

# Into the Third Dimension

By JEFFREY VAGLIO • July 31, 2013

News

Review



Trumpf campus cantina by Barkow Leibinger Architects.

Courtesy Barkow Leibinger Architects

Digital Workflows in Architecture:  
Designing Design—Designing Assembly

Three-dimensional thinking is inherent throughout the architectural design process, where buildings

—Designing Industry  
Scott Marble  
Birkhäuser, \$100

and structures originally conceived as mental visions eventually become built form. Over the last several decades, the transition from concept to construction documents to built form has been subject to

significant evolution at the hands of the digital revolution. In *Digital Workflows in Architecture*, Scott Marble aims at sparking the dialogue with one question: How far have we come?

For Marble, the dialogue is a collaborative exploration of how the digital landscape of the AEC community is transforming relationships; relationships of designers to tools, the relationship of architecture to production, and relationships between the roles we play. A self-proclaimed “machine addict” with over twenty years of experience in practice and academia, Marble was first enthralled by the ability of computer models to drive computer numerical control (CNC) machines—the lure of file-to-fabrication. Years later, Marble’s perspective and extensive network of likeminded digital workflow gurus allow him to connect the dots and bridge generations. Ultimately, this evolution has diminished the “culture of the Sole Designer,” and instead spawned an open and inclusive process that contributing author David Benjamin calls “democratizing design.”

Marble’s 280-page assemblage and commentary on digital workflow is an objective, grounded body of research that appropriately focuses on philosophies and interactions in practice, avoiding a narrative tethered to specific tools, software, or applications. For Marble, the three dimensions of his thesis are designing design, designing assembly, and designing industry. These three dimensions are procedural, material, and organizational issues, and serve as the framework for organizing a collection of fifteen narratives and case studies from eighteen contributing authors. Similar to the cultural shift away from the sole designer in practice, this body of work embraces collaborative assessment, but not at the risk of losing a cohesive message. Following each article, Marble subtly interjects a brief commentary that creates context, a broader dialogue, and identifies key synergies that are representative of digital practice and the AEC industry as a whole. The clear organizational structure of the text, the relief of beautifully visually communicated (but not exhaustive) case studies, and the timely insertion of editor’s notes develop a rhythm that allow for the absorption of ideas without overwhelming readers with the complex nature of the topic.

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O-14 office tower in Dubai designed by Reiser + Umemoto RUR Architecture.

Courtesy RUR Architecture

An initial theme to surface is how the role of the hand has radically changed since the integration of computer-aided design (CAD). Early integration of digital technology was limited to applications as a drawing tool. With time, digital technology's application in architectural practice has expanded to a driver for tooling materials. This adaptation was gradually "removing the hand as the basic interface of both design and fabrication," as Neil Denari (NMDA) describes in *Precise Form for an Imprecise World*. How would architects, engineers, and fabricators respond to this paradigm shift? How would change from scaled drawings to 1:1 modeling alter the practitioner's workflow? Industry leaders who serve as Marble's supporting cast note the significance of physical prototyping. For instance, Ben van Berkel (UNStudio) states how beneficial it is to "step out of the digital workflow and work with physical models" in his essay *Diagrams, Design Models, and Mother Models*. Denari describes the reduced (in some cases, obsolete) role of the scaled drawing and how scaled thinking has moved the digital generation to a paradigm of "one-to-one translation from idea to realization." The need to introduce digital models into physical space, test them, exploit their limits, and re-inform the digital model is essential to keeping the boundless realm of the digital abyss grounded in the reality of material properties, fabrication processes, physics, and first principles of design.

In *Designing Assembly* and *Designing Industry*, the common thread explores the swing from linear flows to something more iterative with feedback loops. These loops occur in modeling cycles between architects and specialty contractors, both digital and physical testing, and is an approach that Shane Burger (Grimshaw Architects) describes as a concurrent design approach "from both top-down (form and program) and bottom-up (component and fabrication) directions"—a convergence of open concept and material constraints. Frank Barkow and Regine Leibinger describe this "profundity of ideation and handling of materials as one mutually intertwined activity." Project delivery strategies are currently confronting the repercussions of digital workflows, which shun the linear approach of the past for a more dynamic set of procedures that Thom Mayne, in *Shift 2D to 3D*, calls "malleable and persistent." It is as though the one-off digital workflows for any given project are increasingly mirroring the unique project delivery models in use.

The juxtaposition of digitally formed complexity and hand-fabricated solutions requires collaboration of a maker with a designer as early and often as possible. Mayne and Marty Doshier's workflow case study of the Perot Museum of Nature and Science in Dallas is brief at just two spreads, but articulates this relationship nicely. The initial spread shows a series of 3D model environments and panel optimization mappings. It

is the following spread that made me realize there is still plenty of room for improvement toward a true file-to-fabrication workflow: on the left, four images of mold making, fabrication process, and precast mock-up panels; on the right, an overall photograph of the project site under construction. In the captions, it states “highly skilled in-house workers” were chosen over computationally milled foam (due to cost, no less) to produce the 3D form liners. Despite the complexity, the level of digital modeling, and the intended accuracy, the project ultimately relied upon handcraftsmanship provided by skilled labor. So what are the opportunities for the architect in this web of modeling inputs that are increasingly reliant on engineers, specialists, and fabricators? Will the designer-maker rise to prominence? In the words of Mayne, “Architects will experience an increasingly smaller role.”

The book closes with an academic tone; John Nastasi’s account in *Designing Education*. As opposed to Mayne’s view of the architect’s reduced role moving forward, Nastasi believes there is a “broadening role for the architect” centered on design rule authorship, designing data management, and design output curatorship. This position is presented with a cautionary statement, however, advising the AEC industry to embrace new and innovative ideas, including those embodied in the next generation of digital designers. Without it, we lose “the most ambitious architecture students to other industries.”

The book’s narrative missed opportunities to examine what digital culture has weakened in practice and academia. What qualities do the “most ambitious architecture students” have? Is a digital aptitude developed at a loss of the fundamental building and material technology training? How is curriculum adapting? What is the industry doing to ensure that the next generation possesses first principles of design along with digital capabilities? Flipping through the case studies it is easy to see that the digital technologies and workflow have generated many complex solutions. My sense is that, too often, the digital culture begins with “what can we do with digital technologies” instead of “what should we be doing?” If complexity is the result of the digital workflows, then there needs to be clear benefits added. In the design process, the integration of more players earlier in the design is more expensive, but with the belief that it avoids downstream costs. What is the improvement in the built form? Is the performance more responsive to its context? Is it more energy efficient? Does it use less material? These are the types of questions that must be addressed and the metrics that can support digital technologies’ added value.

Scott Marble has adeptly curated the role of digital practice in architecture, not as sole author, but as facilitator of dialogue. *Digital Workflows in Architecture* left me with a

number of questions, including, what's next, and where are these evolving trends in digital workflows leading? What effects do non-linear workflows and collaborative modeling have on contractual and legal liability aspects of delivering a project? All challenging questions to consider, and instead of addressing them, Marble's book focuses on extracting a comprehensive cross-section of the diverse thinking and application of digital technology in practice. Documenting collective progress to date, *Digital Workflows in Architecture* serves as a valuable reference and launching pad for future generations of digital design thinking.