Automation in Construction 20 (2011) 115–125

Contents lists available at ScienceDirect

Automation in Construction

journal homepage: www.elsevier.com/locate/autcon

Teaching construction project management with BIM support: Experience and lessons learned

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ARTICLE INFO

Article history:
Accepted 21 July 2010
Available online 4 November 2010

Keywords:
Building Information Model (BIM)
Scope–time–cost
Estimate
Schedule
Quantity takeoff
Construction design
Project management
Project-based learning
Situative learning
Virtual learning

ABSTRACT

This paper presents experiences and lessons learned during the introduction of *Building Information Models (BIM) in* construction engineering project management courses. We illustratively show that the introduction of BIM-based project management tools helped the teachers of two courses to develop more realistic project-based class assignments that supported students with learning how to apply different formal project management methods to real-world project management problems. In particular, we show that the introduction of BIM allows educators to design a class project that allowed the use of more realistic cases that better simulate real-world project conditions, helped students to learn how different project management methods integrate with each other, integrate change management tasks in a class assignment, and learn how to optimize project plans.

1. Introduction

Knowledge of project management theory is important to participate on a project. While mistakes in the classroom result in lower marks, mistakes in the field can affect morale, waste resources, and in the worst-case scenario cost someone's life. Academics universally agree that practically applicable knowledge about construction management tools and methods is difficult to learn. This is mainly because explicit understanding about how to apply formal methods and tools within the unique situations encountered on most construction projects is hard to gain. The application of most formal tools and methods requires project managers to have an in-depth understanding of project-specific information. For example, if a critical equipment or subcontractor fails to perform as anticipated what impacts will this have on time and cost and what impact will potential alternative operation methods have. Answers to such questions cannot be generalized and trivialized; they cannot be developed through the formulaic application of the necessary project management concepts, but depend greatly on project-specific information. This provides a problematic situation that universities face during the development of construction management curricula. In the past, students had to learn practical application of methods on very simple abstract examples because of the limited time available. This approach did not allow students to learn how to adjust the application of project management methods to specific real-world project contexts. To overcome this shortcoming, educators complemented their formal illustration of the method through abstract examples with stories of how project managers applied the methods successfully on past projects. While this learning approach is an improvement to only learning the formal working of the method, the retrospective character of storytelling does little to help students to build up an understanding about how to apply a certain method to solve a practical problem. In hindsight, a story of a successful application of a method to a project management problem, in particular, if told well, sounds obvious, while applying a method to solve a problem that one faces is not so easy. To overcome this dilemma a combination of the two learning methods is necessary, during which students apply formal methods within simulated contexts of real-world construction projects. The design of such projects within the tight boundaries of construction management classes is not easily possible because it simply takes too much time for students to understand the method and all the project-specific information to apply the method. Due to this problem, construction professionals still acquire much knowledge through learning-by-doing [1] with on-the-job training activities, and it is not surprising that many criticize construction management university programs as ineffective [2].

In this paper, we argue and provide first illustrative evidence that the integration of project management tools based on Building Information Models (BIM) can help educators to develop project management class projects that simulate realistic practical situations, such as the

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doi:10.1016/j.autcon.2010.09.009