

Exploring a BIM-based approach of project management

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Abstract: Within the building industry, building information modelling has been widely applied among different organizations, disciplines and project phases. In order to achieve coordination and synergy collaborative effort, it demands organized information flow and communication for effective implementation of project management through the construction process. Although many BIM researches provides solutions for project management, few efforts have involved the whole life-cycle process of project. In this article, BIM-based project management relying on a series of applications of BIM technology was introduced by coupling management requirement of a project with BIM. Through adopting BIM to the life-cycle management of the project and incorporating BIM applications to project management practice, we have developed a BIM-based project management approach that specialize in integrated BIM chain and interface-supporting system. At the end, the developing process of BIM-based project management approach is concluded.

Keywords: Project management, Construction, Building information modelling, BIM-based project management

I. INTRODUCTION

The building industry has often been referred as being fragmented and low-efficiency [1, 2] and building and construction projects face the issue of integrated project delivery. In order to achieve coordination and synergy collaborative effort, it demands more organized information flow and communication for effective implementation of project management through the construction process. Building information modelling (BIM) as an ICT tool, lead to integrated process of multi-disciplinary project delivery of different stages [3, 4, 5]. BIM provides a number of solutions in building construction to improve the accuracy and efficiency of the project process, especial for management purpose such as schedule planning [6]; cost management [7], quality management [8], site management [9], and safety management [10]. However, Chen et al.[11] pointed out the lack of research and practice in integrating BIM to a life-cycle view of the project. The adoption of BIM may have great influence to project management, this area is promising for both BIM and project management research. Pich et al.[12] linked uncertainty, ambiguity, and complexity to project information and pointed out the strategies varying from classic project

management to modern project management are learning, and selectionism, which means to process undated information and make decision due to lack of as-gained information. Flanagan and Lu [13], identified the requirement of information and knowledge management for project-wise decision makings through the whole project life cycle.

In order to tackle the issues of construction projects and strike for better practice in construction, a series of works for the adaption of BPM have done by the scholars around the world. A decision framework with regard to business, technology and organization for the implementation of BIM has been proposed by Gu and London [14]. And according to Cerovsek [15], to adopt BIM model to projects, there is a issue concerning the planning of “BIM Schema” and related technological applications. Singh et al. [16] specified the interfacing requirement for collaborative efforts for complicated projects and proposed BIM-server as a platform to integrate work of different teams. However few efforts have involved the whole life-cycle process of project, as most applications focus on some points or stages.

In this article, BIM-based project management (BPM) relying on a series of applications of BIM technology was introduced by coupling

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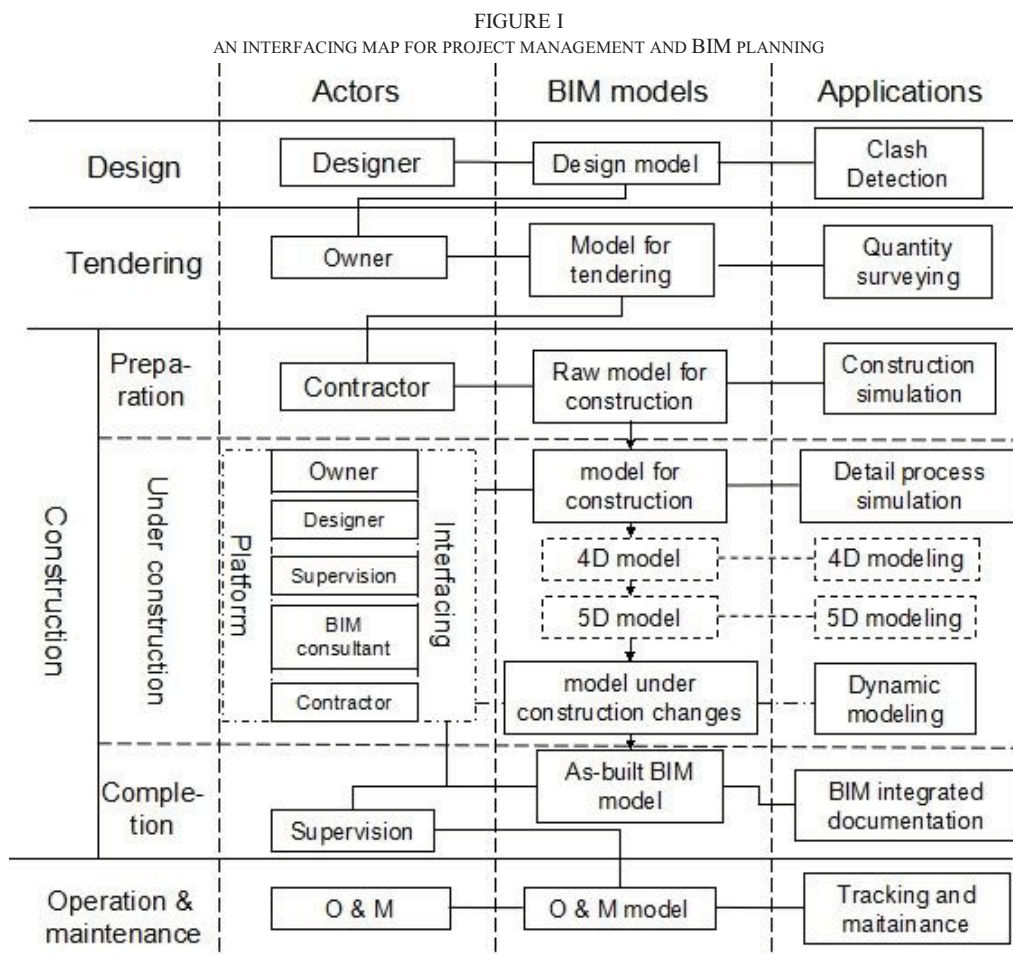
management requirement of project with BIM application in the refurbishment of an office building. Through the case, a feasible BPM approach including a set of standardized management procedures, BIM planning and interface-supporting system, has been designed to match the reality of project implementation.

II. DEVELOP A BPM APPROACH

A. Basic framework

The idea to develop a BPM approach came from the requirement to improve the efficiency of project management practice, so the first step is to find how BIM can contribute to life-cycle project management. So referring to a local project applying BIM in the project management, we investigated project phases, BIM models and actors in order to find a clue for better integration under the project goal.

The first step of our work is to map the developing clue of BIM models with time line by project phases with respect to the participation of different actors, through which the coupling of applications of BIM and management requirement of project with BIM can be achieved. Three parts of work has been gone through to come up with the BPM approach. Fig. I shows the BPM approach framework. It describes the relationship between the project actors and the BIM model and defines the demands of BIM applications during the different phase. Actors listed here are designer, owner, contractor, supervisor, and BIM consultant. Although the owner had some experience in application of BIM, they might not have a whole set installation such as personnel, technical support, management practice for BIM adoption of the project life-cycle, they chose to work with a BIM consultant team to develop the BPM approach.



B. Integrated BIM chain

In this approach, BIM models serve as a chain to connect different actors throughout the project life cycle. The status of models is presented in the second column of Fig. 1. The original model, mainly for clash detection at this stage, is developed by the designer in project phase of the design. Then during the tendering process, as information is required to describe the project, a model with more specific information, such as quantities of works, types of materials and basic procedure of the construction, is in need of the owner who can work further on the design model to obtain the model for tendering.

Moreover, for the construction phase, more detailed 4D and 5D model will be developed by the contractor through coupling costing, time schedule and process design. These models will be shared and transfer among actors. Meanwhile considering on-going changes during construction, modification to model should have been available for corresponding teams in a dynamic way. And in completion stage, there is need to integrate the project documentation. So one, probably the team of supervision, is supposed to finalize the construction model into an as-built model which the team of operation and maintenance (O & M) can refer to and work on for tracking information for O & M purpose.

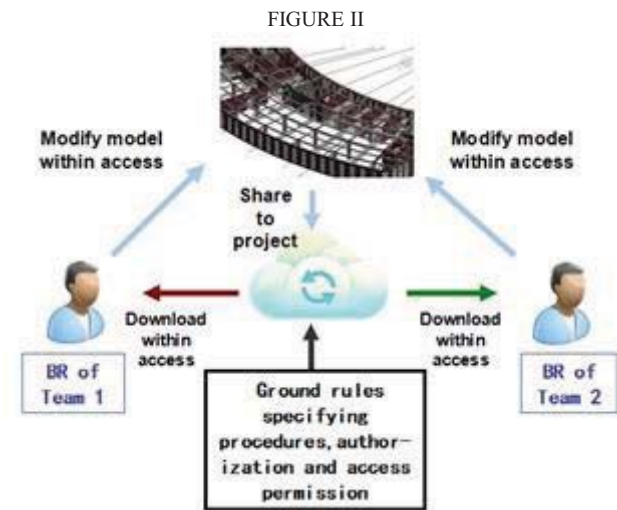
Based on this BIM chain, detailed operational requirement will be specified, which includes data format and accuracy as well as actors in charge of model development to ensure BIM to function in the process. BIM applications, indicated in the third column of Fig.1, are specified with the planning of BIM adoption. So before the project started, the owner define BIM application based on the project goal, together with financial and technological feasibility, and then decide the objectives of BIM adoption and depth to which BIM should apply in this project.

C. Interface-supporting system

From BPM framework and BIM chain, an identical model flow is circulated among actors. It requires an exchange platform and an interface system to exchange data and information. When an actor initiates requirement for change, the proposal will be delivery to other actors. A time limit and approval procedure will be defined. After the corresponding actors read the proposal, it will be dealt with and be delivered to executive team.

The exchange platform for data and information is a necessity to ensure the BIM chain flows as it provides a virtual space to place the model and enables the BIM representative(referred BR in Fig.II) to modify and download the model within access. Besides, ground rules

are fixed to administrate the data and information exchange process in respect of organizational function and hierarchic relations, so authorization and access permission have to be clarified when resorting to the platform. As the platform requires managerial and technical support, organizational strategies and technical support are essential for the interface-supporting system.



PLATFORM FOR INTERFACE-SUPPORTING SYSTEM

III. CONCLUSION

As project management is a methodology to integrate collaborative efforts and deliveries under the context of project, BIM provides a couple of solutions to support the process, but on the contrary issues regarding the adoption have to be addressed. In this research, we build on traditional project management and attempt to adopt BIM to the life-cycle process of project. Through incorporating BIM applications to project management practice, we have developed a BPM approach that specializes in integrated BIM chain and interface-supporting system.

However, BPM is not limited to this approach, more efforts can go for this kind of exploration. And due to the proceeding of project, the effect of this approach is still to be tested further during the implementation of the project. So improvement would be achieved and further discussion will come up to advance the development for BPM methodology.

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