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Exploration and Research on Bim Graduation Design of Engineering Management Major

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ABSTRACT. *For the reform of teaching of BIM in the Engineering Management major of higher education institutions, Graduation design is one of is one of the most important aspects. According to analysis of current circumstances and existed obstacles of the graduation design of Construction management major, appropriate countermeasures and proposals are presented in terms of making use of practical cases of enterprises, interdisciplinary cooperation and training of teachers.*

KEYWORDS: *Building information modeling, Engineering management major, Graduation design*

1. Introduction

BIM (Building Information Model) is a building model that is established on the basis of information data for construction projects, with features of visualization, map making and information sharing etc. With the rapid development of economy in China, the construction industry has prospered and become a mainstay industry, and construction scale has achieved considerable results, as the construction industry has developed rapidly, meanwhile, it has proposed higher requirements on the implementation methods and operating efficiency associated with design, construction, costs and engineering Management. In 2017, the “Opinions on the promotion of sustainable and sound development of the construction industry” issued by the General Office of the State Council and the “13th Five-Year Plan for the development of the construction industry” issued by the Ministry of Housing and Urban-Rural Development have proposed the “Development of the whole process engineering consulting services”. As a result, there are urgent demands for the construction industry for leading-edge technologies (such as BIM, big data and blockchains etc.) and their methods of innovation management. In the age of intelligent construction, disciplines and specialties of many major projects are becoming increasingly complicated, considering involvement of more participants and a massive amount of information, it may impose great impacts on efficiency of project construction, which makes informatization of project management an inevitable trend. BIM technology will provide an excellent platform to integrate

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various data in whole process of the construction project, which improves efficiency and productivity of decision-making and facilitates transformation and upgrading of the construction industry. BIM technology has gained increasing recognition as a technology, since it can make significant contributions to development of the construction industry.

As BIM technology has started to be widely applied and developed, the shortage of professional and technical talents has become an important factor that hinders development and application of BIM technology in China, which has made higher requirements on training of relevant professionals in higher education institutions. Thus, it is necessary to integrate BIM into educational system of colleges and universities, such as engineering management, civil engineering, architectural design, etc., which achieve educational training of BIM and breakthrough of BIM talents. With regard to the training of engineering management professionals particularly, it becomes a top priority to integrate BIM into the training of construction management professionals, which cultivates construction management professionals that are proficient in employing BIM technology for cost management, quality management, progress management etc.

2. Literature Review

In the view of Zhong Wei and other colleagues, construction project management is a course of practical application in undergraduate education of civil engineering majors, and they explore creative teaching methods. For instance, they combine new construction engineering technical measures such as building information modeling (BIM) with visualized simulation methods, which provides a suitable curriculum system with course contents, teaching methods and assessment modes, etc. Thus, they explore and put the teaching reform of this major into practice. Zhang Xiaojing and colleagues have introduced a team-based BIM graduation design framework for construction management through the Daft 4MF organizational management model, stage divisions of BIM design and case-based teaching methods for integrated courses of engineering management, which proves that this framework can systematically analyze vertical correlation of the four-year undergraduate courses for each stage of BIM graduation design with experiment cases. Ye Xiaosu and other colleagues introduced a graduation design model through analysis of the relationship of graduation design with talent cultivation, modern engineering and market demands. On the basis of an educational concept of “student-oriented and instructor-led”, they proposed a practical teaching mode of multi-disciplinary graduation design for optimizing the knowledge, capability and quality structure of educating objects. After analyzing problems and obstacles in teaching of BIM in the reality, Feng Lingxiang and other colleagues discuss the reform of BIM-based construction management teaching mode, curriculum system construction, and teaching contents from the perspective of industry-university-research, which propose methods of integrating BIM into engineering management majors.

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Accordingly, regarding to methods of integrating BIM into the curriculum system of engineering management majors reasonably, and cultivating professional talents with both strong theoretical knowledge and superior practical capabilities, some scholars have studied and discussed how to cultivate BIM-based engineering management talents with graduation design as a starting point.

3. Current Teaching Status of Bim-Based Engineering Management for Graduation Design

Graduation design plays a leading role in undergraduate education, which is a teaching activity for examining the comprehensive quality and practical capability of college students, and to some extent, it also serves as a transition of students to their future work. Through the graduation design, we can make a comprehensive summary of the knowledge, capabilities and quality structure that students have studied for the last four years, and training students to apply their knowledge to practical capabilities. Nonetheless, the civil engineering major follows the traditional teaching method of graduation design, which could not improve the practical capabilities of students to some extent. As it is detached from the practical production of enterprises, which leads to failure for fulfilling the transitional, practical, comprehensive and exploratory aspects of graduation design.

Currently, the following problems are present in the practical teaching aspect of graduation design in engineering management: (1) It fails to satisfy demands of practical projects. As the increasing material needs of people and the vigorous development of the construction industry, modern engineering presents a trend of complexity and comprehensiveness, therefore, the construction project management entails a larger amount of information and challenges with higher complexity. It is difficult to cultivate the practical capabilities of students to handle modern engineering project management with a single graduation design or thesis; (2) the contents of BIM graduation design is relatively single. In civil engineering colleges and universities, they generally open architecture, civil engineering, mechanical and electrical engineering, engineering management, engineering cost and other majors, and the jobs which correspond to these majors are closely associated and inseparable in the construction of projects, thus the graduation design of civil engineering students can collaborate with each other and create an interdisciplinary graduation design to enhance students' capabilities for knowledge expansion and teamwork; (3) Lacking for sufficient teaching staff. Nowadays, as few domestic universities would integrate BIM into the education of construction management majors, and practical experiences are not sufficient enough, there are few teachers who are capable of theoretical teaching for BIM and providing instructions for BIM-based graduation design.

4. Explorations of Bim Graduation Design for Engineering Management

(1) Utilizing practical cases of enterprises. As university students would eventually start working in an enterprise, the graduation design can be oriented to

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the demands of the enterprise. During the application of BIM technology to the graduation design of project management, we can cooperate with the enterprises based on their existing practical projects, and BIM engineers of the corresponding project can be recruited as the second tutor of students, who can instruct the graduation design of the students jointly with the university. To some extent, it allows students to access to practical projects and makes certain achievements.

(2) Interdisciplinary Cooperation. In the completion of a whole practical project, it is necessary for cooperation among students of various majors to complete, for instance, in the stage of BIM building modeling, it can be completed by students of related majors instructed by teachers of architecture, in the stage of BIM structural modeling, it can be completed by students of civil engineering, in the stage of construction organization design, it can be completed by students of engineering management with relevant BIM software, and in the stage of engineering measurement and pricing, it can be completed by students of engineering costing with relevant software of BIM measurement and pricing. A complete BIM team is created by students from all disciplines, who work collaboratively to accomplish a complete project well.

(3) Diversification of teaching staff. Firstly, owing to lack of BIM-related teaching staff in higher education institutions, we may employ engineers from relevant enterprises to teach students BIM-related knowledge and instruct them to complete the graduation design; on the other hand, college teachers shall be trained in relevant cooperative enterprises to improve their comprehensive mastery of BIM technology.

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