

Application of BIM Technology in Road Engineering Management

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ABSTRACT

With the development of information technology in recent years, the level of software and computer has been fully developed. At the same time, the integration between various industries is also gradually strengthened, and industrial integration and informatization have become the mainstream trend. As a part of modernization, the transportation system has also received corresponding industrial upgrading. The highway traffic is the main part of the traffic system, and the application of BIM technology to the highway traffic system is conducive to a more efficient control process of highway design and construction. This paper will discuss the application scenario of BIM technology in road engineering to imagine the possibility of comprehensive application of BIM technology in traffic civil engineering system. By referring to the current literatures and materials related to BIM and road engineering, we find that BIM technology in road engineering is still in a newly emerging state. It can effectively increase the efficiency of the project, but it is still a small-scale pilot project and has not been comprehensively promoted

Keywords: Highway engineering management, information technology, BIM technology

1. INTRODUCTION

With the development of information technology in recent years, the level of software and computer has been fully developed. At the same time, the integration between various industries is also gradually strengthened, and industrial integration and informatization have become the mainstream trend. As a part of modernization, the transportation system has also received corresponding industrial upgrading. The highway traffic is the main part of the traffic system, and the application of BIM technology to the highway traffic system is conducive to a more efficient control process of highway design and construction. This paper will discuss the application scenario of BIM technology in road engineering to imagine the possibility of comprehensive application of BIM technology in traffic civil engineering system. By referring to the current literatures and materials related to BIM and road engineering, we find that BIM technology in road engineering is still in a newly emerging state. It can effectively increase the efficiency of the project, but it is still a small-scale pilot project and has not been comprehensively promoted.

2. CONNOTATION OF BIM TECHNOLOGY

2.1. Definition of BIM technology

As an abbreviation of the English name, BIM is changing with the development and application of technology. Extensive reading of domestic and foreign literature shows that the BIM name can be extended as Building Information Modeling, Building Information Model and Building Information Management. The US National BIM Standard (NIMS-US V1) states that: "Building Information Modeling is the act of Building facility Information Modeling, whose goals are visualization, engineering analysis, conflict analysis, design rule and standard inspection, project cost management, digital expression of finished products, etc. "The Building Information Model is a shared knowledge resource that provides basic, reliable decision-making services for the entire life cycle of the facility from concept design to demolition." Building Information Management is the organization and control of business processes that use information in digital models to realize information sharing in the whole life cycle of building assets. BIM is defined by the International Standards Organization's Facility Information Committee as

follows: BIM uses open industry standards to digitally represent the physical and functional characteristics of a facility and related project lifecycle information to support project decisions and better realize project value. The above definition emphasizes the requirements of standardization and accurately describes the role and status of BIM in the current construction engineering field. This is the prerequisite for BIM technology to be applied in the construction industry and promote its development. BIM standardization has two parts. One is the standardization of the building model, including building components, material accessories, design standards and other issues; The other part is standardized information model data, including data input and output construction.

2.2. Domestic research status

The problem of light maintenance in road engineering reconstruction is widespread in China. The cost of road maintenance in China is always high, and the unreasonable road design also leads to an increasing number of road traffic accidents. Highway management departments began to realize that only by using the concept of cost control based on the whole society within the whole life cycle, and taking appropriate theories, methods and policy measures for each stage of highway project planning and design to construction management can these problems be solved. At the same time, due to the continuous development of industrial informatization in China, BIM has been promoted and applied. Through the use of BIM technology, engineering personnel can effectively master each construction link, carry out digital information modeling for each construction link, detect and correct mistakes, and improve management efficiency. The highway construction organization’s design is for difficult construction and other shortcomings. The need to integrate computer technology and the packaging construction process in each link to help employees improve their work efficiency. Construction management indicators, risk measures should be formulated, with the help of a variety of modern tools, to carry out specific plans.

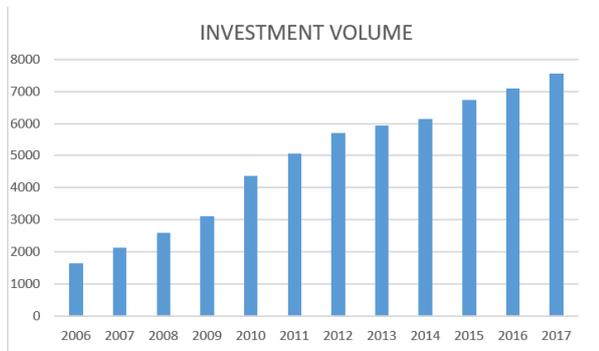


Figure 1. Road maintenance input statistics chart

3. APPLICATION SCENARIO OF BIM TECHNOLOGY IN ROAD ENGINEERING CONSTRUCTION MANAGEMENT

BIM has the characteristics of informatization, efficiency and simplicity[1]. In the traditional road construction project, engineers need a lot of field investigation and calculation of a lot of data. At the same time a large number of

It is easy to ignore subtle mistakes and waste a lot of time and resources. However, after using BIM technology, the data from the preliminary survey, road information, geological information and other information will be input into BIM

Each step of construction will be built in advance on the BIM platform, which can make each step of construction more intuitive and convenient.

Engineers can save time by viewing and correcting these minor errors. In the early stage of project construction, if the expected effect can be seen, a large amount of resources need to be invested, which not only delays the special period, but also increases the cost of investment. However, if BIM technology is used, efficiency cost can be reduced and work efficiency can be improved on the premise of a certain cost. BIM technology can show the information of the whole highway construction project on the THREE-DIMENSIONAL digital model, can let the staff more intuitively familiar with the project, better solve the work problem, shorten the project period, the work efficiency of the relevant staff will also be improved[2]. At the same time, through BIM technology, engineers can check and optimize the preliminary design. Take the design of a student dormitory building using BIM as an example, when laying steel bars on the floor, the BIM platform will calculate the layout range of steel bars and check the wrong layout. For example, lack of reinforcement, more layout reinforcement and so on. We can reduce some unnecessary material input and correct some design mistakes by modifying the scheme such as material selection, schedule and so on. And the use of BIM technology, drawing information technology, can save the original paper used for drawing printing, saving resources conducive to environmental protection and also providing convenient access[3].At the same time, it can effectively reduce the input of various costs in the management of highway engineering costs, improve the utilization efficiency of all kinds of resources and maximize the benefits. The generation of these benefits is an important reason for the wide application of BIM technology in highway engineering construction. Because the technology has the characteristics of simplicity, efficiency and information, to a certain extent, it promotes the smooth management of highway engineering cost, and improve the efficiency of highway engineering construction. The ultimate goal of

management is to achieve a low cost for the highway construction system. In order to achieve a low cost, it is necessary to combine the actual construction needs and reasonably distribute relevant materials and money, so it is crucial to develop scientific and effective architectural design schemes. In this process, BIM technology can provide the most effective auxiliary function for the establishment of a design scheme. First of all, BIM technology can understand the possible defects in the construction process of the overall project through data visualization analysis, such as the collision between structures and external factors hindering the construction progress, etc., and detailed analysis can be realized through THREE-DIMENSIONAL simulation visualization[4]. In addition, early designers can timely find and correct mistakes, which can effectively improve the rationality of resource allocation and capital allocation and avoid capital loss. In the process of completion settlement, the BIM software can be used to carry out the corresponding price rollback and analyze the changes in materials and engineering design, understand the actual development situation of the engineering quantity, and calculate the final cost according to the actual cost. In addition, it can also verify the accuracy of each branch project according to the corresponding details in the early stage of construction drawings to avoid the existence of data omission and precision reduction. Cooperating with manual preparation and manual accounting can provide a lot of reference data and information.

4. SUGGESTIONS ON PROMOTING THE POPULARIZATION OF BIM TECHNOLOGY

BIM technology, as the basic technology of the next generation computer-aided design, is undoubtedly important. As the country with the largest construction scale at present, It is necessary to promote the application of BIM technology in China. However, the promotion and application of BIM technology is not as "popular" as the previous CAD, the reason is actually very simple, that is, it is not only a tool to replace the "drawing", BIM changes the design concept and thinking. BIM is a design. The integration of ideas, methods and tools. At present, the software carrying these tools are all foreign products with low localization degree, and there are certain differences with some domestic standards, specifications and even expression forms, which is also one of the problems restricting the application of BIM in China. Therefore, in order to promote the promotion and in-depth use of BIM technology in China, the following questions and suggestions are put forward:

1. About BIM standards. BIM will promote global integration and information exchange to realize information interaction, sharing and collaborative management. The government and the entire

construction industry should actively participate in the formulation of BIM standards and improve the system, mechanism and norms of the construction industry. At the same time, in the actual promotion and application of BIM, not only technical data standards like IFC are needed, but also higher-level application standards, such as 3D architectural design standards, construction application and management standards, can better meet the application requirements of BIM technology.

2. The development of local software based on BIM technology is still in the initial stage in China, while the development of other BIM technology software, such as BIM scheme design software, geometric modeling software that interfaces with BIM, visualization software, model checking software and operation management software, is basically blank. The research and development of BIM software by some domestic research institutions and scholars has promoted the development of China's independent intellectual property BIM software to a certain extent, but it has not fundamentally solved this problem. Therefore, it is urgent to research and develop a complete set of BIM series software comprehensively and systematically, and it requires the joint efforts of the participants of the whole BIM technology
3. Schools and industry practitioners coordinate with each other to jointly promote the popularization and application of BIM technology. The school has strengthened education, introduced BIM into the classroom, and encouraged students to take BIM related courses. At the same time, the government issued relevant policies to encourage the application of BIM technology

5. CONCLUSION

In recent years, with the advancement of China's industrial informatization and the steady progress of digital upgrading, BIM has been promoted and applied. This study explores the application prospects of BIM technology in various scenarios. By using BIM technology, engineers can inspect and correct problems in construction more efficiently and quickly. Construction design, construction materials, architectural design, simulation construction and other information. Reasonable arrangement of various resources, arrangement of personnel and optimization of construction steps, cost saving and shortened construction period are the benefits brought to us by the application of BIM technology at present. However, BIM technology is not very perfect at present. It requires high learning cost(training fees and time) and has certain requirements for equipment. For areas with poor signal, information transmission may have problems. The promotion of BIM should be carried out synchronously

with the upgrading and improvement of China's communication technology. At present, this study lacks some practical BIM application scenarios, and more field investigations will be conducted in the future to demonstrate the possibility of BIM application in road engineering.

REFERENCES

- [1] Haoping Wang. Research on highway Design and Application based on BIM Technology U412.366
- [2] Kaisheng Kang. Application of BIM technology in highway cost management [A] Transport Manager world 2021.12.05
- [3] Kaisheng Kang. Application of BIM technology in highway cost management [A] Transport Manager world 2021.12.05
- [4] Li Wang. Application of BIM technology in highway engineering cost management [A] Horizon of science and technology 2021.07.05
- [5] Haoping Wang. Research on highway Design and Application based on BIM Technology U.412.366
- [6] Li Wang. Application of BIM technology in highway engineering cost management [A] Horizon of science and technology 2021.07.05
- [7] Li Wang. Application of BIM technology in highway engineering cost management [A] Horizon of science and technology 2021.07.05
- [8] Haoping Wang. Research on highway Design and Application based on BIM Technology U.412.366
- [9] Xiaokun Yao. Application of BIM technology in highway bridge construction management. [J] Intelligent building and urban information 2018 (7):64-65
- [10] Rong Tan. Application of BIM technology in cost management of project life. [J] Urban Architecture 2019(20): 170-171.