Chapter 25
Design and Evaluation of an Integrated Design Practice Course in the Curriculum of Architecture

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ABSTRACT

The architecture, engineering and construction (AEC) domain is moving to a new kind of practice. Professionals are leaving the traditional way of design - engineering projects delivery and moving to a more integrated one. The implications of this initiative have started to appear in the curriculum of construction and architecture schools as well. This chapter presents the design and evaluation of an elective undergraduate course which aims to convey both the theoretical and practical principles of integrated design. This course has been designed for the curriculum of architecture to replace the Computer Aided Design and Drafting course, in which traditional 2-dimensional drafting used to be taught. In this new course, students tried to deliver a design project collaboratively by exchanging data between selected applications. Although some technical problems have occurred, the case studies have proved that integrated design is possible using the latest improvements in the Information and Communication Technologies (ICT) domain. The evaluation of the course has also revealed various barriers related to implementing integrated design principles at educational programs.

1 INTRODUCTION

Information and communication technologies (ICT) have been affecting the way we conduct business. Many industries have redefined their processes within the last couple of decades as a result of this. The construction industry and its related businesses are also under the pressure of using new digital mediums more efficiently. Design and construction projects now have the opportunity to be delivered in a more integrated manner as the new ICT tools begin to proliferate within the industry. Clients and owners are pressurizing the project participants to deliver a more integrated practice. It has become evident that integration promises to make the design,

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construction and operation of buildings much more streamlined and efficient.

In spite of these rapid changes, training related issues are considered to be one of the important barriers that impede the delivery of projects in a more integrated manner. Eastman et al. (2008, p.300) and Sacks and Barack (2009) explained that the current lack of trained personnel remains a barrier to achieve a more integrated practice within the construction industry. In a more detailed survey, Kunz and Gilligan (2007) tried to measure the benefits of Building Information Modeling (BIM) use and factors that contribute to its success. The results indicate that management support, training and the availability of staff are the biggest value-adders. It has been found out that lack of training, staff and software are among the main impediments of creating a more collaborative project delivery platform. Hartman and Fischer (2008) conducted a similar survey and identified that there is a lack of knowledgeable practitioners who could move the industry into the new age. They have concluded that AEC industry and companies need to establish far reaching education and training programs.

In order to adapt to this new situation, the educational institutions need to make the necessary changes in their curriculum and teach the up-to-date information. The professional life now demands university graduates to be more capable in using the latest ICT tools more than ever in order to deliver more effective projects in terms of time, cost, quality and satisfaction. Some of the schools have now included courses in related topics in order to promote the idea of the Integrated Project Delivery. As Cheng (2005) states there is an urgent and immediate need for architectural education to prepare future practitioners who will catalyze this change.

In the last couple of years, there have been a number of research projects that aimed to demonstrate that the concept of integration is working (Kam et al., 2003; Kam and Fischer, 2004; Plume and Mitchell, 2005; Tanyer and Aouad, 2005; Plume and Mitchell, 2007; Mitchell et al., 2007). Moreover, as Sacks and Barack (2009) state the benefits of integrated project models have been researched and measured in architectural practice (Birx, 2005), in structural engineering (Sacks and Barak 2008), in construction (Khanzode et al., 2005) and in fabrication detailing (Sacks et al., 2005). In these projects, researchers have tested the capacity of the international data standards with case studies and recorded the strengths and weaknesses of the technical issues along the process. Although many efforts record the technical and practical effects of integrated practice, very few research efforts are available to record the requirements and consequences of the integrated design practice from the curriculum perspective of educational institutions.

This chapter presents some of the major challenges and opportunities that 'integrated design practice' presents in architectural educational settings. The need and evaluation of an undergraduate elective course has been presented in this context. The chapter starts with a short history of computing in the architecture curricula. Next, integrated design practice is defined and main approaches to integration are explained. The last section explains the development and evaluation of an undergraduate elective course in which the theoretical and practical aspects of integrated design has been taught.

2 COMPUTING IN THE ARCHITECTURE CURRICULA

Computers have entered the architectural schools more than a couple of decades now. In the first introductory years, a number of schools were experimenting with computers and there was not a systematic teaching framework (Pittman, 2005). During the last couple of decades modern *ICT tools* and *digital media* have been fully adopted by the discipline and profession of architecture (QaQish and Hanna; 1997). As a result of this, virtually