Chapter 15
The BIM Concept:
The Role of the Engineering School

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ABSTRACT

Building Information Modeling (BIM) is changing the way projects are constructed. This emerging practice requires new mind-sets and technological know-how in order to achieve significant improvements in building efficiency. Universities must focus on the strategy of using BIM as an innovative technology to allow the acquisition of new skills by students and prepare them for their future activity in a more competitive world. Based on this perspective, this chapter presents some educational measures on offer at the Technical University of Lisbon. It focuses on the importance of teaching BIM: the involvement of students in research projects, PhD theses, and MSc dissertations, and the dissemination of BIM through professional short courses and workshops addressed to the AEC community outside the school. Some of these have already been carried out in the school; others are presently being proposed or currently in progress. It is clear from this that school is an important driver for the growth of BIM knowledge and practice through the preparation of new and existing professionals.

INTRODUCTION

The management of all information, in its entirety, concerning the different phases of the life cycle of a building, from architectural design to post-occupancy maintenance, can be supported on a single common technological environment. This concept is the basis of Building Information Modeling (BIM) technology. There is now a growing interest in the adoption of this technology within the Architecture, Engineering and Construction (AEC) industry. A BIM model is a parametric model, strongly associated with visual presentation (the geometric model), but it is, in

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fact, a model rich in information (Succar, 2009). The immediate benefit of BIM is that the three-dimensional (3D) model is automatically generated from the 2D lines drawn and the properties of the elements within the software. But, there is more to BIM than visualizations, as each building element is an object with its own information and identity. Within BIM software, relationships and behaviors are defined between elements such as door, window, pipe or wall. Moreover, with a BIM, quantities can be calculated automatically by the software, making the automatic generation of template bills of quantities, door and window schedules an instant operation. Once the major building elements are in place, it is possible for architects, structural engineers and mechanical engineers to work together on the same BIM. The spatial relationships defined can then ensure that there are no clashes between, for instance, the mechanical engineer's duct work and the structural engineer's steelwork (Hamil, 2010).

Although is still at an early stage of development and implementation, the BIM is one of the most promising technologies for the integration of teams working on the same project. The ability for interoperability, that still must be made possible by BIM, is the basis of the integration of collaborators in the project (Hallberg & Tarandi, 2011). Today, it is being used by many in the construction industry to make efficiency savings and to improve the accuracy and coordination of documentation (Hamil, 2010), although it is still common for building information to be held in different models. For creating and handling a BIM model the user should acquire knowledge concerning the identification of data involved in each phase of the project, the analysis of its organization and classification and the study of modes of reuse and data depending on which additional phases are to be developed or coordinated for that model. The implementation of this concept involves multiple actors from different sectors of the AEC industry. At present, the professional architecture and engineering community is embracing new technology quickly, incorporating new opportunities to streamline the design process and to save time and money (Race, 2012), whereas the academic community moves more deliberately and thoughtfully to incorporate new technology and to offer new courses (Sabongi, 2009). However, as the pressures increase both to control costs and save time, it is inevitable that Civil Engineering education will move into a world which demands that students and new professionals are adept at using tools like BIM.

The mission of the school of Architecture and Engineering is to prepare future professionals in those fields, and as such, must provide education on those topics relating to all aspects of those professions. As part of this, the school must focus on the changes in Information Technology (IT) tools, used in the project office which could be used in the realization of collaborative, interconnected and therefore more effective projects. For this reason, students need to acquire knowledge of basic BIM technology, both because it is innovative technology and because there is a growing interest in its application in the design office.

It is evident, as Sabongi (2009) says, that the standard of non-integrated, stand-alone courses no longer meets the needs of students who will be employed in the construction industry. The new project management tools, such as BIM, are challenging for undergraduate construction education. Students' post-university employment increasingly depends upon their ability to integrate all facets of the curriculum and to comprehend more than the more widespread design-bid-build model of project management. Thus, the basic BIM technology must become one of the essential tools in students' training, in the future, to facilitate their integration in a demanding and competitive work environment. Lecturers and academics must first concentrate on learning how and why usability of new digital tools can improve the design of buildings in order to better offer students knowledge of diverse technological solutions that are beginning to be disseminated. IT play a significant role in