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Title	ENHANCING VISUAL UNIT BATH SETUP IMPLEMENTATION USING BIM APPROACH
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Description	The Thirteenth East Asia-Pacific Conference on Structural Engineering and Construction (EASEC-13), September 11-13, 2013, Sapporo, Japan.
Relation	Proceedings of the Thirteenth East Asia-Pacific Conference on Structural Engineering and Construction (EASEC-13), September 11-13, 2013, Sapporo, Japan, B-3-2.
Citation	Proceedings of the Thirteenth East Asia-Pacific Conference on Structural Engineering and Construction (EASEC-13), B-3-2
Issue Date	2013-09-11
Doc URL	https://hdl.handle.net/2115/54244
Type	conference paper
File Information	easec13-B-3-2.pdf



ENHANCING VISUAL UNIT BATH SETUP IMPLEMENTATION USING BIM APPROACH

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ABSTRACT

A unit bath (UB) is that a bathroom is produced as a unit object in the factory, liking the precast object. Usually, the activity of the UB setup/install is implemented based on 2D CAD documents, while some problems occurred in such situation such as complex information description in one drawing and participants have different experience relating the understanding of 2D CAD drawing. In order to improve the process and performance of the UB setup/install activity, the Building Information Modeling (BIM) technology is applied in this paper. BIM is the process and emphasizes the information delivery in whole construction lifecycle. Utilizing advantages of BIM, the process of the UB install/setup activity is clear than before; and, engineers can have good understanding about the process of the UB install/setup activity through 3D BIM during the construction. Therefore, the BIM-based UB install/setup procedure is proposed in this paper. The proposed procedure is then applied in selected case in Taiwan. The results indicate that the proposed BIM methodology can be an effective tool for UB setup/install implementation.

Keywords: Building Information Modeling, BIM, Unit Bath, UB, Construction Management, Construction Phase.

1. INTRODUCTION

A unit bath (UB) is that a bathroom is produced as a unit object in the factory, liking the precast object. A unit bath consists of components. Usually, the activity of the UB setup/install is implemented based on 2D CAD documents, while there are some problems occurred in such situation, such as complex information description in one drawing, and participants have different experience relating the understanding of 2D CAD drawing. Also, because there is too many

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information in the 2D CAD drawing, it is difficult to implement UB activity for engineers, leading the low performance.

In order to improve the process and performance of the UB setup/install activity, the Building Information Modeling (BIM) technology is applied in the construction phase in this paper, and the BIM-based UB install/setup procedure is then proposed. Through this procedure application, participants can know the whole process of UB activity clearly by modeling the process. Moreover, the advantages of 3D BIM technology also are applied to enhance the understanding of designs and increase communication for participants. Overall, the main objective of this study is to propose the BIM-based UB install/setup procedure to assist and enhance the performance of the activity implementation. Finally, the proposed methodology is applied in a Taiwan case project, and the results indicate that the proposed BIM methodology can be an effective tool for UB setup/install implementation.

2. LITERATURE REVIEWS

Currently, BIM is the trend in the construction industry. BIM is used as a technology and strategy for a new generation of design software tools and solutions. BIM is not only the virtual 3D model with the building component information, and information also includes the construction life-cycle information. BIM model provides a platform for different participants to retrieve information they want (Malone 2010).

Knowledge management is very important for a company, especially the construction. During the construction, any construction problem may occur, and experienced engineers can deal with it at a short time. Also, no construction project is similar to others. In order to strengthen the project implementation, collecting the implicit and explicit knowledge is important for developing knowledge asset of a company. KM efforts typically focus on organizational objectives, such as improved performance, competitive advantage, innovation, the sharing of lessons learned, integration and continuous improvement of the organization (Wikipedia 2013).

The unit bath can be a custom design to address the requirements of the owner. And, the bathroom can be constructed by the dry construction method. Main material of UB is Fiber Reinforced Plastic (FRP), and it is a lightweight structure, both seismic design, with a simple construction, installation fast, full-featured, attractive appearance, low price, water resistance, lifelong and many other advantages (Puda 2011).

3. THE PROCESS OF THE BIM-BASED UB INSTALL/SETUP ACTIVITY

The construction project is more complex than before, and the UB is manufactured as a precast object and then install in the preserved space. In this situation, the process of installing UB must be clear for engineers. If any mistake occurs, the installation process may be re-worked. Thus, this paper proposes the novel concept to improve UB installation operations process using BIM. Figure 1 shows the concept of BIM-based UB install/setup process. The BIM is applied based on the

engineers' knowledge and experience to modeling the UB component and simulate the installing process. Integrating the knowledge and BIM, the significant BIM model can be developed and used in the construction.

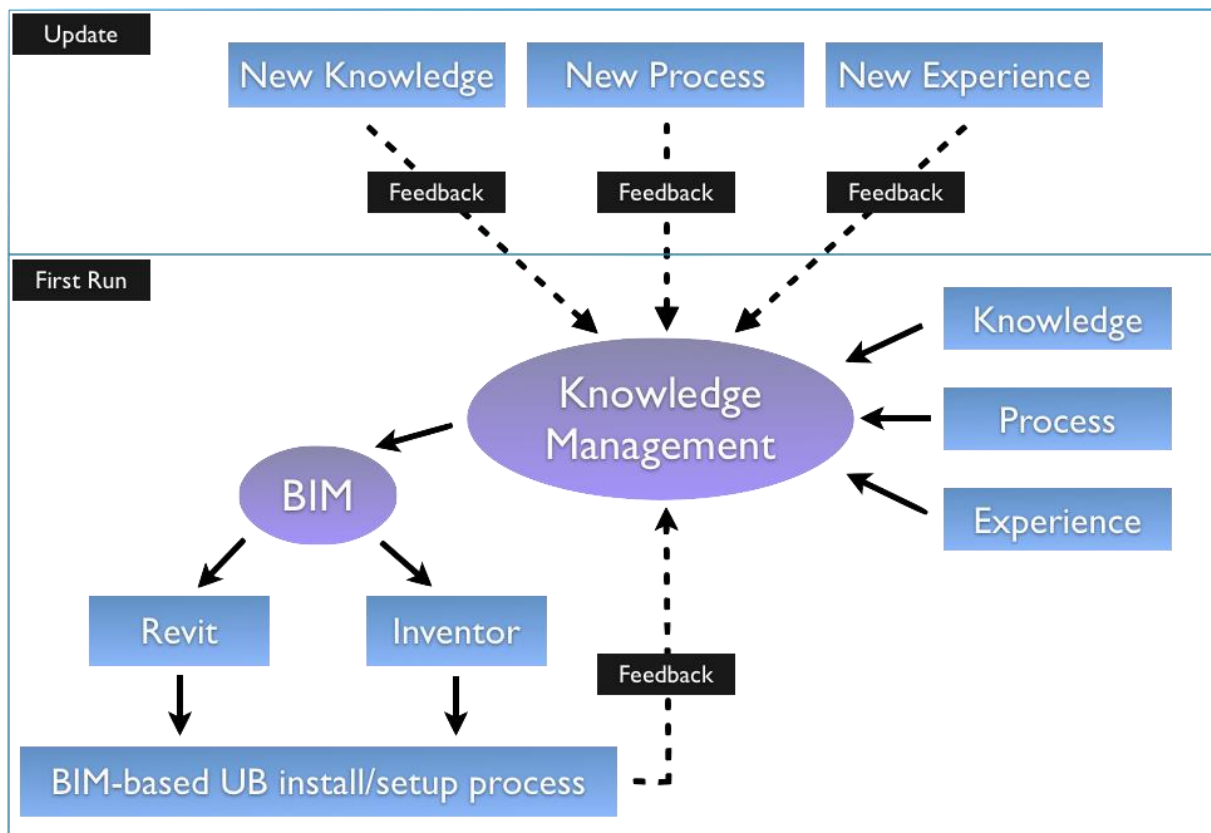


Figure 1: The concept of visual unit bath setup implantation using BIM

4. CONCEPTS UTILIZED FOR SYSTEM DEVELOPMENT

Improving the lacks of using 2D CAD drawings in UB install/setup activity, the visualization and information of 3D BIM model are applied to simulate the process. Fig. 2 describes the procedure of the UB component development using BIM, and using the inventor software, the simulation process effort can be produced. The final effort can be e-learning documents to assist engineers' understanding of UB installation in the site.

First, the customized design requirements of UB are identified, and determine which material and equipment the owner needed. Then, when these requirements are reviewed completely, the BIM software, which Autodesk Revit is used herein, is applied to build the UB components. The completed components are import to Inventor professional and publisher software, and then the animation can be produced for simulating the visual UB install/setup process.

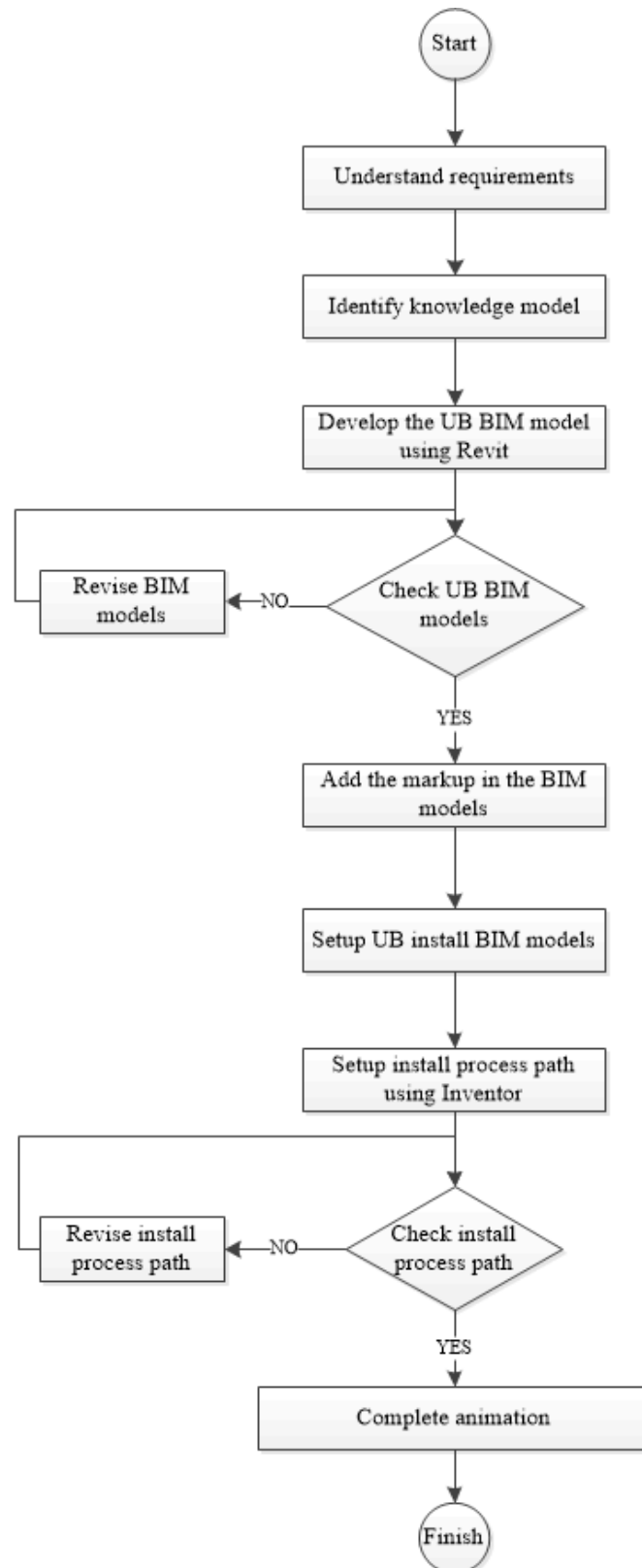


Figure 2: The flowchart of visual unit bath setup implantation using BIM

5. POLITE TEST

The proposed methodology has been applied in the selected polite test in Taiwan. Figure 3 shows the screenshot of BIM-based UB install/setup model. The methodology is demonstrated by the engineers in the construction site that BIM model can assist UB installation activity effectively, and the junior engineers can be easier to learn how to deal with the problems about installing UB object. Fig. 4 shows process illustration of UB installation for the knowledge and experience management using BIM models. Furthermore, Fig. 5 show updating knowledge and experience of UB installation using markup for staff training in the polite test. Therefore, through the interview with the site engineers, the results indicate that BIM technology can support the work implementation effectively, and the efforts can be made as an e-learning document by using Inventor software, linking the knowledge asset for a company.

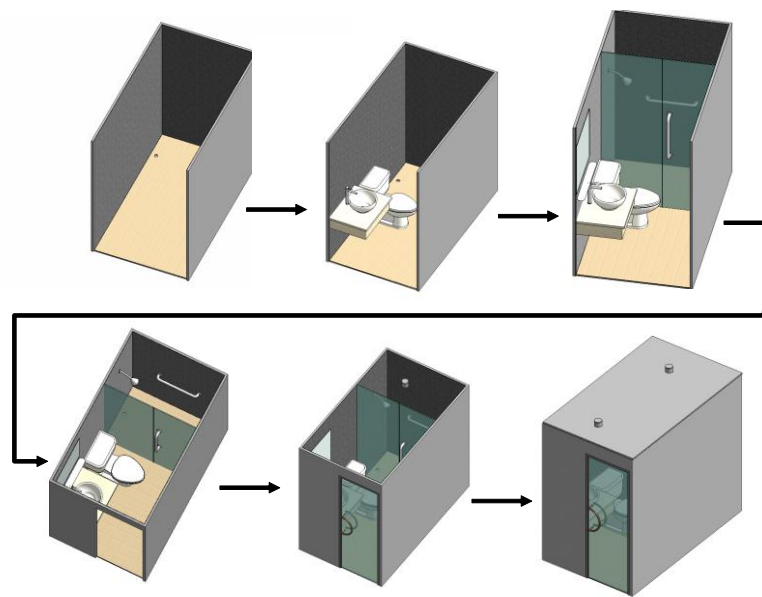


Figure 3: Process illustration of UB installation in the polite test

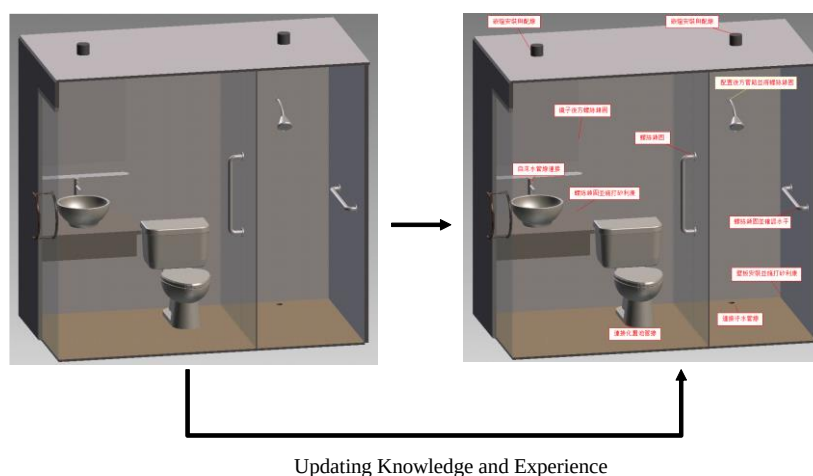


Figure 4: Updating knowledge and experience of UB installation in the polite test

Table 1: Differences between the current approach and proposed system

<i>Task</i>	<i>Current Approach</i>	<i>Proposed Approach</i>
Shop drawings	2D CAD	3D BIM models
Knowledge Management	Paper-based illustration	3D BIM animation
Related Information	Paper-based manuals	BIM models linked with digital information
Installation Sequence	Text-based illustration	3D BIM animation illustration
Visual Training	2D shop drawing and manuals	3D visual BIM models and animation

6. CONCLUSIONS

The UB installation is a very complex process, and the installation is implemented by 2D CAD drawings. The lacks of the construction using 2D CAD are identified, including engineers need the better understanding for shop drawings, too many information is involved in one drawing, and it is difficult to leave the knowledge and experience. Thereby, the BIM technology is utilized to develop a procedure of BIM-based UB install/setup activity in this study to improve the above-mentioned lacks. And this procedure had been applied in the selected Taiwan case project; the results indicate BIM is a significant and effective tool for UB installation, avoiding the reworks and construction mistakes. There are several advantages of BIM application for UB construction, they are as follows: (1) the BIM visualization function is applied to clarify the relationship between UB installation steps and interfaces, (2) UB installation process can be easier to be record and stored as an asset of the valued knowledge. and (3) through simulating UB installation process in BIM model, the chance of interface problems occur during UB installation can be reduced.

The recommendations are found during the interview, they are as follows: (1) the training and workshop should be held for assisting engineers know how to use the BIM components of the UB; (2) the mechanism of review can be considered by managers or senior engineers for managing the UB model to ensure the model is available; and (3) the BIM-based knowledge management system should be developed for storing these UB models from different projects, and they will be significant asset to reuse in the future projects for junior engineers.

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