Building Information Modeling:
State of the A&D Industry and BIM integration into design education

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Panel Participants:
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ABSTRACT

Purpose
Building Information Modeling (BIM) technology is taking the architecture and design industry by storm. In the last year, the number of licensed seats of Autodesk REVIT has grown from 100,000 to 200,000 worldwide (Cadalyst, 2007). Compare that to the approximately 500,000 currently licensed seats of Autodesk AutoCAD, and although AutoCAD is not going away any time soon, it appears that the architecture and design industry is firmly headed in the BIM direction. As early as 2005, design programs across the globe began to investigate BIM and many decided to add this to their curriculum (Rundell, 2005). Others have more recently begun incorporating this new technology into their design programs to respond to industry needs for these skills. The purpose of this presentation and panel discussion is to give educators an overview of BIM technology, and discuss its implementation in programs around the nation.
Context

BIM is a technology that uses parametric modeling to minimize the time spent in coordination of design details like locating and moving architectural elements and the corresponding required documentation changes. It also has the added benefit of allowing the entirety of design development to occur in three dimensions possibly leading to better quality designs and enabling timely creation of realistic renderings. It allows greater control of document information, such as schedules, and can produce and manage information like occupancy plans for use in the long term facility management process.

A transition to BIM in the professional world requires a paradigm shift in terms of the design process and especially time spent in different project phases (Holness, 2006). Adaptation of the technology in design programs may also require a shift in curricula and projects in order to create graduates skilled in application of this type of computer software.

Method

The initial presentation will contain a general introduction by the researcher to BIM and discuss the current state of BIM integration in the A&D industry. The following questions will be addressed: 1) What is BIM?; 2) What software is available?; 3) Who (in the profession and in education) is using BIM?

Additionally, a panel composed of educators from around the nation who are currently applying BIM technology in Interior Design programs will answer the following questions: 1) How are interior designers, and design students, applying the
technology?; 2) How is each specific Interior Design program incorporating these tools into the curriculum?

Findings

Many large design firms across the country have begun implementing BIM technology into their work process. Educators’ currently in midst of the BIM-in-education revolution, will share successes and pitfalls encountered in teaching, learning, and applying these tools – while keeping our students focused on good design.

Summary

As the number and type of firms employing BIM technology continues to increase, it will be essential to provide design students experience with this technology. A first step in this direction is to share knowledge across university boundaries to best enhance our students’ educational experience and prepare them for the ever-changing, technology-intensive, profession of Interior Design.
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NARRATIVE

Building Information Modeling (BIM) technology is quickly becoming increasingly adopted in design firms across the nation. Some firms are implementing the technology in a limited aspect – using the technology for specific clients, specific project types, or may still be researching the technology. These firms may have one or two design teams exploring the technology. Other firms have completely converted to BIM for the majority of their business. Wherever a design firm is on this continuum, as they search for new, young designers, an understanding and practical skill with BIM is increasingly a “hot commodity”. As educators in the A&D field, we are obligated to determine how to prepare our students for this ‘new world’ while at the same time – providing an ever-increasing set of design competencies. BIM has become a topic interior design educator’s can’t ignore.
What is BIM?

Building Information Modeling is a technology (not a specific program) that offers an integrated platform to improve design, increase the speed of delivery for both design and construction, and provide a seamless flow of information. Both from software manufacturers and practicing professionals have discussed the benefits of BIM. (Bhatt, 2006; Holness, 2006; Horwitz-Bennett, 2007). The value proposition includes significant benefits for all three parties involved in a construction project: the owner/operators, the A/E firms, and contractors (Wong, 2007a).

Those involved in the architectural design and construction process recognize the inadequacy of typical 2D CAD software, simply a replication of the traditional hand drafting process, in the complex world of today’s large design projects. Although 3D design has been embraced by many as a visualization tool, expanding the use of BIM tools to manage the large amounts of data generated by different project members offers an intriguing value proposition. The true vision of BIM includes “providing a common database of intelligent information that can be seamlessly and sequentially used by all members of the design team and ultimately the owner/operator of the facility throughout the facilities lifecycle” (Holness, 2006). This 4th dimension, often called 4D, is the added layer of design information that truly differentiates BIM from traditional CAD. The possibilities of the tool to improve project coordination, reduce errors, and streamline the process of design and construction – some say by up to 40% - is the real draw for implementation of the technology (Gonchar, 2007; Wong, 2007a).

There are several current software applications that fall into the BIM category. In October 2007, AECbytes and Bentley Systems published the results of a survey which
questioned which BIM applications were currently being utilized nationally. AutoDesk Revit was the leader with a 68% market share, Graphisoft ArchiCAD was second with a 31.69% market share and Bentley Architecture was third with a 14.79% market share (Khemlani, 2007). The market share held by Revit is likely strengthened by the backing of AutoDesk, the industry standard CAD program manufacturer.

**Who is using BIM?**

In an a recent publication of Architect, published by the AIA, Riskus (2007) writes that as of 2006, 16% of AIA member owned firms had acquired BIM software, and 64% of those firms were using the technology for billable work. Interestingly, 46% of large firms, those with over $5M in gross billings, had acquired BIM software. Additionally, 35% of firms working internationally had acquired the software.

Some design specialties, such as educational and institutional design, have been quicker to embrace BIM than others. Since 2007, the General Service Administration (GSA) has required that ‘appropriate new construction or major modernization projects’ employ BIM technology. GSA defines BIM as “a data rich digital representation cataloging the physical and functional characteristics of design and construction” (Buckley, 2006; "GSA Building Information Modeling Guide," 2007). The GSA BIM guide indicates that the technology is used primarily to “make the design information explicit, so that the design intent and program can be immediately understood and automatically evaluated.” While the GSA has not standardized on a specific BIM software product, they have committed to this technology as the future of their design and construction program.
Although large firms have been the primary drivers of the technology adoption, a recent online search of job banks: www.ASID.org, www.monster.com, www.interiordesign.net, www.hotjobs.yahoo.com and www.revitcity.com, yielded over 300 job postings across the U.S. and abroad, searching with the terms Revit and interior design. In an AIA article on emerging professional issues in the architectural internship, Jason Henson, an architectural graduate of Louisiana Tech, notes that his internship at a large architectural firm, HKS in Dallas, included a crash course in Revit. He describes his adjustment to this technology as “an entirely different way of thinking than conventional drafting or modeling programs” (Henson, 2006). He also notes that using Revit has enabled him to “insert himself more in the design process, while giving [him] a medium to express [his] talent to learn and take initiative”.

Teaching BIM

Over the last five years, interior design and architecture programs have begun incorporating BIM into their curriculum. While there is currently no CIDA standard on the inclusion of BIM, many programs have recognized the need for adoption based on the professional acceptance of the technology. As more programs introduce BIM, each program must determine at which student level to teach the technology, how to best utilize the information management aspects and how to fit BIM into an ever shrinking credit hour allocation. Complicating the implementation is that currently there is no seminal textbook or process for teaching BIM. (Rubenstone, 2007).

However, manufacturers of the three widely accepted software applications have begun to aggressively market to universities. At this point in time, each of the three
manufacturers mentioned above has instructional materials available for download. Some also have free versions of their software, student workbooks, educator materials, and student and faculty support networks to supplement the teaching material. (Wong, 2007b). Given the newness of the technology, and the rapidly changing versions and options, it is difficult to find anyone who has actual field experience to teach these courses. Realizing that everyone is in a learning curve, taking advantage of these resources is key to successful incorporation.

Additionally, currently there are no interior design-specific instructional materials. By definition, interior designers will only use a specific set of BIM tools, given that they are not usually responsible for generating exterior construction or structural systems. Since BIM was developed to encompass the entire construction process, teaching the technology in interior design programs becomes even more problematic. Over the last 15 years, faculty have made extensive use 2D existing ‘building shells.’ They often get these from past projects, design firms, or self-generate these very basic 2 dimensional representations in CAD. This is no longer an easy option with BIM. Teaching materials are geared to exterior construction and materials first, with a couple of chapters devoted to interior elements at the end. This is an identifiable gap in the existing available teaching tools. Several schools have developed their own ‘workbooks’ or must adapt existing texts to meet their needs.

**BIM and Design – Help or Hindrance?**

Most design and construction professionals classify BIM capabilities as process improvements that will positively affect clients’ and design firms’ bottom line. But some
have voiced their concerns that ‘design’ may suffer with the transition to the technology. (Chang, 2006; Seletsky, 2006; "Will BIM be the Death of Design? [Weblog Entry]," 2006). BIM software is, by its nature, more complex. To use BIM effectively, interior design students must understand significantly more construction detailing than was required when using a 2D CAD application. For this reason, some educators link the teaching of BIM with the teaching of construction detailing. Others choose to focus on the technology’s ability to help visualize space and work with conceptual designs. In this implementation, students may not be encouraged to explore the ‘construction aspects of the application, but rather use it in a representational way, sometimes exporting the drawings to traditional CAD packages to complete the construction documents. Given the newness of the industry, universities will have to determine their own course for software implementation. Each of the uses listed above, in addition to the myriad of other capabilities, are legitimate applications. The educator’s responsibility to the professional world, at this point, may hinge on exposure to the technology rather than its mastery.

**Summary**

The expanding role that BIM is playing in the professional world has created an pedagogical imperative that the technology be introduced at some level in the interior design curriculum. Over the next five years, students who have these skills will have an opportunity to quickly become important resources for their design organizations. In the past some educators were concerned that designers with technical knowledge would be pigeonholed into a CAD-only position, with no real ‘design’ opportunity. Because BIM is
as much about the design process as a tool for implementation, exposure to it offers a unique opportunity to become valued additions to any firm. While BIM skills will not guarantee a job for interior design students – it will guarantee a second look at their portfolio.
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References
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