ARCHITECTURAL RECORD

EVOLVE YOUR WORKFLOW:

FROM 2D TO 3D TO BIM AND BEYOND

IMAGE COURTESY OF TIM HURSLEY

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EACH YEAR, more architecture firms from across the globe are incorporating BIM into their practices to build a competitive edge in the ever-evolving AEC industry. From small residential projects to massive stadium projects, the use of BIM lets the project team collaborate more efficiently and fosters communication between the architect and the client more effectively by using 3D models. The architect gains more design control, reducing errors and saving time and money. This eBook, produced by Architectural Record and Vectorworks, Inc., includes valuable information explaining the core differences between 2D and 3D, which will help you make the correct decisions for your firm.

Alex Bachrach, Publisher
ARCHITECTURAL RECORD

Table of Contents

Why Transition from 2D to 3D?

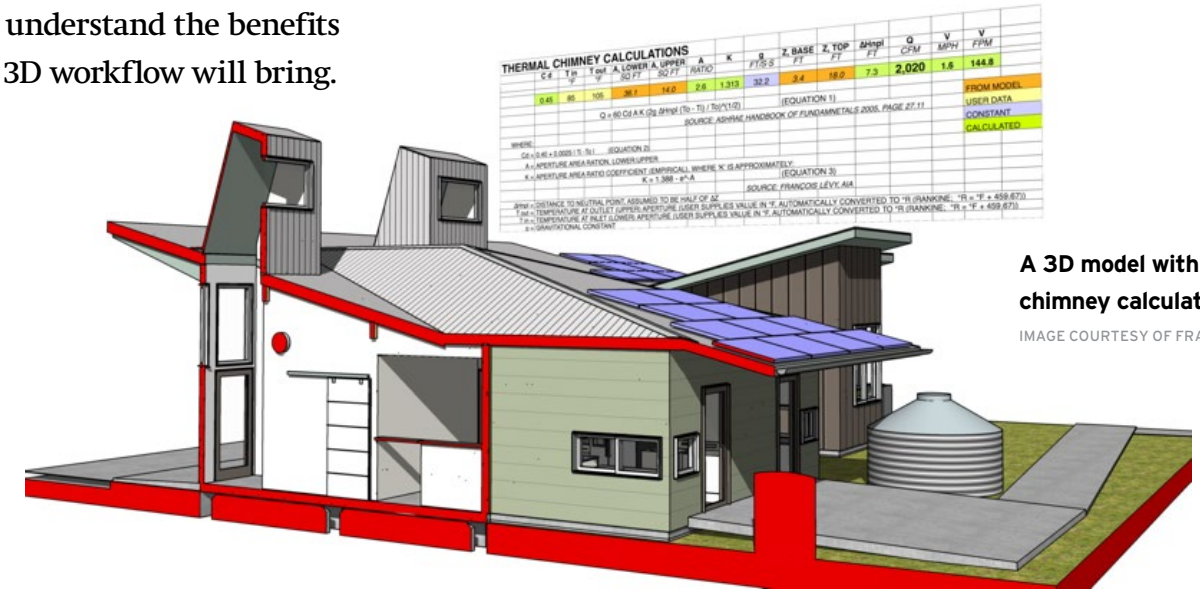
DESIGNERS NEED to meet increasingly compressed project schedules and shrink budgets without sacrificing the creative process. One of the easiest ways to do this is by adopting new workflows that incorporate 3D modeling – facilitating a streamlined design process while allowing designers to focus on expressing their creative visions, rather than solely producing documentation.

To the right is an overview comparison of a traditional 2D, drafting workflow and a 3D, Building Information Modeling (BIM) workflow. This comparison will help you understand the benefits of time efficiency and cost savings that a 3D workflow will bring.

2D	3D
• Drawings	• Models/Database
• Manual	• Automated
• Limited collaboration	• Full collaboration
• End-loaded process	• Front-loaded process
• Targeted value	• Persistent value

Drawings vs. Models/Database

With 2D, the project information is in the drawings. In this workflow, the drawings *are* the data, and these drawings are primarily a collection of lines, circles, and text. So, if a drawing is removed from the project file, an important, integrated part of the project is removed.

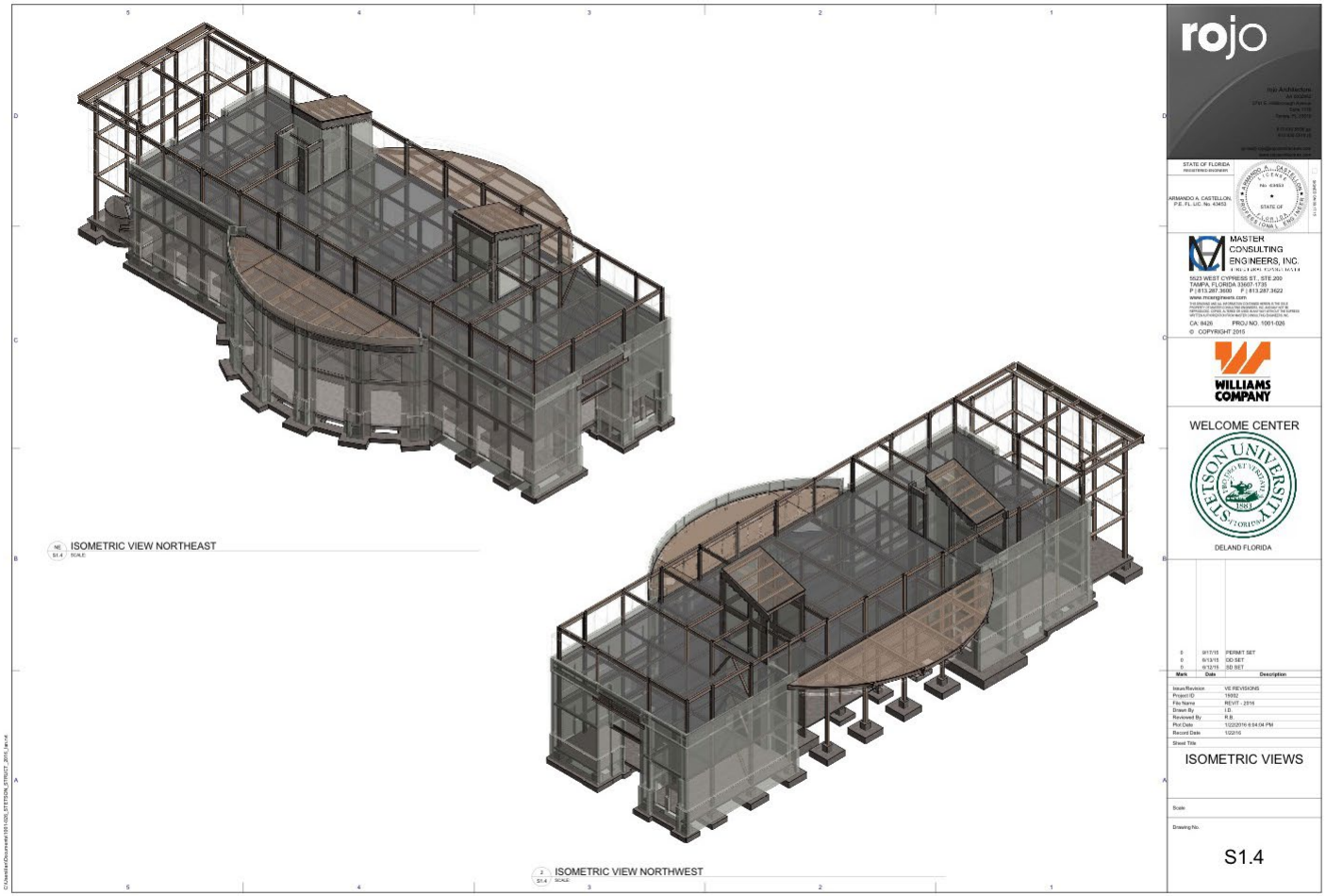


A 3D model with thermal chimney calculations.

IMAGE COURTESY OF FRANÇOIS LÉVY.

Northeast and northwest isometric views showing structural model built in conjunction with the architectural model of the Stetson University Welcome Center.

IMAGE COURTESY OF ROJO ARCHITECTURE.



With 3D and BIM, the primary source of project information is the model database compiled by building a model with "intelligent" three-dimensional objects with data associated with them. BIM is not just the 3D model or just the data; it's the model *and* the data.

Manual vs. Automated

2D is considered "low-tech," similar to an electronic pencil. The user must manually coordinate the accuracy of information and the multiple views and annotations of drawings. Because of its manual nature, a 2D process is prone to error and miscommunication.

When working in 3D, however, drawing coordination, reports, and schedules become automated. A 3D workflow includes one model from which all views are extracted, so as changes are made and as the design evolves, all the views update accordingly. This is a huge advantage because it reduces errors and, in return, reduces inefficiencies.

Limited Collaboration vs. Full Collaboration

On a large project, the 2D way of working creates a culture where different areas of expertise are segregated. Production is based on the output of drawings and this leads to a separation of work. So, this type of workflow prohibits the project team from having a holistic view of the project.

A 3D workflow with a collaborative approach offers all team members the opportunity to act together, giving them the chance to share their knowledge and expertise to contribute to the overall design and documentation of the project. Communication and collaboration amongst the team is no longer an afterthought but becomes an integrated part of the workflow.

End-loaded Process vs. Front-loaded Process

A 2D process typically involves the largest amount of work done late in the game, with the production of construction documents, as well as the process of drawing and detail coordination. Hence the term "end-loaded."

However, in a 3D workflow, the work is much more front-loaded. Not only can changes be made much earlier in the project, but more time can be spent on the design and development of a project with less coordination time spent in creating construction documents.

Targeted Value vs. Persistent Value

2D drawings have a targeted value due to the nature of drawings fulfilling a singular goal. This limits the value of 2D output. Yes, the design was there and the building got built, but any other necessary information and data needed by the owner or facility manager is compiled and extracted from multiple locations and within different formats.

A 3D workflow produces a data-rich, intelligent, and comprehensive model whose value continues after the project is completed. The owner and facilities management team can use the data to manage the project after construction and during occupation.

The ROI of BIM

François Lévy, M.Arch, MSE, AIA, author and partner of Lévy Kohlhass Architecture, and Rob Glisson, AIA, founder and principal of ROJO Architecture, both have had successful BIM implementation experiences within small- and medium-sized firms, and have realized the many benefits of working in 3D and BIM.

"This is the future — the decision has been made, and BIM is where we're going," said Glisson. "We initially started doing 3D drawings mostly to show perspective views of our projects to clients, and continually added more information over time. When we finally went to a seminar about this new thing called BIM, we realized it was just the same thing we'd been doing for years."

Side-by-side comparison of an initial rendering of the Stetson University Welcome Center and a photograph after construction. The rendering was used to convey ROJO Architecture's initial ideas for the project and to win the project.

IMAGE COURTESY OF ROJO ARCHITECTURE.

Both architects utilized Vectorworks design software's 2D/3D hybrid environment to ensure their transition to BIM didn't slow down their work. Instead, the software fostered a gradual learning curve that allowed them to work smarter and faster while picking up new skills over time.

Creating a Competitive Edge

"The first time we saw that BIM made us more competitive in a concrete and quantifiable way was in 2000 when we were competing with a larger and more established firm," says Lévy. "We were able to underbid them without taking a huge hit ourselves because we were more efficient. We could do the same work in less time — we could do work that wouldn't have been possible or cost-effective otherwise. That other firm wasn't doing BIM."

"I see lots of firms that use three or four or even five different software applications, each one specialized to do its own thing, but whenever the project gets handed off from one to another there is always friction in that interface," says Lévy. "With Vectorworks, we don't have to jump around – everything happens in one application."

Now that you know why, let's talk about how to make the switch.

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IMAGE COURTESY OF THE NATIONAL VETERANS MEMORIAL & MUSEUM AND MIR

Changing Course

Architectural education is diversifying, with more options for students.

BY JONATHAN MASSEY

THEN AND NOW Design studios in the early days of Columbia University's Graduate School of Architecture, Planning and Preservation, shown in Record in July 1900 (left). Now, students at the Taubman School of Architecture at the University of Michigan (above) seem more immersed in various media, if more casual in attitude.

PHOTOGRAPHY: COURTESY ARCHITECTURAL RECORD (ABOVE); UNIVERSITY OF MICHIGAN (RIGHT)

MASTER'S CLASS **Frank Lloyd Wright prevailed as top gun in his school at Taliesin West, as shown in 1937 (above, left). Paul Rudolph, a strong force in education as the chair of the architecture department at Yale University from 1958 to 1964, is shown in his Arts and Architecture building (above).**

PHOTOGRAPHY: ©HEDRICH BLESSING/GETTY IMAGES (LEFT); LIBRARY OF CONGRESS (RIGHT)

WALK INTO any of the 154 architecture schools certified by the National Architectural Accrediting Board and you are likely to encounter students working long hours in the design studio, learning their craft in small groups through desk crits and pinups. It's a scenario with roots in the 19th-century tradition of the Ecole des Beaux Arts. Combined with rigorous professional requirements, this approach makes becoming an architect an extended and expensive proposition, entailing from five to eight or more years of full-time study, with heavy course loads. Factor in internship and licensure exams and you've got an endurance course: the average time from starting a degree to becoming a licensed architect is 11 years. Architecture, and architectural education, are still to some degree a gentleman's game geared to people well endowed with time, money, and social capital.

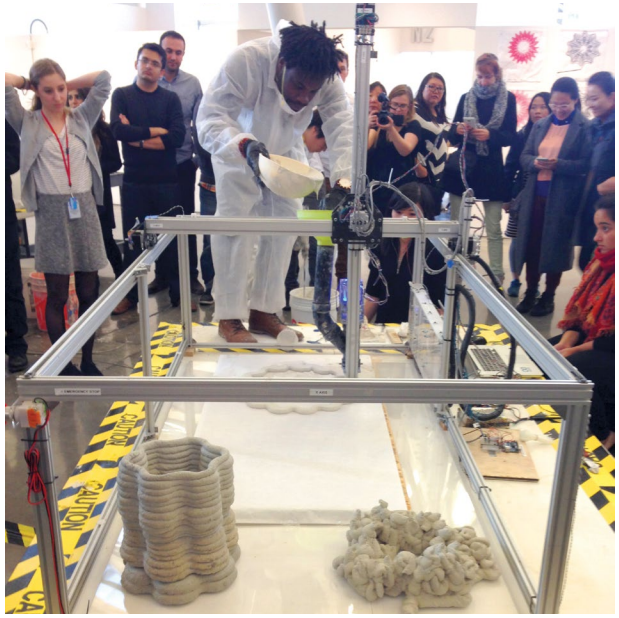
High barriers to entry skew the demographics of architecture by steering away talent, especially among women, first-generation college students, and people from historically underrepresented ethnic groups. Recognizing this, the organizations regulating access to the profession have changed procedures. Nineteen schools now incorporate work experience and test preparation into degrees to provide an "integrated path to architectural licensure," and the National Council of

Architectural Registration Boards has changed its internship requirements to recognize a broader range of activities and give candidates an earlier start.

But these are small steps, and there's substantial pressure to make the field more accessible and equitable. I see two primary methods for changing this: building new pipelines into the profession and exploiting the efficiencies of online tools.

The discipline starts losing a diversity of talent early on. Having completed a study on inclusion in architecture last year, Harvard professor Toni Griffin suggests that we need to introduce the field early to future architects by addressing middle- and high-school students from underrepresented backgrounds. To this end, the National Organization of Minority Architects runs youth summer camps and workshops through its Project Pipeline, while the University of Michigan's Taubman College of Architecture and Urban Planning has joined forces with the Detroit public schools to launch a one-semester college-level introductory program. The Equity by Design committee of San Francisco's American Institute of Architects chapter uses research and conference workshops to promote gender equity in both academia and practice.

Recruiting and retaining people who aren't interested in a gentleman's profession also requires changing curricula to foster awareness of architecture's relevance to matters of common concern. This is the work of Design Futures, an annual workshop founded in 2013 by Dan Etheridge and Barbara Brown Wilson, to train students in public-interest design, and of the Feminist Art and Architecture Collaborative, a group of young historians generating teaching materials that emphasize women's contributions and the insights of feminist scholarship.



California College of Arts has a different approach, shown in its Creative Architecture Machines Studio in 2015.

PHOTOGRAPHY: ©JONATHAN MASSEY

A bigger impending change is technology-driven. San Francisco's Academy of Art University, Lawrence Technological University in Southfield, Michigan, and Boston Architectural College offer accredited architecture degrees either fully or partially online, allowing students to fit education around work and family. So far, these programs generally replicate the methods and scales of on-campus education, with class discussion moving into chat forums and desk crits conducted in video calls. Across higher education, though, providers ranging from established universities to specialized for-profits, such as General Assembly, which was begun in New York, are offering new formats. MOOCs, or Massive Open Online Courses, present course materials and assignments online, with students evaluating the work of their peers. And since people need new knowledge and skills at multiple points

during their careers, fields such as interaction design and teaching are issuing microcredentials—certificates recognizing that the bearer has demonstrated competency in a specific topic or expertise.

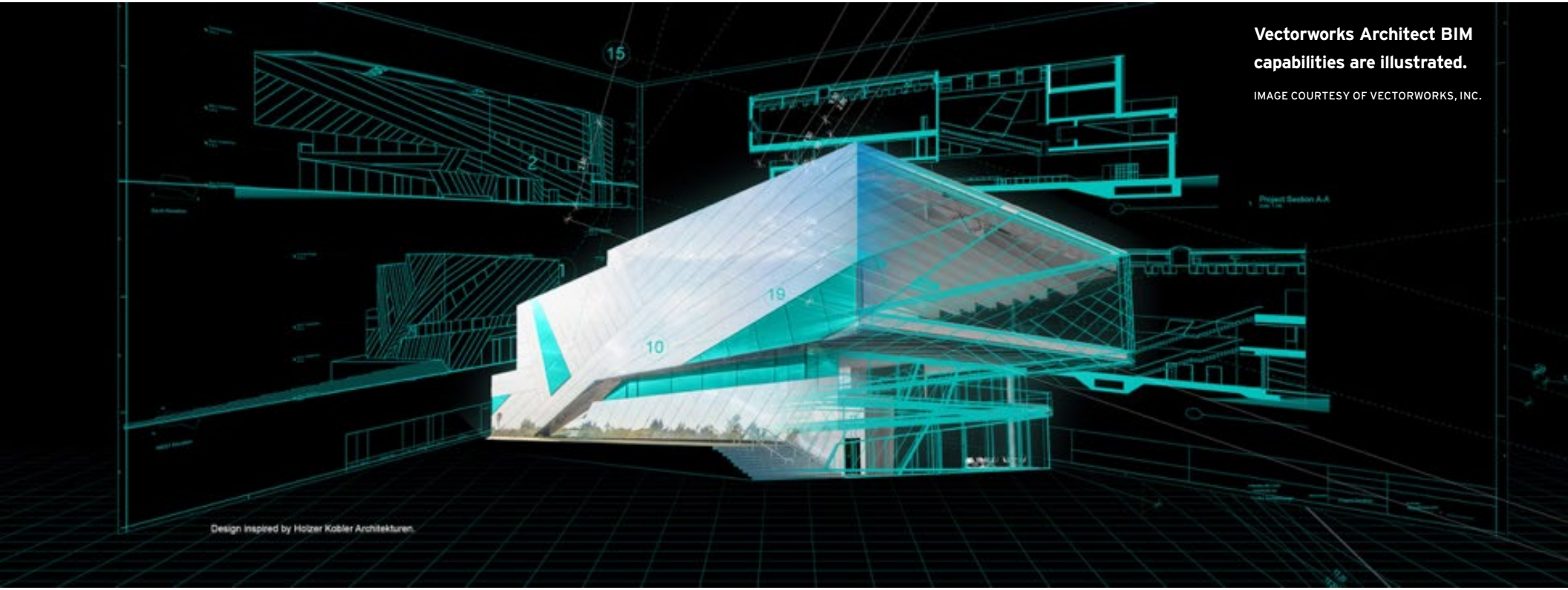
MOOCs and microcredentials have low completion rates, however; so far, in architecture, they function primarily as free or low-cost loss leaders that recruit students into traditional degree programs. But market analysts predict an "unbundling" in which students move from signing up for the degree program as a complete package finished in a short period right after high school (the traditional college-degree model) to a service consumed in different ways throughout a career. An exercise at Stanford University's d.school imagined the future university as a lifelong "open loop" between study and work, with a self-paced curriculum in which participants move forward not at set time intervals but when they demonstrate competency through exams and completed projects. Marketplaces such as LinkedIn, which use peer endorsements and other data to represent competency in specific areas of skill, may begin to supplant degrees in some fields.

Since most architecture degrees are connected to professional licensure, these changes will be slower to affect architectural education than other fields. But we can expect many architecture schools to combine on-campus learning with online courses, allowing students to learn at variable paces and lower costs. The key to significant change is innovation in the design studio, which owes its uniquely powerful teaching to a high cost in time, space, and staffing. The information-rich, multiuser platform afforded by building information management (BIM) software suggests that cloud-based platforms can support more efficient ways to learn and to evaluate design. Architect and Yale University professor Peggy Deamer sees BIM as a framework for introducing students to architecture as a collaborative art embedded in markets for products and services. Future practitioners educated in this kind of complex and dynamic design medium may be better equipped to navigate the labor market. Ultimately, the strongest incentives for people to pursue architectural education are higher earnings and a better work-life balance.

Many people practice architecture without becoming licensed. They work in a firm with other licensed practitioners, partner with someone who can stamp drawings, or operate outside the service model embedded in AIA-approved contract documents. Some of the strongest design research in the professional and post-professional degree programs at California College of the Arts, where I am dean of architecture, comes from experimental studios that adopt tech-sector approaches. In our Creative Architecture Machines studio, students make prototypes of automated fabrication systems for building components, generating intellectual property for commercial use rather than bespoke "instruments of service" for clients. Architecture offers ample room for innovation, not only in design but also in the models of practice and methods of preparation through which we equip students to transform the built environment.

Jonathan Massey is dean of architecture at California College of Arts in San Francisco and the author of Crystal and Arabesque: Claude Bragdon, Ornament and Modern Architecture (2009).

How to Prepare Your Firm to Transition to BIM



Vectorworks Architect BIM capabilities are illustrated.

IMAGE COURTESY OF VECTORWORKS, INC.

WHEN IT comes to adopting new workflows, some software programs force you to abandon or recreate your personal design process, leaving you with a steep learning curve and an inefficient workflow.

Vectorworks Architect allows you to transition to a 3D and Building Information Modeling (BIM) workflow in a meaningful and manageable way, because it's built around an architect's design process. This means you and your team can remain productive while experiencing the positive impacts of information modeling throughout your transition to a BIM workflow.

This article will specify how to prepare your firm's transition to BIM without compromising your practice's vision.

How it Works with Vectorworks

Vectorworks Architect is a 3D and BIM solution that supports your creative process instead of replacing it. Using BIM workflows with Vectorworks Architect provides you with the opportunity to deliver more accurate documentation with increased efficiency while remaining true to your vision as a designer.

Creating a strategic plan to identify what you wish to achieve by adopting BIM will help pave the way forward. This means understanding how your model will be used internally among your architectural team, as well as externally among your consultants, establishing BIM goals, and continuously monitoring or evaluating the process.

Seven Steps to Success

Here are seven essential elements that must be in place in order for you and your team, or any stakeholders involved with the project, to achieve a successful transition:

1. Vision

Establish a clear vision for everyone to work toward to help convey confidence in the successful implementation of BIM. Your organization's leadership should establish and clearly communicate the expectations for the use of BIM.

2. Goals

Defining your firm's goals will help you outline manageable changes to your workflows when creating an implementation strategy. These goals will create measurable objectives for each project to meet your expectation and further refine your implementation approach.

3. Skills

Your staff must have the proper skills, passion, and motivation to successfully achieve their goal(s). Plan to provide the required training to reduce stress and anxiety for the staff responsible for implementing BIM on a project.

4. Incentives

We recommend you think of a way to reward your team for the additional time and effort necessary to carry out your BIM vision. When choosing an incentive, be sure to gauge employees'

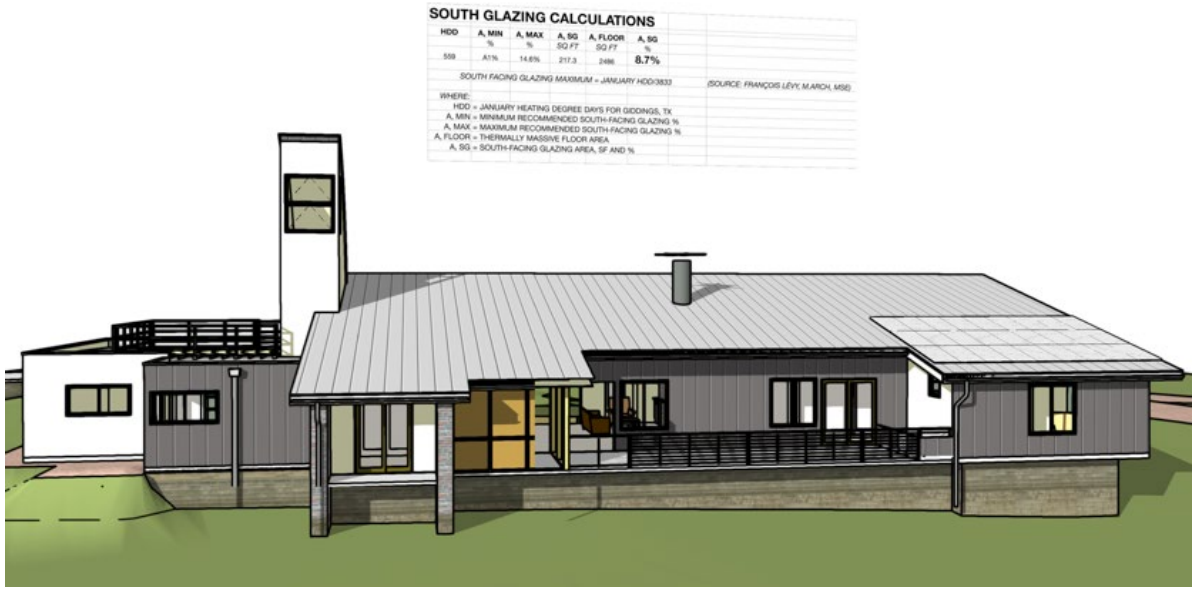
interest to ensure the incentive will motivate them before moving forward.

5. Resources

Your firm must be prepared to provide the proper resources, such as software and hardware, to support this new process.

6. Action Plan

Identify a potential BIM project in an early stage – possibly before winning it – and team up with consultants interested in collaborating on your endeavor. Establish agreed-upon uses of the model to determine the level of development of the model.



A 3D model with south glazing calculations.

IMAGE COURTESY OF FRANÇOIS LÉVY

7. Evaluation

Create an ongoing evaluation process to assess your progress and adjust as you go. Without this assessment, the firm may face a plateau in its implementation.

As you move forward in adopting a 3D and BIM workflow, it is important to record the impacts the new processes have on your projects. What have you been able to do differently, and to what benefit? Identifying and documenting your progress will help inform how to move forward with an office-wide BIM implementation.

"The key is that you keep moving forward – that you don't get complacent," said François Lévy, (M.Arch, MSE), AIA, author and partner of Lévy Kohlhass Architecture. "It's tempting to just learn the five tools that you know and use only them. We incrementally adopted more BIM workflow processes over time as we got more comfortable, starting out simple and then doing more complex things in 3D as we became more skilled."

Lévy also feels strongly about the benefit training provides for firms switching over to a 3D workflow. "Training just absolutely pays for itself, and it will continue to pay for itself for as long as you continue to develop your skills with BIM," says Lévy. And training doesn't have to involve flying out of the state; there are books, seminars, YouTube videos, online options, and even on-site classes."

Continue on to read some real-life examples

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IMAGE COURTESY OF **CAIQUE NIEMEYER**

The New Master Builders

Architects warm to a project delivery method that makes them more integral to the construction process and reasserts their control over the final product.

By Joann Gonchar, AIA

PHOTOGRAPHY: © LAWRENCE ANDERSON

FACT OR FICTION, it is a common perception that the design and construction process is plagued with problems: cost and schedule overruns, under-detailed design drawings, shoddy workmanship, disputes, and litigation. Some architects have been pursuing a remedy for this fraught situation—the project delivery method known as design-build. Until recently, most practitioners were reluctant to be too involved in construction. But that may be changing, with new approaches that make design-build a more viable alternative—one that gives the architect more control over the building process and the completed project.

According to the professional association the Design-Build Institute of America (DBIA), "design-build is a method of project delivery in which one entity—the design-build team—works

CARY LEEDS CENTER **This 12,000-square-foot clubhouse (top and above) for a nonprofit that offers tennis lessons and academic tutoring to New York children is being designed and built by GLUCK+. To minimize the impact of the building on the surrounding municipal park, the firm has sunk the two-story structure and its adjacent tennis courts 12 feet below grade.**

RENDERINGS: COURTESY GLUCK+

TROUSDALE HOUSE Marmol Radziner's client for a Beverly Hills house originally planned to hire a separate contractor, but then decided the firm's construction division was best suited for the job. PHOTOGRAPHY: © BARRY SCHWARTZ

under a single contract with the project owner to provide design and construction services." (With the more standard approach—design-bid-build—the owner hires an architect and a contractor separately and holds a contract with each.)

Fans of design-build tout its advantages. They say it provides the client with the convenience of a one-stop shop, or a single point of responsibility, for both design and construction. They maintain that it provides tight control of costs and schedules. And they claim it fosters greater collaboration, and therefore results in a less adversarial process, and ultimately produces higher-quality buildings.

The practice seems to be gaining momentum. According to a 2013 study by RS Means, a supplier of construction-costs data, design-build project delivery is used on 38 percent of nonresidential construction projects in the U.S., up from 29 percent in 2005. "It is not a fad. Design-build is here to stay," says

Jim Whitaker, a principal in the Dallas office of HKS Architects and board chairman of DBIA. "It is just as important as sustainability and BIM [building information modeling] are."

Some observers point to BIM and other digital technologies, and their potential for facilitating integration among project team members, as one factor in design-build's growth. "This integration is not as easily implemented with design-bid-build," says Michael Vardaro, managing partner at Zetlin & De Chiara, a construction-law firm.

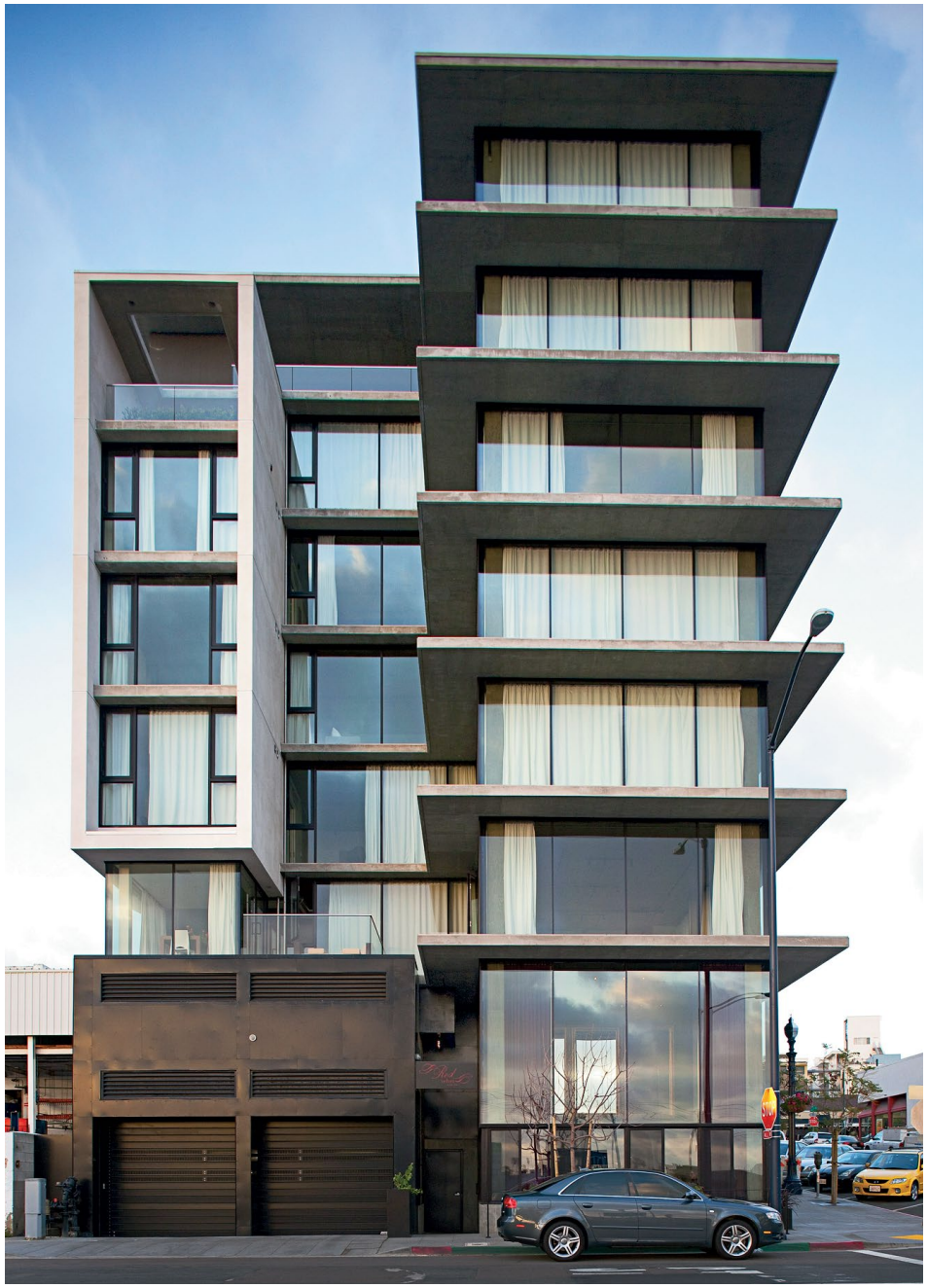
A design-build team can be organized in a number of ways, though the most prevalent structure is contractor-led: the contractor holds the prime contract with the client, and the architect provides design services as a consultant to the contractor. According to a 2007 survey by the research firm ZweigWhite, contractors take the lead on 56 percent of design-build projects.

There is also an architect-led design-build (ALDB) delivery type. In this situation, the architect is the full-service leader of the project team, performing tasks such as hiring subcontractors, managing costs, and controlling construction means and methods, in addition to designing the building. Yet this format, with the architect at the helm, is rare: ZweigWhite says that design firms lead only 12 percent of design-build projects. (The remaining 32 percent are led by integrated design-build firms, the developer, or a joint venture.)

The dominance of the contractor-led method isn't surprising, since design-build first gained ground on projects where architecture wasn't paramount, like roads or barracks. Nevertheless, some design-oriented architects, including Matthew Chaney, partner at Ehrlich Architects in Culver City, California, prefer the contractor-led process over the architect-led type. He cites insurance and design firms' limited bonding capacity as the challenges to ALDB, especially on large buildings like Ehrlich's recently dedicated 60,000-square-foot John M. Roll United States Courthouse in Yuma, Arizona. The $24 million building, which features photovoltaics mounted on a weathered-steel entry canopy, is the firm's second design-build project with the general contractor Sundt as lead. "Construction is not our core competency," says Chaney.

On the other hand, the architect-led process has its admirers. They maintain that design-build is especially well suited for buildings with a challenging site, a difficult program, or a tight budget. One of the most enthusiastic supporters, architect Peter Gluck, founder of New York–based GLUCK+, makes the case for the architect as the logical leader in his chapter on ALDB for the AIA's most recent edition of The Architect's Handbook of Professional Practice. Gluck argues that the owner benefits greatly from a process led by the architect who "originated the design and can take responsibility for its execution."

The ALDB approach affords what Gluck calls "informed freedom," allowing architects to invent and implement design solutions that might otherwise be deemed impractical or too expensive. He points to his firm's 12,000-square-foot facility for the Cary Leeds Center for Tennis & Learning, now under construction in Crotona Park in the Bronx, New York. When the



THE Q Architect-developer Jonathan Segal had originally designed his 27-unit loft-apartment building (left) in the Little Italy section of San Diego as an office building. But when the economy tanked in 2008, he was able to convert it to residential use, even though the structure had been topped out and partially enclosed.
PHOTOGRAPHY: © JEFF DURKIN

$6.8 million clubhouse is completed early next year, New York children will be able to receive both free tennis instruction and academic tutoring.

As the project's design-builder, GLUCK+ was able to bring subcontractors onto the project early, in order to take advantage of their expertise on the clubhouse's civil construction challenges in the design phase. These complexities included sinking the two-story structure and its adjacent tennis courts 12 feet below grade. "The parks department wanted a building mindful of its context," says Deborah McFarlane Antoine, president and CEO of New York Junior Tennis & Learning, the nonprofit that will operate the center.

The building's defining element will be its thin, apparently floating triangular roof that comes to a knifelike point at one end. In order to preserve this architectural expression, GLUCK+ took some unusual steps, such as drawing mechanical and electrical elements as early as schematic design. The process not only ensured that the elements would fit between the finished ceiling and the roof deck without conflicting with structural elements, but it also provided a tool for discussing the design conceptually with the engineering consultants. It should also reduce the number of construction-phase surprises and the need for costly change orders.

Although GLUCK+ does not have its own construction tradespeople on staff, some architect-led design-build firms do, including Los Angeles–based Marmol Radziner. When they launched the firm in 1989, partners Leo Marmol and Ron Radziner couldn't find highly qualified contractors and craftsmen interested in working on their then modest commissions. So they built their projects themselves. "It was done out of sheer need," says Marmol. Since then, the company, known for luxurious houses that take their cues from

BELFIELD TOWNHOMES **Three Philadelphia row houses (below, left and right), designed and built by Onion Flats, paved the way for the company's largest project yet—a 145-unit affordable-housing complex slated to begin construction in the fall. The current project, like the Belfield buildings, will depend on modular construction and is aiming for Passive House certification.**

PHOTOGRAPHY: © SAM OBERTER

Midcentury Modernism, has grown. It now includes, in addition to an 80-person architecture office, a construction division with its own concrete crew, carpenters, and metal and cabinet shops. The organization's integrated nature provides the architect with an unusual level of control over its projects, ensuring that "the design is fundamental," says Marmol, but also offering "a holistic view of cost and schedule."

Curiously, prospective clients are often unaware of Marmol Radziner's design-build expertise. Skip Paul, a senior advisor with investment firm Centerview Partners, hired the architect for a recently completed three-bedroom house in the Trousdale section of Beverly Hills simply because he "liked their very clean, Neutra-inspired work." Initially, Paul intended to have a separate contractor build the dwelling, which has deeply overhanging flat roofs and sliding glass doors opening onto terraces. But several months into the design process, he decided to hire Marmol Radziner's construction arm. It became clear, he says, "that they knew the vocabulary and understood how to translate it without compromising livability or aesthetics."

The most entrepreneurial architect-led design-build firms do away with clients altogether and act as their own developers. Such is the business model for San Diego–based architect Jonathan Segal, who has designed, built, and developed 20 projects since founding his firm 25 years ago. The arrangement gives him almost complete autonomy and flexibility, he says. "But I still have to answer to the building department and the banks," he concedes.

One project that demonstrates the firm's nimbleness is the 27-unit loft-apartment building The Q, in San Diego's Little Italy, completed in 2011. Characterized by floor-to-ceiling glass and projecting floor slabs, the building was first conceived as offices. But when the bottom fell out of the market in 2008, Segal was able to quickly get a new permit and convert the project to residential use, even though the structure had already been topped out and partially enclosed. Although the change in program meant modifications such as adding operable windows and redesigning the interior, The Q has proved extremely successful, he says. Its apartments ommand rents well above the neighborhood average—from $1,300 for a studio to $5,200 for a two-bedroom duplex—with no vacancies.

Another firm that combines architect-led design-build and development is Philadelphia-based Onion Flats, which has divisions for design, construction, and development. Its projects often deploy innovative construction methods and are highly energy-efficient. For example, the Belfield Townhomes, three row houses completed in 2012 in Philadelphia's Logan neighborhood, earned Passive House certification (an ultra-low energy designation)—the first to do so in Pennsylvania. The houses were assembled from factory-built wood-framed modules—a strategy that made them viable at less than $130 per square foot.

By demonstrating that high-performance design doesn't have to come at a premium, the Belfield houses have paved the way for Ridge Flats, the company's largest project yet. The 146-unit affordable-housing complex, which is targeting Passive House certification, is slated to break ground in Philly's East Falls section in September. Plumbob (the company's architectural arm) is designing it, while a joint venture of Onion Flats and the much

larger Grasso Holdings is serving as developer. Although it will be built by a yet-to-be-named general contractor rather than by Onion Flats' construction division, Timothy McDonald, Onion Flats president, says his company is deeply involved in every aspect, from financing to property management, including design, construction detailing, and quality control on-site and at the factory where the apartments will be prefabricated.

BARCLAYS CENTER **Forest City Ratner, the developer of this 18,000-seat multipurpose arena in Brooklyn, turned to SHoP Architects to cloak an earlier, more utilitarian scheme. The architect, in turn, hired sister company SHoP Construction to help perform an accounting of the facade's thousands of components and integrate the skin's digital model with that for the base building. Once construction started, the SHoP spin-off worked as a consultant to the fabricator, helping detail the panels.**

PHOTOGRAPHY: © DAVID SUNDBERG/ESTO

It "doesn't rely on our own hands to build it, but it maintains an intimate connection to those who do," he says.

A similar tie to the construction process appealed to New York–based SHoP Architects in its role at the Barclays Center, the 18,000-seat multipurpose arena in Brooklyn that opened in 2012. Here SHoP was hired directly by Forest City Ratner Companies, the developer, to dress up a utilitarian scheme created by the project's design-builder, Hunt Construction Group, with Ellerbe Becket (now AECOM) as its design consultant. SHoP devised a cloak of 12,000 unique preweathered steel panels that wrap the building like scales on a giant reptile. The architect in turn hired its firm's sister company, SHoP Construction, taking advantage of its expertise with digital technologies. SHoP Construction performed such tasks as coordinating the model for the new skin with Hunt's base building model as well as creating an accounting of the thousands of facade components. Once construction got under way, the SHoP spin-off served as the fabricator's consultant, helping detail the panels. "It was our way of maintaining control and not having the design shortchanged," says Jonathan Mallie, a principal with both SHoP entities.

There are myriad ways, it seems, that architects incorporate design-build into their practices. But, regardless of the approach, the goal is the same: to reassert control of design and construction and the quality of the final product. "At the end of the day," says Peter Gluck, extolling the benefits of ALDB, "it's all about design and making really good buildings that work." And who knows? It might just be the way of the future. ■

Continuing Education

To earn one AIA learning unit (LU), read "The New Master Builders" and complete the test at continuingeducation.bnpmedia.com. Upon passing the test, you will receive a certificate of completion and your credit will automatically be reported to the AIA. Additional information regarding credit-reporting and continuing-education requirements can be found at ce.construction.com, under "Resources and Requirements."

Learning Objectives

1 Explain how the design-build project delivery method works.

2 Explain how the design-build project delivery method differs from design-bid-build.

3 Describe different types of design-build and the advantages and limitations of each.

4 Discuss the roles and responsibilities of the architect in different types of design-build projects.

AIA/CES Course #K1405A

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Finding Success in the Transition from 2D to 3D

TWO ARCHITECTURE firms, one common factor: a successful switch to a 3D, Building Information Modeling (BIM) workflow. Here are success stories from ROJO Architecture in Tampa, Florida and The Design Büro in Warwickshire, United Kingdom.

ROJO Architecture

For ROJO Architecture, making the switch from 2D to a fully integrated 3D workflow was a no brainer. As an early embracer of technology, ROJO has employed Vectorworks Architect software as a BIM authoring tool for several of its projects, including the Florida Orthopaedic Institute.

The firm modeled the design in the software right from the start, often adding far more detail than necessary for initial client signoff. This approach proved to be beneficial. "The better we can show our designs, the better we can sell them," said Rob Glisson, AIA, founder and principal of ROJO. "And it works." With fully developed presentations, he adds, the firm's

The Florida Orthopaedic Institute.
IMAGE COURTESY OF ROJO ARCHITECTURE.

client meetings are 95 percent successful.

John Saldana, cofounder and principal of ROJO, remarked that operating in a BIM workflow reduces the firm's backend work significantly, saving hundreds of hours. "Even though clients often look at 2D drawings, we have everything backed up in a 3D model," he said. "We know a lot more about their space than it appears."

ROJO also encourages its contractors to use BIM. "Precise quantities can save 10 percent on wasted materials," said Glisson. "Passing these savings along to clients clinches more bids. It's a win-win for all."

Looking ahead, ROJO's founders envision BIM playing an increasingly larger role in streamlining their workflows. For example, Glisson asserts that as subcontractors develop BIM models for their millwork, HVAC, and other products, construction details will be rendered moot. Architecture firms like his can therefore work with the subcontractors and contractors directly.

Saldana also sees huge timesaving opportunities with more prevalent BIM. "Contractors can input our model into their shop drawings," he said. "Then, we can put 100 percent of our time into

Section drawings of the Florida Orthopaedic Institute. IMAGE COURTESY OF ROJO ARCHITECTURE.

The Pathology Department building for the Ysbyty Glan Clywd Hospital in North Wales.

IMAGE COURTESY OF THE DESIGN BÜRO.

the design, rather than documenting and drafting, and provide more accurate bidding." That sounds like progress for everyone.

The Design Büro

The Design Büro has also benefitted from making the switch from 2D to a 3D workflow. One large-scale BIM endeavor for the firm was its work on the Pathology Department building for the Ysbyty Glan Clywd Hospital in North Wales. Since this was The Design Büro's prototype BIM project, the firm set up parallel design teams. One group worked in 2D to create signoff materials, and the other team worked in 3D to model the building.

The contractor told them that they could revert to an entirely 2D process if the BIM transition became too much to handle. However, designers picked up the intuitive workflows of

Vectorworks Architect quickly and soon moved the whole project into 3D.

"We realized as the project progressed that the 3D team was not only working faster than the 2D team, but that they were also producing better outputs from the model to aid user signoff," said Neil Marshall, former director at Design Büro. "We converted the 2D team to assist the 3D team, which ultimately delivered the project in a more efficient fashion."

Marshall adds that the firm supports an open standards approach to BIM, and has been able to successfully exchange files with other software platforms using the IFC file format.

Vectorworks also played a role in The Design Büro's transition to BIM, as designers relied on tutorials listed on the Vectorworks YouTube page as part of their training. When new employees come on board, they spend time watching the videos and exploring the software. After a short time, they become comfortable with the workflows and can begin doing more detailed work.

3D model of the Pathology Department building for the Ysbyty Glan Clywd Hospital.

IMAGE COURTESY OF THE DESIGN BÜRO.

Now for all projects they work on, The Design Büro applies the knowledge they gained through BIM-incorporated projects. "We have fed that knowledge back into the practice, and we've got a whole new team now working on that project that haven't previously been involved with a BIM project with Vectorworks," said Marshall. "We've set ourselves up to meet BIM's aspirational goals. This is going to transform our workflow, and it's going to make our business much more economical and much more straightforward."

For more resources regarding a 3D workflow, visit our BIM page.

Visions of the Future

A group of prominent architects discuss their forecasts for the decades ahead.

PATRIK SCHUMACHER
Zaha Hadid Architects
London

MY PHRASE for the civilization we now live in is post–Fordist network society. Architecture needs to converge around ideas for this new era—the paradigm of parametricism—as it did around Modernism in the 20th century. We need to enhance the capacity of the discipline, not only in terms of technological sophistication, but also by taking a more scientific approach with respect to social processes.

Cities will be the superbrains of our civilization. Enhanced research-and-development activity means that people will have to network and communicate all the time, and so we will make cities that are dense, open, permeable, and mixed. Each building is a device that invites, structures, and frames interactions, and so the primary task of future architects will be communication design. At the same time, the division of labor into specialisms will continue. Architects will be in charge of the overall layout, aesthetic articulation, and semiology of a building, but they will distribute all technical elements to others, including engineers, programmers, and contractors.

If the core competency of architects is to translate the life process of an institution into space and form, and to make sure that the final product communicates as expected, architecture must develop a more sophisticated account of the built environment as a system of signification. For that, we need to upgrade the discipline's intellectual capacity. Architectural theory will need greater rigor,

> "We will see the emergence of intelligent buildings that can signal dynamically what is going on within."

PHOTOGRAPHY: © MATTHEW JOSEPH/ZAHA HADID ARCHITECTS

like that found in economics or the social sciences, and it will need to flow more directly into the work of the practicing architect.

We will also see a greater role for artificial intelligence in the creation and operation of the built environment, and the emergence of responsive environments—intelligent buildings that can signal dynamically what is going on within. This expands the communicative potential of architecture, and also feeds hard data back into an enhanced disciplinary discourse. That will challenge a purely intuitive architectural approach. Architects need to keep pace with advances in knowledge; otherwise, they will lose responsibility. If the discipline of architecture is successfully upgraded, I foresee a growing demand for architectural skills, as design contributes an ever-greater part of a building's value.

BJARKE INGELS
Bjarke Ingels Group
Copenhagen & New York

THE TECHNOLOGICAL revolution that has propelled Silicon Valley is almost exclusively focused on the virtual world. Looking ahead, I think we will see more advances in the physical realm, from driverless cars to solar infrastructure to new building materials that could totally transform architecture.

Already, nanotechnology is giving us a handful of carbon materials with almost magical properties. Take graphene, which is a monofilament carbon material that is 200 times more conductive than copper, 100 times stronger than steel, and more transparent than glass. It's even potentially abundant. It's just becoming available at the manufacturing level, and I believe it will become commercially available within a decade. It's so much better than anything we know today. It can be used to create completely transparent window photovoltaics, and spans and dimensions that seem like magic. Nanotechnology gives us possibilities that we could only dream about.

We will also see 3-D printing at an industrial scale. Computer programs have enabled architects to design with great precision and complexity, but at the end of the day, designs have to get built. When 3-D printing becomes fully commercially available, it will create amazing new opportunities. Instead of having to schlep a lot of materials to a site, you will bring a handful of printers and print the building components, all of which will be incredibly strong. Any architectural form will be not only possible but also financially feasible.

I foresee architects' getting more involved in the "back of house" aspects of a city too—all the infrastructure that makes a city work. There is still a divide in the built environment: building types that are "deserving" of architecture—like cultural venues, corporate headquarters, and luxury condos—but what about the power plants, the waste-management facilities, the water-purification plants, the parking garages, the highways? All of those are seen as engineering challenges, with little thought put toward how to integrate them into the urban

PHOTOGRAPHY: © STEVEN VOSS/BJARKE INGELS GROUP

environment. These facilities can make a positive contribution to a city. One of our current projects, a power plant in Copenhagen, will have an alpine ski park on its roof. It will open in 2018. We are very interested in finding ways to turn infrastructure into a positive contribution to the urban landscape.

ODILE DECQ
Studio Odile Decq
Paris

THE WAY we practice architecture will be totally different in the future—not just because tools and contexts change, but because the young people studying today are absolutely different from my generation.

First, there are the number of women entering the profession. There are now more female students in architecture schools than men. This will alter the profession because women don't manage their time, or relate to the client and architecture, in the same way as men. At the moment, there are not many women running offices, but in the next 25 years, they will be there.

Another factor is that today's young people don't want to be salaried employees. They want their own companies. They want to learn by doing, to be hands-on in making things. They are highly adaptable and think in terms of individuals and small groups' sharing a platform. Big firms have to be very structured, like a machine, and we know that big machines are not efficient anymore. A two-person start-up can invent a new way of doing things. It has to happen in architecture.

In the school I founded, Confluence, I push the students to be entrepreneurial. That doesn't mean they will necessarily build buildings. When you are educated in architecture, you are able to face very complex questions and work at many scales. It's a unique way of thinking. We could apply it to many problems in commerce and society. Some companies are already involving writers, anthropologists, and philosophers to help them to think differently and evolve their business. Why not architects?

ALEJANDRO ARAVENA
Elemental
Santiago, Chile

WE ARE living in an urban age. People are moving to cities for opportunities for jobs, education, health, and other basic services. And cities have the critical mass for knowledge creation, something that will be more crucial in the development and formation of wealth in the broadest sense of the word.

The problem is what we call the "3S menace": the scale, speed, and scarcity of means

PHOTOGRAPHY: COURTESY STUDIO ODILE DECQ (LEFT); ELEMENTAL (RIGHT)

with which to respond to this phenomenon. There is no historical precedent. Out of the 3 billion people living in cities today, 1 billion are under the line of poverty. By 2030, out of an anticipated 5 billion city dwellers, 2 billion will be under the poverty line. That means we will have to build a 1 million-population city per week over the next 15 years.

If we don't solve this equation, people will not stop coming to cities. They will come, but will live in awful conditions. The result will be a humanitarian and health crisis rife with social friction—a crisis that will become in the midterm, if not the short-term, a security threat.

We do not have enough knowledge to solve the 3S menace. Even if we had the tools to solve it, we would end up creating an environmental crisis. The carbon footprint, the water consumption, and the undesired emissions to build for 1 million people a week, using current building techniques, will end our planet.

President Obama and U.N. Secretary General Ban Ki-moon, have said that the future terrorist threat will be the consequence of climate change. The 3S menace is an environmental, political, and social problem. And it's a problem for everybody, not just the developing world.

Thanks to design's power of synthesis, architects have the opportunity to translate into form all of the conflicting forces at play and provide solutions for the complexity of contemporary society. In front of these challenges, we need to be creative enough to identify strategic opportunities and translate them into proposals and projects of public space, public transport, multitask infrastructure, open incremental housing. With good design, the involvement of patient capital—that looks for predictability more than profitability—and the right rule of law could turn cities into a vehicle of development.

These issues are difficult—and difficult questions require professional quality, not professional charity.

ADRIAN SMITH and GORDON GILL
Adrian Smith + Gordon Gill Architecture, Chicago

IN TERMS of tall buildings, there will always be people who will want to go higher. We are reaching a point, however, where it is economically unfeasible, despite being technically possible. Our firm has designed a mile-high tower that could get built, but it probably will be a losing financial proposition.

While supertall towers often become national symbols, their value extends beyond their country's borders. Eventually the whole industry benefits from what we've learned. Take glass, for instance.

PHOTOGRAPHY: COURTESY ADRIAN SMITH + GORDON GILL ARCHITECTURE

We can now build glass walls that are stronger than concrete block. And while we were at Skidmore, Owings & Merrill, we designed a positive-energy building, the Pearl River Tower, which would have produced more energy than it consumed, but the Chinese power grid was not capable of accepting the power generated by the building. Someday, that won't be the case.

DAVID ADJAYE
Adjaye Associates
London

WE FACE a new challenge as architects, learning who will be in the driver's seat in the shaping of our cities as they evolve. The private sector has jumped into what formerly were the arenas of the government and local authorities. For example, we're at the edge of seeing how transportation and infrastructure will change over the next 25 years. It most certainly will not look the way it does now. One area that will need policy and will not be led by the private sector is housing. As urban populations explode, we have to get ahead of housing.

Incredible things are right at our doorstep, and they will have a powerful impact on urbanism and architecture. We're on the precipice of reimagining the city and how it serves its citizens.

> "We're on the precipice of reimagining the city and how it serves its citizens."

This offers opportunities for new typologies, and for being able to think in a more avant-garde way about what the public needs and how to maintain the identity of a city. This is going to be at the forefront of our agenda.

TATIANA BILBAO
Tatiana Bilbao Estudio
Mexico City

ARCHITECTURE HAS the tools to improve quality of life for real people, but only if we integrate the needs of real people into our work. The future needs to be more about the informal production of architecture, not architecture for architecture's sake. Just as urbanism has to integrate the ways that cities grow organically, architecture has to integrate the ways real people decide to create their homes. I think a lot about

PHOTOGRAPHY: COURTESY © ED REEVE (LEFT); TATIANA BILBAO ESTUDIO (RIGHT)

alterity —which in architecture would mean integrating "others" into how we practice. There have been starts in that direction, but I haven't seen anything that I think really nails it. I don't think it's easy. But I hope that it can happen. Otherwise, there's no future for architecture. The profession will cease to exist.

TOSHIKO MORI
Toshiko Mori Architect
New York

WE HAD a client who ended up with less space than he originally thought he needed because the house we designed had expansive views and an amazing quality of daylight. The idea was to get closer to nature, to experience those external phenomena. And for that, what matters isn't the quantity of space but the boundary condition, and open and flexible arrangements. With a better boundary condition, the space one actually occupies can be more intimate.

Throughout most of history, architecture has been about nature in opposition to the manmade environment. But there is a gradual shift with new technology and new attitudes that seek closer alliances. I have a theory that two 20th-century inventions changed our understanding of inside and outside. One was the X-ray, which made it possible to see inside the body, and the second was psychoanalysis, which allowed us to explore the internal mechanisms of our mind.

Since then, we have been trying to lessen the boundary between internal and external conditions. The idea and the degree of enclosure needed, both physically and psychologically, has changed. Now that we can do more with less material, with high-performance enclosures getting thinner and lighter, we can embrace natural elements. By incorporating natural ventilation and sunlight—by working with and not against the forces of nature—our buildings become more sustainable. These trends, of needing less space and less separation from nature, will continue as technology advances and our perception enlightens.

GREGG PASQUERELLI
SHoP Architects
New York

THE PRACTICE of architecture is going to change. Architects will reverse slide from their specialization in aesthetics and reclaim their expertise in problem-solving. We will need to be broad-minded generalists, and firms will need to have a more expansive view of what architects can do. We can combine art and technology, and do it in a way that solves real problems.

PHOTOGRAPHY: COURTESY TOSHIKO MORI ARCHITECT (LEFT); SHOP ARCHITECTS (RIGHT)

Our firm is continuing to research what building a city means, and not forgetting the artistic side, while capitalizing on technology. How can we create areas with density, links to public transportation, spectacular public spaces, and an inclusiveness that embraces many kinds of people? How can we create higher-quality buildings, with better performance, that don't cost an arm and a leg? The most sustainable thing is not an array of photovoltaics on the roof; it is a building people love and care about and don't have to renovate every 20 years. If we can do all of this successfully, we can make a huge difference.

JEANNE GANG
Studio Gang
Chicago

WE NEED to promote social connectivity in ways that will keep our cities safe and livable. I fear that with greater wealth disparity, we are losing connections between people who come from different walks of life. I'm optimistic that architecture can find ways to reconnect communities. To do that, architects will need to be more engaged with the public and will need to find ways for people to become active participants in designing their environments. Public engagement is not something we're taught to do in architecture school, but we need to learn it.

We are also going to have to rethink our civic assets—including police stations, libraries, community centers, and even streets—and redefine what they are in order to get the most out of them. A library can become a place to get job assistance or mental-health services. A police station could also be a community center. We're going to have to reinvent all of these things, and think of ways they can be networked together. A city that is more cohesive will be more resilient, even regarding climate change. When things start happening, we're going to have to take care of each other. And to do that, we have to know each other.

SHOHEI SHIGEMATSU
OMA
New York

IN THE next 25 to 50 years, responding to food at its diverse scales and its different processes will catalyze new architectural typologies. Food is specific to livelihood, to the soil, and to culture—and yet it is also expansive and global. From large urban developments driven by food production to local cafeterias and home kitchens, food has the unique ability to be multi-scalar. It

PHOTOGRAPHY: COURTESY STUDIO GANG (LEFT); © GEORDIE WOOD (RIGHT)

also goes through many stages, from planting to harvesting to processing and ultimately to waste, yet no comprehensive survey of this full food chain exists. I am leading a studio at the Harvard GSD that is investigating the intersection of food, architecture, and urbanism.

DÍEBÉDO FRANCIS KÉRÉ
Kéré Architecture
Berlin

DESIGN THAT really serves—that is the most pressing issue architects should be concerned with in the next few decades. As our global population continues to grow, the need for high-quality but economical buildings will become even more critical. We need to create great architecture that serves humanity; we need to build with purpose. Architecture should inspire, it should evoke emotions. In a remote village, a beautiful building can help challenge people's perception of what is possible. You give them inspiration and hope.

When working in underserved communities, we need to be careful that low-cost does not mean cheap. Architecture, whether in a city or a rural area, needs to last. I think one solution is to use more local materials in innovative ways. In my work, we are pioneering new methods for utilizing brick and other natural resources. By incorporating native materials, we cut down on transportation costs, support the local economy, and create architecture that has an authentic connection to its context. If you are constantly bringing in materials from faraway locations, you will never be able to meet the worldwide demand for high-quality and enduring shelter.

We always need to remember that good architecture takes time. It's about learning local realities, studying climatic conditions, and then working with the community to create a successful design. In the African context, I cannot afford to be too quick or "fashionable." If you take this approach, you will destroy more than you create, and communities will turn their backs on architecture. We should take care never to neglect the foundation of architecture: to serve humanity.

> "The need for high-quality but economical buildings will become more critical."

PHOTOGRAPHY: © © DAVID HEERDE/KÉRÉ ARCHITECTURE

> "We need new methodologies. Instead of building new cities, though, we should go back and rebuild the ones we have. I'd like to see the new city built on top of the existing one."

MENG YAN
URBANUS
Shenzhen, China

I'M ALWAYS hesitant to predict the future. We see the future best from the perspective of history. Looking at China, I think there are still lots of opportunities. Every second- and third-tier city here wants to be Shenzhen, to grow very fast. But we're using the same set of tools to plan our cities that we did 25 years ago. We need new methodologies. Instead of building new cities, though, we should go back and rebuild the ones we have. I'd like to see the new city built on top of the existing one.

Architects must change too. Traditionally, we would wait to get a commission and then provide a service. There are other ways to practice, though. We can go out and find our projects—research where we live and work, and find problems that require solutions. This means identifying key moments where we can intervene and make a difference. It means actively engaging with our cities. Right now URBANUS is working with a community in Shenzhen that is being threatened by development. It's actually a 500-year-old village in the middle of a city that everyone says is just 36 years old. It has been there for hundreds of years, changing all the time, and is now surrounded by a giant new city. We used social media to reach out to people living in this urban village, as well as to architects, planners, and researchers. It's very powerful. We couldn't have done this five years ago.

People in China continue to move from the countryside to the cities. But a lot of work needs to be done in rural areas. The countryside has always nurtured our culture; it's where our poets, painters, and philosophers went to find inspiration. In the Confucian system of governance, smart kids from the countryside would take the exams, go to the cities for education, and get posts in different places. But they always came back to the countryside. We need to do that again—to bring people back to the villages, not just as tourists, but to live there and contribute.

PHOTOGRAPHY: COURTESY URBANUS (LEFT); DAVID VINTINER/SOU FUJIMOTO ARCHITECTS (RIGHT)

"In a few years, construction workers will be wearing goggles preloaded with information provided by architects."

GREG LYNN
Greg Lynn Form
Venice, California

THE FUTURE of architecture is figuring out what happens where the physical and the digital intersect. Buildings are becoming smarter and more networked. Yes, some of the "smart building" technology starts out benefiting the rich—as toys to entertain wealthy consumers—but it will eventually reach many more people.

I recently visited the Villa Tugendhat, in Brno. I went expecting to see really cool Mies. I found myself fascinated by the air conditioning. The whole facade of sliding glass disappears into the basement. The slot where it goes is a giant diffuser, and in the basement there's a rudimentary cooling system, with these four bins of wildflowers. Throughout the day, cool air with different scents blows through the house. I was amazed at all the technology cooked up for this one family. Yes, it was superbourgeois, but that stuff trickles down eventually.

So buildings will change, in ways that no one can predict exactly. How buildings are delivered will change in ways I'm much more certain of. I've had the opportunity to work with the HoloLens, which are glasses that project augmented reality onto whatever you're looking at. It's not virtual reality, which I hate, but something much more useful. Put them on at a construction site, and you see what you're supposed to be building. And as you move your head around, you'll see it in 3-D. In a few years, construction sites will be paperless. The workers will be wearing goggles preloaded with information provided by the architects. I'd bet the farm on it.

SOU FUJIMOTO
Sou Fujimoto Architects
Tokyo

IN THE future, biotechnology will allow us to blur the line between the natural and the man-made. I can imagine structures that are half grown and half built. We could not say that buildings contain plants, because buildings and plants would grow together: the process of building and growing would be fundamentally the same. I think this would completely change our understanding of architecture. This is my dream.

PHOTOGRAPHY: ©HELLO DESIGN/GREG LYNN FORM

RANDY GERNER
Gerner Kronick + Valcarcel, Architects, DPC (GKV)
Principal

MY PARTNERS and I have worked together for years; we know each other very well, our strengths and our limitations. The single force that drives each of us is the goal of discovery.

For me, when I start a project, it inevitably starts at a very small scale. The Owner and I speak about their aspirations and goals for a new building. Of course, we want to understand the detailed requirement of their program, but the nuances that are associated with their goals are really morst important.

From day one, I start thinking about a building in 3D. I take the smallest component area of a building, a corner of the facade, a door frame or a window and I start to draw it in Vectorworks… and piece by piece it grows into a building. Only when I have a sense of the overall parti and ideas have congealed aesthetically do I select those members of our staff to join the team to further develop the project.

As we work mostly in urban areas, we try to uncover the intrinsic nature of the city or neighborhood that we're working in. We inevitably find that a piece of the essence puzzle is missing. Our goal is to then design this missing piece and reinforce the urban character of the place in which our building sits.

From day one, I start thinking about a building in 3D. I take the smallest component area of a building, a corner of the facade, a door frame or a window and I start to draw it in Vectorworks… and piece by piece it grows into a building.

Something we really enjoy is the invention and re-invention building systems, or methods of making a building. I believe a building should tell the story of its composition. What is it made of? What keeps it standing? How does it embrace light and resist wind and rain? When a building speaks to a passerby it will enrich the lives of those it interacts with. Our buildings celebrate the structure as is most evident in our Beton Brut facades. We revived exposed cast-in-place concrete as an architectural expression. The Hero Architects of the 1950's and 60s were excited to design buildings of exposed concrete thinking that this was the new frontier in architecture. Unfortunately, the cost prohibitive nature of custom formwork forced Beton Brut into an early grave.

Lamenting this loss, we sought out new technologies and adapted roadway construction technology to architecture, which now allows us to design buildings that celebrate the art of concrete and are greener, most cost effective, and safer to build as they are built from the inside out. Most interestingly for us, as this technology evolves, the design opportunities seem limitless.

CHRISTOPH ARPAGAUS
Itten+Brechbühl AG
Member of the Executive Board/Site Director

YOU CAN and may draw from tradition, but you must always look into the future and remain innovative. A big topic at the moment is BIM. In that respect, we can safely say that we are the leading Swiss architecture firm when it comes to the topic of BIM. The particular strengths of Itten+Brechbuhl are certainly the size and efficiency of the firm. We have about 320 people in Switzerland, and the competence acquired with 95 years of experience. This also allows us to support our claim to be the right partner, especially for larger, more complex projects. A current BIM project we have the opportunity to build is the new construction of the Scott Sports Headquarters in Givisiez. For us, the big challenge was that for a headquarters you have to reflect a bit of the genetic makeup of the Scott brand and ask yourself: "What does Scott actually do?" This we try to translate into architecture. And I think we'll succeed doing that in Givisiez. As far as the future is concerned, BIM has actually already established itself with us. We apply it to all new buildings we start. We think it is a collaboration model that is going to be widely implemented, the same way CAD has been.

SUSANNE KELLER
Itten+Brechbühl AG
BIM Manager

IN MY experience, BIM planning strengthens the role of the architect by allowing for stronger coordination, stronger process control, and the ability to pull all the pieces of the project together. The model is created and given information. It is not just a 2D drawing that is created. And this is certainly a great benefit, and more exciting for the designer, and thus also an enormous validation. The communication or the exchange with the specialized planners was also defined in the project management plan, thus a rhythm was defined as to how and when the exchanges should take place. It is very important for the model exchange and review to take place prior to the coordination meeting, so that the feedback from

BIM planning strengthens the role of the architect by allowing for stronger coordination, stronger process control, and the ability to pull all the pieces of the project together.

collisions found can be sent back before the coordination review, and everyone can look at their craft and possibilities so that solutions can be brought to the meeting rather than exposing problems. This, in my opinion, is a great step forward and makes the project run better.

SANDRO RYF
Itten+Brechbühl AG
BIM Coordinator

I THINK the greatest benefit from BIM is that you are forced to work on the components in a much more disciplined and cleaner manner. I especially appreciate Vectorworks' easy-to-use design. It's pretty easy to learn. You can quickly find out how the whole program works. And I especially appreciate in the modeling that you have so many decision making possibilities and customizable modeling options. Then you attach an IFC tag at the end. I am not restricted by that at all. We created Scott's architecture model using Vectorworks. This went without major problems. The designers work with a different program, and the exchange of data actually worked without major problems after a small amount of research.

TIMA KAMBERI
Itten+Brechbühl AG
Project Manager & Architect

AT THE Scott headquarters, we started setting the rules. What should BIM actually be able to do, or what are the benefits of BIM for planning or for the customer? From the start, we had a very close cooperation with ComputerWorks, where we also set up the whole framework and how things had to work.

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