Firm management

Embracing artificial intelligence in architecture

By Kathleen M. O'Donnell, March 2, 2018

Architects stand to benefit from learning about data, its applications, and how taking small steps now to incorporate artificial intelligence into practice could ensure better business and a stronger profession

In recent years technology and automation in architecture have soared, now spanning all aspects of practice including project delivery, performance, evaluation, and billings. But not all architects have taken advantage of emerging technologies, and there is a growing sense that if firms don't incorporate artificial intelligence into practice, they'll get left behind.

"We've been talking about these issues for a very long time," said Natasha Luthra, AIA, 2018 chair of the Technology in Architectural Practice Knowledge Community and director of emerging technologies at Jacobs. "The entire industry could change on us on a dime," she stated at the recent Building Connections Congress. "We have to find a way to get ahead of the revolution before we get flattened by it."

Construction and software companies are incorporating AI more quickly than firms, which could leave architects out of key decisions in how the technology will influence practice. Randy Deutsch, AIA, associate director for graduate studies at the University of Illinois at Urbana-Champaign School of Architecture, has written three books on design technology in professional practice. "We're soon going to see super intelligence enter just about every sector, market, and field," he says. "It would behoove architects to imagine that it's going to enter our field, and we have the opportunity now to do something about it, to look at ways it can actually improve what we're doing and make us more profitable as practitioners as opposed to being victim to somebody else taking it and running with it."

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Some fear that technology is advancing so quickly that the learning curve will be impossible for architects to overcome, or that artificial intelligence will replace architects altogether. According to experts, that is highly unlikely. "It's unfounded that AI can replace humans, especially as designers," says Patrick Hebron, a user experience designer with Adobe Systems and adjunct graduate professor at New York University. "AI has limited purview into the nature and proclivities of human experience," he asserts, adding that the human element is crucial because leaving design to machines alone would create an unlivable built environment.

Architects should see artificial intelligence as an opportunity—a tool to augment practice, replacing mundane tasks—not as a threat to their jobs. As founder and CEO of digital design agency Proving Ground, Nate Miller researches and develops data-driven software for the building industry. "If you dig into the science behind artificial intelligence and research into machine learning, you may find highly futurist stuff," he says. "But where it's applied, it isn't used as a replacement for human thinking or problem-solving. It's meant to be an accelerator that positions the computer to handle certain things that a computer is really good at."

Miller and Hebron agree that it falls on humans to determine how machines can help us solve problems more intelligently than in the past. "We could also think of the machine as offering possibilities or evidence to support the human decision-making process," Hebron states. It's safe to say that design decisions will be ultimately made by humans—or at least verified by humans—for the foreseeable future.

In a time when the value of architects and their services is being questioned, practitioners need to move from theoretical discussions about the future to incorporating data and automation into their everyday workflow. In doing so they'll create efficiencies to cut down on wasted time, ultimately enhancing practice models and adding value to the entire profession. Luckily, architects have the creative problem-solving abilities to do just that, but they will still have to actively shift their thinking. "We don't often cast a critical eye at the way we're getting our work done," says Michael Kilkelly, AIA, principal of Space Command and owner of ArchSmarter, a company dedicated to making technology approachable for designers. "I think there is a lot of opportunity in the way we work to think creatively about how we could do it better," he says.

What is AI?

Moving from the abstract to the actionable is always a challenge. When it comes to AI, it starts with data. Artificial intelligence is the application of data—data is what machines learn from—and in the AEC world there is no shortage of opportunities to obtain it. From billing analysis and construction-site safety to building products and performance, the data sets available to collect seem infinite.

For architects to rely on data and leverage it through artificial intelligence in the design process, a first step is to just start accumulating as much as possible. Brok Howard is an architect and technical account manager for dRofus, a planning, data management, and BIM collaboration software. "Any data that you can collect today that can help you tomorrow is the data you should be collecting," he says. Howard believes that architects are in a prime position to use data to advance the profession.

Collection is just the beginning. Storage and sharing are two even bigger parts of the data equation. "We've always been collecting the data, but we've been doing it with emails, copious notes, and user meetings. Having it in a format that can be shared has always been the challenge," says Howard, whose work with dRofus is helping to create a platform for sharing data amongst architects, contractors, and owners.

The industry has progressed in making research and case studies available through the Building Research Information Knowledgebase (BRIK), but there is a still a gap in industry-wide sharing of big data, which could be utilized to automate and improve design and practice on a larger scale. Data storing and sharing may become easier through cloud technology. "In combination with large quantities of data and the tools we have, we also have the cloud, which provides us with instantaneous feedback," says Deutsch, who thinks feedback and sharing are key for leveraging data in the design process.

Unfortunately, problems with data storage, delivery and sharing are complex—regulations, security, and

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software and cloud technology are so far ahead of the curve that govenment policy hasn't quite caught up," Miller says. "And then there are other cases where policies are being introduced that would actually prohibit commonly used architectural products hitting the market from being used because there are stricter, more rigorous standards around what you can use with data."

Data sharing is a multilayered concept, and it can occur internally as well as externally. Sharing within a firm, amongst projects, can influence better design and project delivery. "When it comes to what an architect may have at their disposal, building information is a critical data source," says Miller. "BIM is often positioned as a production tool, a way to generate a deliverable, but these are actually data-rich resources tied to a firm's particular knowledge base that can be used to make informed decisions about a portfolio or future design prospects."

As another example, post-occupancy evaluation data can easily be used to inform the pre-design for new projects of similar building types. "This is something that any firm can do," says Deutsch. "And when you have access to data—and the larger the quantity, the better—that will make it easier." Every project is an opportunity to inform a future project. If architects look beyond what they are contractually obligated to do to, they can improve their buildings and their relationships with collaborators.

One of the most pervasive issues with architectural data is the protection of intellectual property. When firms are conducting research and development, they are often hesitant to share knowledge because architects are taught to keep their ideas and information away from competitors. However, sharing data could actually be more beneficial than keeping it close to the chest, as it would benefit the profession at large.

"The most compelling reason to do something is self-interest, and sharing data is in everyone's self-interest," says Hebron. "There's no one at the table who doesn't benefit." Architecture firms should seek to acquire data from owners, other firms, contractors, and software companies—and share theirs in return. This would create an industry-wide information loop that may redefine practice methods and drive profits. "If the architect shows good faith that they want to help the whole process even if they don't benefit directly, I believe strongly, from a business case, that they will benefit in the long term," Deutsch states.

And this is really the bottom line: There are long-term benefits to investing time and resources into data and automation for every architect's business. The opportunity to influence a new way to work is too big to ignore. Large firms, midsize firms, and software companies are leading the charge right now. Luthra's company, Jacobs, which sponsored the Building Connections Congress, has launched Jacobs Connected Enterprise, a suite of digital tools for data integration and analysis. KieranTimberlake has developed apps for assessing buildings throughout their lifecycle. Autodesk's BIM 360 software is collecting and analyzing massive amounts of construction data to improve safety and compliance. There are big disruptors like WeWork entering the space, too—acting as owner, contractor, and designer—with access to all the data associated with their properties. And these are just a few of the current AI players in AEC fields.

How can smaller firms, which make up the majority of the industry in the US, utilize AI in their work? It's definitely going to be tricky, according to Kilkelly, who operates Space Command as a sole practitioner. "If you're a small firm, you don't have a whole lot of time to dedicate to researching these topics," he says. "You have to look inward at the way you're working, and then keep an eye outward on what other firms and software companies are doing and what research is out there. Then, think about ways you can bring that knowledge into your own work."

"You have to smart small and learn to manage the complexity." - Michael Kilkelly, AIA

The learning curve can be pretty steep, but architects don't need to wait for technology to trickle down from larger firms to start implementing automation into their work. "It's like baby steps," Kilkelly says. "You can't jump all the way into full AI and machine learning if you don't really know what that means in terms of your own work. You have to smart small and learn to manage the complexity."

Opportunities to automate mundane tasks are low-hanging fruit, and there are many simple ways to get started. Miller's company recently launched LunchBox, a set of free computational design tools for Grasshopper and Dynamo, which also includes machine learning components. Maximizing such plug-in tools—or learning something as simple as how to run a small script in Microsoft Excel—can save an architect time and money in day-to-day operations. "There's always an understanding that there's got to be a better way to do something," Kilkelly says. "Look at individual steps, then look at the tasks and figure out a way to automate. Make it faster, make it easier. As you start to build in those automations, you can cluster them together into a more comprehensive automation."

That clustering of tools is what will really help architects start to understand the potential of big data and artificial intelligence and, in the short term, enhance their productivity. "The minute you start overlapping tools and using them together, they become much more powerful," says Deutsch. "When you start tapping into the data you have available to you, you're able to make higher uses of the tools, freeing you up to design more or, if you're a business owner, to go after more work instead of spending all your time in documentation," he says.

Artificial intelligence could easily be seen as divorced from humanity. In architecture, though, the human element is perhaps the most important one. Firms of all sizes can benefit from investing in the right talent to help them approach this new era facing practice. "Evolving a business and introducing new skills in a marketplace that is highly competitive, very deadline-driven...it doesn't leave a lot of room in the day-to-day to pick up on these things," says Miller, adding that the onus falls on successful practices to think about training and encouraging staff to learn new things while managing operations.

And it's very possible to do both when you've got the right people on your team. While working at a large firm in California, Kilkelly looked for opportunities to streamline parts of his design process. He

found that by utilizing simple automation methods, he became an invaluable asset to his firm. By sharing his skills, he saved time and energy for himself and numerous other staff members. As an educator, Deutsch believes in human capital above all. His charge to firm leaders: Hire and develop emerging professionals who have the curiosity to inquire into tools, give them the confidence and capacity to use the tools, and play to their strengths as digital natives to combine and augment them. "Developing those qualities in our staff, in our future profession, is more important than learning the tools and skillsets," he says.

Interested in these issues and want to learn more? Plug in to the AIA Technology in Architectural Practice Knowledge Community.

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