Organization and Management System Innovation of BIM Life Cycle Management

Wang Dan
Xi’an Eurasia University, 8 Dongyi Lu, Yanta District, Xi’an City, Shaanxi Province, China
skykimiboy@126.com

Abstract. During the entire life cycle of rail transit projects, many participants, complex types of information, diverse forms and large quantity make poor information communication and serious information loss in the management process, which greatly restricts the improvement of project management level and management efficiency. Taking the information management of rail transit project as the research object, carrying out information analysis and BIM application research in all stages of project construction, this paper puts forward the framework system of information management for the whole life cycle of rail transit project based on BIM, realizes the effective communication of information in the whole life cycle of rail transit project, and provides theoretical support for the whole life cycle information management.

1. Introduction
At present, project owners, design units and construction units mainly promote the application of BIM technology in China’s construction field. There are generally two modes of BIM technology application promoted by project owners. One is the consulting-assisted type, in which the owner hires an independent BIM consulting unit to provide professional consulting services for the BIM application of the construction project. The consultant works as an "agent owner" in the implementation of BIM. This model can make up for the shortcomings of the owner’s lack of BIM experience and reduce the burden of the owner’s application of BIM technology and management, while the consultant is limited by its level and service capabilities, and often lacks strength in work coordination, which affects the effect of BIM implementation to a certain extent. The other one is the owner-independent model, led by the owner. It coordinates the participating parties in each stage, forms a professional BIM team, which is responsible for the implementation and application of BIM at each stage or a certain stage. The advantage of this model is that the owner can better control the flow of information at all stages and improve management and control capabilities. However, it requires higher communication and coordination capabilities for the owner’s BIM team, leading to relatively large workload of contract management in project construction. At this stage, the design company mainly focuses on the visual performance of the use of BIM technology. Through BIM technology, the design plan is presented intuitively, which is convenient for the modification and improvement of the design plan. As for the construction unit, their use of BIM technology is mainly based on simulation construction. They apply BIM technology to a certain stage and continuously improve the construction plan and technical parameters to ensure construction efficiency and reduce resource waste [1]. For the sake of their own interests, the three parties continue to promote the application of BIM technology in different scenarios, which certainly expand the scope of application of BIM technology and help change the problems of low level of BIM technology application and relatively limited application fields. However, the above
three ways have exacerbated the degree of information asymmetry in construction projects. Due to the lack of necessary information communication among the project owner, planning and design unit and construction unit, there are still certain differences in the project plan and construction management, which hinders the improvement of the construction management efficiency of the construction project, and causes chaos in the management activities of the construction site to a large extent and brings extremely adverse effects on the entire construction project. BIM full life cycle management is a key technology to achieve the integration of informatization and industrialization at all stages of urban rail transit engineering construction, and it is also the basis for smart design, smart construction, and smart operation in the concept of smart urban rail system construction. Through project practice, enterprises, digital application system for rail transit will be formed by exploring the establishment of a BIM integrated application organization and management model for the whole process of planning, design, construction management, operation and maintenance [2].

2. the Overall Construction Plan of BIM Whole Life Cycle Management

According to the guiding ideology of "overall planning, top-level design" and the construction principle of "one-time planning, step-by-step implementation", BIM full life cycle management system of smart urban rail will be built.

The overall construction plan of BIM life cycle management of smart urban rail is as follows:

| BIM technology management | IT infrastructure construction (IoT, construction of software platform to an integrated one) |
|--------------------------|---------------------------------------------------------------------------------------------|
| application amid planning stage. | information display application. BIM technology Application standard. |
| application amid design enterprise management and control stage. | BIM technology project application. implementation. |
| Application amid construction stage. | project construction application. application of existing information stage. |
| Application amid completion and handover stage. | operation management application. information security and operation and maintenance. |

3. BIM Whole Life Cycle Management System and Its Advantages

According to the characteristics of information exchange in subway construction and based on the realization of multi-participant BIM integration and management of engineering projects, comprehensive data integration and sharing can be achieved. Through the research on the BIM service model and the BIM cloud computing system, a BIM application management system has been formed based on the BIM data integration and management of the distributed private cloud system. Oriented to all parties involved in the project, the system uses a distributed private cloud platform to store, share, transfer and integrate BIM data during the whole process of project construction. The built cloud platform consists of a BIM server and a platform management server that are distributed and deployed in the main participants [3], with following advantages.

3.1. Efficient Collaboration between Participants and Professionals

The construction unit can ensure that they fully controls the phased progress of the project through the design integrated management platform, the "Zheng Guizhi Zhijian" platform and the operation integrated management platform. The construction unit manages and coordinates the BIM application work, and organically combines all the participating parties in the project, ensuring the smooth progress of the coordination work in the rail transit industry under the condition of complex professional systems.
and numerous interfaces. The participating parties are both demand providers and specific implementers. Therefore, they all can deeply participate in the BIM application, so as to ensure the enthusiasm and efficiency of the work, and fully reflect the high efficiency of BIM information integration and collaboration.

3.2. Cross-Stage BIM Data Link
Taking BIM as the carrier and comprehensively utilizing GIS, Internet of Things, mobile internet, big data, cloud computing and artificial intelligence technologies, a data chain throughout the entire process of survey, design, construction, and operation and maintenance can be formed based on BIM technology, which realizes the efficient transmission and effective utilization of data across the construction phase and gives full play to the advantages of the owner-led BIM organization system. The data chain also integrates and manages various professional data information, such as spatial geometric information, spatial function information, construction management information and equipment of urban rail transit projects. It also improves the efficiency of subway construction project management, improves project construction quality and investment efficiency. Particularly, it can also provide information support for the subsequent operation and maintenance stage, promote the transformation of subway operation and maintenance from traditional mode to informatization and intelligence, reduce operation and maintenance costs and maximize the overall benefits of subway construction units [4].

3.3. Enterprise-level BIM Information Sharing
Relying on the BIM whole-process information integration and sharing service platform, the data accumulated on the aforementioned design integrated management platform, "ZhengGui Zhijian" platform and operation integrated management platform are integrated and analyzed, so as to provide experience and management decision support for construction of subsequent line. This multi-project BIM integration and management system oriented to the overall level of the enterprise focuses on the organic integration and full utilization of the overall resources of the enterprise, in order to ensure the realization of the overall strategic goals and benefits of the enterprise. In addition, it keeps up with the development of BIM technology, sums up experience and lessons, widely absorbs opinions from all parties, and continuously explores the value of BIM application and expands the field of BIM application. The BIM whole-process integrated application management system led by the construction unit also makes the implementation of the integrated application of BIM technology and various new technologies more systematic and forward-looking [5].

3.4. BIM Life Cycle Management Standard and Norm System

| Table 2. BIM technology application standard system |
|-----------------------------------|
| technical standard. | Working standard. | management Standard. |

Technical standards regulate various conditions related to the quality of BIM application results, including design, application, results, design and application methods, which is the core of the BIM technology application standard system and an important prerequisite for the quality of BIM application. Other standards are carried out on technical standards.

Work standards regulate the basic responsibilities and work requirements of various personnel in various departments and units in the BIM application process, including work content, work flow, and division of responsibilities [6].

Management standards is a regulation that ensure the implementation of BIM standards from the aspects of business decision-making management, quality management, contract management, financial management, and operation management.
4. Conclusion
BIM is an important part of the information technology development in the construction industry during the 13th Five-Year Plan. BIM application runs through all links of the "Outline", from the concept and the development of practice during "12th Five-Year" period, to entering the whole process of application nowadays, its technical advantages have become the highlights in the construction industry. The application of BIM whole life cycle management will enable China's urban rail transit construction to a leading edge in the current world informatization development.

Acknowledgments
Upon the completion of this paper, I would like to express my heartfelt thanks and sincerest respect to the teacher Zheng. Mr. Zheng's persistent spirit of scientific research, profound knowledge, realistic working attitude, magnanimous and modest person, selfless dedication spirit has always inspired me to continue to learn knowledge and pursue the realm of life.

Reference
[1] H Edward Goldberg. The Building Information Model. CADalyst, Eugene, Nov 2014, Vol. 21: 56–58.
[2] Mou Ming. Research on Four-dimensional Building Information Model Technology [Master's thesis]. Beijing: Beijing Forestry University, 2019.
[3] Wang Ke. Research on the Information Model of 3D+ Construction Cost Dimension Based on IFC [Master's thesis]. Shanghai: Tongji University, 2017.
[4] Ma Zhiliang. BIM Technology and Its Application Problems and Countermeasures in China. China Construction Information, 2010(4): 12-15.
[5] Building SMART Alliance of National Institute of Building Sciences, BIM Project Execution Planning Guide Version 1.0.
[6] He Guanpei. The Location, Evaluation System and Possible Application of BIM in the Construction Industry [J]. Civil Engineering Information Technology, 2017, 2(1): 109-116.