment for project experience and BIM experience of highway engineering. However, for the mechanism of BIM implementation in highway engineering projects, government departments can formulate appropriate comprehensive incentive measures,

subsidies and other incentive measures to promote the implementation of BIM Technology in highway engineering projects and create BIM application projects in the field of highway engineering.

4.2.2. Integrate high technology

In recent years, some high-tech information technologies such as new network and cloud technologies, communication technologies, Internet of Things, and mobile technologies have emerged, which should have new impetus and influence on the development of project management information. With these new technologies, BIM technology can be better implemented. With cloud technology, all participants can share and request information, understand the work of multiple parties at the same time, and use mobile technology to update information anytime and anywhere.

4.2.3. Improve building information model

Understand the integration of national supply standards to ensure continuous use of building models from the design stage, to ensure that each participant can cooperate and freely share information between multiple links throughout the project, thereby eliminating information islands and slowing down The speed of the existing software, and the interface between special software can be realized, so it can be used for multiple purposes and avoid duplication of design.

5. Conclusions

The implementation of BIM Technology in highway engineering industry will bring great value. However, the implementation level of BIM Technology in China's highway engineering industry is relatively low. Enterprises in the industry recognize the BIM implementation experience and the lack of BIM technical personnel, and through the joint efforts of all participants in the industry (government, construction department, design department, construction department, control unit, supplier), to create highway characteristics, complete the in-depth test and research of three BIM software, BIM application points and BIM standards, and simultaneously excavate tools New BIM application points in highway engineering industry with industry characteristics, establish BIM industry standards, and complete highway engineering construction friendly to BIM software. Secondly, the training of industrial BIM technical personnel should reflect the focus and development level of colleges and universities, and solve the problem of industrial talent shortage from the source of ability. Through questionnaire survey and on-the-spot interview, this paper examines the BIM implementation of transportation and highway construction departments (construction units, control units, construction departments), analyzes BIM Technology in traffic and highway construction management, and reflects the implementation of BIM Technology in Highway Engineering in China. Facing the future, BIM information technology will provide good technical support for building data integration platform, and effectively promote safe construction.

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