mold it for the benefit of all instead of avoiding the issue.

The answer to the first question requires a crystal ball. But the second is up to us. As practitioners, we need to lead this revolution instead of letting construction managers, brokers, and the like define our future for us. We must start by admitting to ourselves that we do waste significant time and money employing conventional methods. Second, we must put aside our fear of the unknown and experiment with new risks, emerging technologies, alternative business models, and unfamiliar new roles. As architects, engineers, contractors, etc., we must jointly share both the authority and responsibility for design, means and methods, costs, and delivery schedules by sharing contract risks on a project-by-project basis and/or integrating our respective disciplines within the same firm.

Most of us are reluctant to do so, but then, we can't complain about becoming a commodity or losing control of the process. This is all about regaining control (thereby reducing risk), improving margins, and contributing to a better built environment which we owe to our clients, our communities, and ourselves. Yes, many of our clients are not asking for it, but then I don't remember anyone initially asking for the fax machine, computer, or cell phone. That crystal ball may reflect a future much closer than we think – so what's your choice?

–Peter Beck

Peter Beck is Managing Director of The Beck Group, a full-service builder engaged in the development, design, and construction of commercial projects across the U.S. and Mexico. He is a board member and Senior Fellow of the Design Futures Council.

Computing in Architectural Education

When I entered architectural school in the U.S. more than thirty years ago, computers were, at best, a curiosity. A few schools were experimenting with computers, but there was no systematic instruction or theoretical framework for computing in architectural curricula. Education mirrored practice. A few pioneering firms were experimenting with computers, but mainstream use was nonexistent.

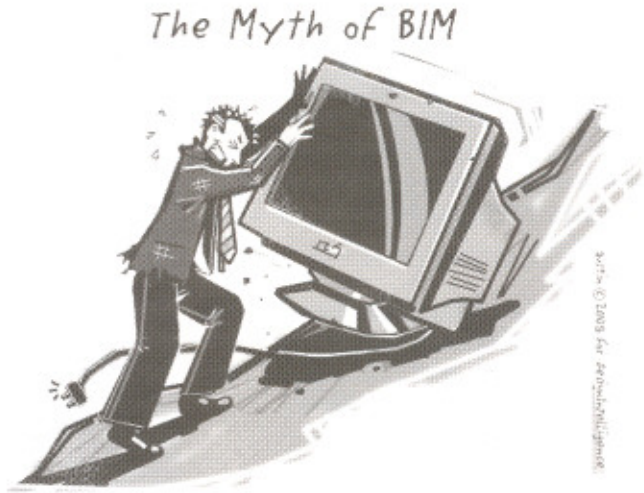
Over the last thirty years, computing has become integral to architectural practice. Computer-aided drafting, specification writing using word processors, and use of spreadsheets for quantity takeoffs are standard in most firms. An increasing number of firms design buildings impossible without digital technology. While the level of sophistication varies among architecture and design firms, digital technology pervades the industry.

Given the integral nature of computing to practice, how has education evolved to prepare future practitioners? Today's students will shape the next three decades of practice. What are they learning? What skills and attitudes will they bring with them as they enter practice? To address these questions, I informally surveyed several educators and industry leaders familiar with architectural education in the U.S. and Europe. The following is a brief summary of what I learned.

Computers are now integrated into the design curriculum.

The use of digital tools has moved into the studio. The studio experience focuses on design skills and concepts rather than the use of digital tools, which are now transparently supporting the design process. From an educational standpoint, digital tools have faded into the background – as they should.

Students now arrive on campus with computing skills and a working knowledge of key applications. Most curricula build upon this knowledge in introductory "skills" courses. These courses, which once taught only tactile skills such as drawing and physical model making now incorporate such digital skills as line drawing, digital photo



TRANSITIONS

DFD CornoyerHedrick announces the promotion of **Andread Friese** and **Tom Cady**, to principal.

Robert L. Brown, Jr. has been elected to the represent the Fourth Congressional District on the **Georgia State Transportation Board**. Brown President and CEO of **R.L. Brown & Associates, Inc.** in Decatur, GA.

Joan Goody receives 2005 **BSA Award of Honor**. The award was presented to Goody in the new Undercroft at **Trinity Church, Boston**, a National Historic Landmark for which Goody recently led the renovation, preservation and expansion.

Joseph Murray joins **DFD CornoyerHedrick** as senior designer.

GreenbergFarrow hires **John Nourzad,** as Principal and Senior Vice President of Engineering. Farrow, a 20-year industry veteran, will direct GreenbergFarrow's engineering divisions including civil, mechanical, electrical, and plumbing.

William Halter has joined the **HOK Atlanta** office as Design Director.

Foreign Policy and **Prospect Magazines**, of Britain, has named architect **Rem Koolhas** as one of their Top 100 Public Intellectuals, along with such notables as novelist **Chinua Achebe**, and linguist **Noam Chomsky**.

Peter Drey + Company joins with **GreenbergFarrow**. The new Atlanta based studio will go by **GreenbergFarrow/Peter Drey Urban Design Studio**.

manipulation, presentation, and simple 3D modeling.

Most of the digital tools used in studios over the past decade are formal or representational in nature. Some programs have a renewed emphasis in how buildings will actually be realized – including materials, construction methods, and fabrication. New Building Information Model (BIM) tools now use concrete representations of building elements and provide the basis for performance analysis. They create the possibility of design studios that balance form, function, and performance.

Specialty courses augment and extend the use of digital tools in the design curriculum.
To supplement digital tools in the design studio, many curricula offer specialized courses that more deeply address specific topics. Examples include:

- **3D modeling and visualization**
- **Analysis and simulation**
- **Fabrication**
- **Generative design**
- **Digital photography**
- **Collaboration**
- **GIS**
- **Computer programming**
- **Facilities management**

Over time, these may be absorbed into the mainstream curricula and new courses developed as a reflection of emerging research.

Architecture schools supply a variety of facilities and students often provide their own laptops and software.
Most design studios accommodate computers for each student – frequently with wireless networks. The students typically provide their own laptops and software; most schools recommend hardware and software configurations.

A variety of digital design tools are used in Western architectural programs. Students are almost universally exposed to Microsoft Office, AutoCAD, Photoshop, and 3D Studio Max. Other tools being used are Autodesk Revit, Autodesk Architectural Desktop, Bentley Microstation, ArchiCAD, FormZ, Rhino, and Maya. A few schools are experimenting with mechanical engineering software such as Autodesk Inventor, Solidworks, Pro-Engineer, or Catia. High quality printers and plotters are commonly provided and - as interest in fabrication increases - schools are also providing laser cutters and rapid prototyping devices.

Several new research directions promise to contribute to both the theory and practice of computing in architecture.

The three most promising research directions are:

• Relationship of Design and Manufacturing. Renewed emphasis on realizing buildings has brought forth an interest in manufacturing and fabrication.

• Sustainable Design. As energy and environmental impact become more critical, the impact of design decisions from a lighting, energy, and material perspective is becoming increasingly important.

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David Erik Chase, former president of Hilier, has recently joined **Zyscovich, Inc.** as Managing Principal of the new **New York** office.

The board of directors of recently formed **Charles Pankow Foundation (CPF)** announces the appointment of **Robert K. Tener** as **Executive Director**. The CPF plans to fund research, development and the adoption of new ideas to enhance the efficiency and cost competitiveness of the US building construction industry. CPF's board of directors includes **Richard M. Kannuth**, president; **Judy L. Vawter**, vice president; and **Timothy P. Murphy**, Secretary/CFO.

The iconoclastic professional architect and management consultant **Allistair Cory** joins the London studio of **NBBJ** as principal.

Gensler-Chicago has named **Richard Fencl** as Technical Director of the firm's North Central region. Fencl will focus on project and technical merit and quality assurance for the firm's Chicago, Detroit and Denver offices. Also named by Gensler-Chicago is **Neena Konon** as new Clients and Projects Director. Konon was formerly president of Chicago-based Nicholai Limited.

Leda Woods, of **HLW International LLP**, and **Eve Savvakis**, former Proeject Manager of **Lieber Design Group**, join **Gensler-Chicago** as Senior Project Managers of the firm's Professional Service Firms and Workplace practices.

John DeSalvo, formerly associate principal architect at **Murphy/Jahn Architects** in Chicago, has joined **BOOTH HANSEN**. BOOTH HANSEN has also recruited **Cheryl Baughman Souder** as lead of the Interiors practice for the firm.

• Performative Design. We will see increasing integration of design tools with performance analysis and synthesis tools in the domain of structure, acoustics, lighting, thermal, and life safety.

These research directions all point toward a more integrated design process, one in which architects, engineers, fabricators, construction managers, and others work more effectively together to produce ever more complex, yet better performing and more easily constructed buildings.

Some issues remain.
While significant progress has been made over the last thirty years, issues still remain in realizing the full potential of digital tools.

Architectural education has made enormous progress in the use of digital tools over the past thirty years.

• Modeling is still primarily focused on form, composition, and visualization. Although building information modeling tools exist, the majority of 3D modeling taught in schools (and used in practice) is concerned only with the composition, and visualization of form; building information modeling tools that incorporate form, function, performance and constructability are only just beginning to be used.

• The level of integration between digital tools is very low. Digital tools do not typically work well together nor is there much attempt in research or practice to facilitate the flow of data from one tool to another.

• Mainstream software is under-represented in the schools. Because of the preoccupation with form, architectural schools have adopted digital tools that can create the most expressive forms. These are not the tools in mainstream practice.

Despite the issues discussed above, digital tools have moved from a novelty to integrally embedded elements. These tools have become accepted and have "disappeared into the background." Architectural education is about designing buildings – facilitated by digital tools – rather than about the tools themselves.

Today's students will shape practice for years to come. Their educational experiences provide the basis for their use of digital technology. It is incumbent upon our academic institutions to leverage and extend the progress made over the last three decades in teaching computing to ensure that students realize the full potential of digital tools over the next three.

–Jon H. Pittman

Jon H. Pittman is senior director of Strategic Research for Autodesk, Inc. He holds a Bachelor of Architecture and MBA from the University of Cincinnati and an M.S. in Computer Graphics from Cornell University.