DesignIntelligence® Quarterly

2020

NOTABLE ARTICLES & INTERVIEWS

CONTEXT

In a year that defied description, the DesignIntelligence community steadfastly convened to share thought leadership in our journey to improve the built environment. Reflecting on these past months with the benefit of having 2020 as hindsight we have selected the most notable articles of the year. Selected per criteria such as most views on DI-media-group.com and simply for their engaging content, these are the top ten essays and interviews from DesignIntelligence Quarterly in 2020.

We share them in this collection:

Cultural Connections, with Caroline Braga — page 3 Cross Disciplinary Research, by Barbara Bryson — page 11 A Dialogue With Katerra, with Craig Curtis — page 18 Research: A Culture of Inquiry, with Billie Faircloth — page 27 Redefining Professional Practice Education: Speculations and Challenges, by Irene Hwang — page 34 Digital Thrivers & the Digitally Unequipped, by Roberta Kowalishin — page 46 Scale: Supply Chain Thinking in the Circular Economy, with Federico Negro — page 54 Reinventing the Firm, with Dan Noble — page 65 Market Expectations in a "New Normal", by Ken Sanders — page 75 Technology Transformation: Are We There Yet?, with Dennis Shelden — page 85

DesignIntelligence Quarterly

Cultural **Connections**



CAROLINE BRAGA

Chair, Firm Culture, Sasaki

A look inside a culture-rich firm offers insight into the power of people, connection, obstacles overcome, and pleasant surprises.

DesignIntelligence (DI:) You have a unique role within your firm. You also benefit from a recent strategic firm re-focusing.

Caroline Braga (CB): We restructured Sasaki's governance two years ago to include a CEO and board of directors, which includes my role as chair of firm culture. We also completed a strategic plan that unites the firm's different practice areas, and each practice group developed a specific mission and goals in line with the firm's.

DI: How has that helped your response to the Covid -19 pandemic?

CB: It's been helpful to have clear goals as we make decisions that will change how we work now, and likely how we will work in the future. Our CEO, James Miner, has also played a central role as we have responded to the pandemic. It's been helpful to have someone dedicated to managing the crisis full-time. From a cultural perspective, he's been the consistent voice presenting a clear and hopefully reassuring message to our community. He's been sending out a daily email to the entire firm, which combines official company announcements with tidbits shared with him by other Sasakians. These messages have ranged from announcements about our finances and remote work plan, to personal stories and links to interesting news articles. There has been something reassuring about knowing that email is coming, even if it may contain difficult news. He's probably asking himself what he's gotten himself into, as he is now on daily message #44!

DI: How have you coped to stay connected and be productive?

CB: In keeping with Sasaki's collective culture, we have responded to this crisis by conducting a lot of meetings! We are currently holding weekly HR meetings, biweekly board meetings, monthly stockholder meetings, and monthly all-company meetings to make timely decisions and keep everyone informed. It's a lot of Zooming, but making sure that

DesignIntelligence Quarterly DesignIntelligence

5

Quarterly



Get Out and Garden!



Although we're currently working from home, SIP has updates from the Sasaki garden!

New plants are blooming, our garden soit is better than ever, and we already have a nesting mounting dows (Zenalda macronna). The programs in the garden is a timely reminder for all of us to got outside, track some steps, inspect our own gardens (or those of our neichhorn) and foot hose in the chancing assame

all Sasakians know what the plan is as it evolves, and have a chance to ask questions, has been an important part of helping us all move forward together.

We have also been trying to continue our usual gatherings and traditions virtually to provide as much of a sense of normalcy as is possible. Our practice group socials most definitely continue, our Sustainability In Practice (SIP) blog has been going out, our Earth Day celebration happened online, and we hosted an artists' reception for the opening of a new exhibition in the Sasaki lobby, only staged in virtual space! I am currently planning our next new employee welcome party, a quarterly onboarding event, for the unfortunate people who joined the firm between January and March this year.

A good example of adaption is that rather than postponing our Q1 quarterly meeting, which was scheduled to occur just as we were getting into working from home, we hosted it as a massive online meeting. We included an all-staff interactive polling activity, where we

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...we heard afterwards that it was the most engaging all-firm meeting to-date because of the live online polling and Q&A interaction – people found the ability to participate anonymously online less intimidating than in front of 300+ people in person. The online format actually helped people speak up - we didn't expect that!

asked staff about what COVID-19 would mean for our practice, as well as for design of the physical environment at large. It was fun to see the range of creative answers we got. We closed the meeting with an interactive panel with several firm leaders, who picked up on some of the threads raised by staff in the poll in a live discussion. It was inspiring to come together to think beyond our immediate tactical needs to envision positive outcomes that we could contribute to. We also included an anonymous Q&A session using the zoom chat function, so staff could submit questions to the CEO, who answered them live.

DI: That's impressive you were able to pull that off. I love the surprise in getting that kind of feedback. You might think technology is less effective than being face-to-face, but it yielded some unexpected benefits.

CB: Technology has been absolutely critical as we try to stay connected, keep project work moving ahead, and win new work.

We rolled out Slack the first week we were working from home, which was a little crazy. Slack allows for a continuous back and forth discussion, similar to what happens informally in the office within



teams. It records a continuous thread of collaboration that you can refer back to, and allows for easy file sharing. There were some lessons learned from that rollout – while some people were instantly up and running, happy to have a new tool, others resented being asked to learn a new technology in the middle of a crisis! We were definitely learning on the fly how best to support everyone.

Following the Slack rollout, I collaborated with Sasaki's Chief Technology Officer, Holly St. Clair, and VR master David Morgan, on a Sasaki guide to remote work. It includes tech tips on Zoom, Slack, and other technology, as well as cultural best practices to help people manage their remote work-life balance, which is challenging in different way than regular office work-life balance!

Holly and team then conducted a survey to collect input on how remote working is going for our staff, to see how we can best support their needs going forward.

DI: What have you learned about caring for and retaining talent as a result of Covid-19? What strategies will you employ to make the best of things once we return to a new normal?

CB: The strain of remote work is emphasizing the need to support wellness across the firm. People are experiencing a

REMOTE WORK

variety of stresses, from too much kid time during work time to too much alone time.

To try to provide some relief, we're adapting our existing cultural practices to the media we have available. Our lunchtime yoga classes and "younger next year" fitness classes still happen twice a week, only online now vs. in the office. We are encouraging people to schedule team lunches or happy hours on Zoom, as well as meetings with their advocate, even if those meetings are now less about professional development and more about making sure everyone is doing okay. We already had a flex-work policy, which allows employees to negotiate their hours in the office with their teams, but few people had previously asked to work entirely remotely. I expect once we're able to be back in the office (and schools and daycares are open) we'll see a greater percent of the office making this choice, whether part or full time, now that remote work has been significantly de-bugged. The better we master remote work now, the better we will be able to meet our staff's diverse needs later.

DI: You've had some positive outcomes from this forced change. Any epiphanies

or profound moments?

CB: We hope the experience of remote work will dramatically improve for working parents once daycares and schools reopen, making it an option we can more confidently offer to those who would like it. It would be a big win if our improved work-from-home ability would help us retain working parents.

We've also lost staff in the past who wanted to move back home to be closer to family, or ecologists to the pull of less urban locales. Perhaps in the future, we could keep them all on, even if they live in the mountains or across the country!

DI: How has your staff reacted? Are expectations changing? Any heroic acts, shining lights, exemplary leadership, or creative leaps in this time of crisis?

CB: Lots of small heroic acts are taking place across the firm. When quarantine began, there was a quota on how many laptops people could buy, because companies were all rushing to do it at once, so our IT team pretended to buy five computers each individually on behalf of the firm to make sure people could work effectively at home. Our IT team was also working crazy overtime hours to be available to help people address VPN, Revit or other technology crises, and to plan out our next round of investment in technology.

I spilled tea on my laptop the first week we were home, had a minor panic attack, and tried to revive it with a hairdryer. When that didn't work, one of our IT team members met me at the office to triage my machine, and I was back up and working within 2 hours. They are awesome.

DI: Have you seen any impacts on design process?

#social podcasts

CB: The biggest challenge has been drawing together. We're testing a range of technologies to better enable this core function.

Another challenge of remote work is that while experienced staff can run without direction, entry level staff need and deserve more frequent, hands-on guidance to advance the work. Good communication and good management is even more important than it was before.

DI: What about impacts on clients, partners, or consultants?

CB: In a funny way, the unplanned intimacy of Zoom meetings has been positive for building relationships with clients and consultants. Seeing into one another's home lives seems to reduce barriers and make it easier connect with people on a personal level. That foundation helps to build a strong working relationship, where you truly feel like partners grappling with new challenges together.

DI: Another unanticipated consequence: You're getting to know your colleagues better than you did before because you're seeing inside their homes, personal effects, dogs and kids.

CB: Not only our colleagues. Our clients. Our consultants. Everyone's in -- maybe

Sasaki social Slack channels started to date...

#social_binge-book-pod-books
#social_eats
#social_experinstruments
#social_joeexotic-tigerking
#social_happy-things
#social_homiestations
#social_kids
#social_nookscranny
#social_pets
#social_plants-and-gardens

#social_misfits-lounge
#social_sasaki-garden
#social_sip (sustainability in practice)
#social_song-of-the-day
#social_virtualdiner
#social_virtual-pod
#social_wall-of-shame
#social_wrt (womxn's round table)
#social_yoga

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We're thinking it's not all or nothing. We are imagining scenarios where we might go to a kickoff meetings, get to know a client, visit the site -- but maybe then we don't need all of the subsequent meetings to be in person. not the same boat, but some kind of weird boat they weren't in before!

DI: Small moments of delight.

CB: I'm enjoying the Slack social channels that have been popping up. Lots of kid pics, pet pics, home office set-ups, home crafts, recipe sharing etc. It's a nice way to understand where everybody is literally and figuratively. I noticed the other day that someone started a Tiger King channel...

DI: Are you considering moving to a more remote approach long term when you come back?

CB: As we go through this experience, we're all considering what we do and don't like about remote work. In addition to the complaints about Zoom fatigue and drawing remotely, I've heard parents say, "I'm tired, but I appreciate spending more time with my family." I've heard non-parents say they are cooking, eating healthily, and working out more. There are many things that most of us like about NOT commuting. So we know there are pros here that people may want to extend. That said, we are wondering if, once the pandemic ends and working remotely becomes a choice, will there still end up being more value put on in-person face time? Will the need/desire to work remotely create an unequal situation

between people who have more and less flexibility to be in the office? We will definitely continue to offer remote work as an option, but we don't want to create inequity between employees. The good news is that it looks like we will have a while to figure it out as the involuntary beta test continues!

To complement the potential for more remote work, we have also talked about the need for our space to better support the activities that really work best in the office, like team collaboration, making large drawings, model making, sample review for CA etc. So maybe the office will end up looking different. Maybe it will have fewer desks and more collaboration space.

DI: What about travel in the future? Now that we've learned remote work is possible, do we really have to drive all the way into Boston for that meeting? An activity analysis may be in order to save that trip in the future.

CB: Not just driving, but flying! A lot of people in our office who routinely get on multiple planes each week to travel around the country and the globe would love to do less of that. It's tiring, it's time away from home and family, and it burns a lot of fossil fuels. We're thinking it's not all or nothing. We are imagining scenarios where we might go to a kickoff

meetings, get to know a client, visit the site -- but maybe then we don't need all of the subsequent meetings to be in person.

DI: Has there been consideration given to using this crisis to reevaluate what you're doing as a firm? Has it caused you to ask: "When we go back to normal, was what we were doing okay in the first place, or is this an opportunity to revisit things?"

CB: At the Q1 meeting, Michael Grove, our chair of landscape architecture, shared a photo of Wuhan after the quarantine was lifted. People were right back out on the street. Everyone was wearing masks, but they were mobbing the public open spaces. There's a lot of doom and gloom prediction right now, but we continue to believe in public space and are excited to be part of creating those resources for communities. We're writing a number of articles on the subject now, and hope we can find ways to be more active in advocating for public resources to be allocated to new types of green infrastructure, whether spaces for safe movement or access to wild green spaces for recreation and reflection.

DI: Has all this given rise to looking for new kinds of talent? Risk managers, scenario planners, strategists, crisis managers, researchers, or other new kinds of talent or skills?

CB: I don't think we are going to get into risk management, but we will likely continue to develop our resiliency planning skills, which has been a growing practice area for us over the past 10 years.

We have also talked about partnerships with industries that allow us to contribute what we do well - think creatively about problems from a design perspective – to more specialized teams grappling with new challenges. For example, we're not in the healthcare market, but we'd love to be part of designing healthy spaces indoors and out.

DI: Having learned more about your firm in our Design Futures Council conference, its reinvention, your role, and those of your colleagues, it seems you have a gold mine - an embarrassment of cultural riches in your firm. I commend you for that and I thank you for sharing it.

CB: Thanks for your kind words – this has been a nice opportunity to reflect.

Caroline Braga is a proven thinker, collaborator, and leader who teams with architects, planners, urban designers, and civil engineers to create beautiful and ecologically functional landscapes. She is passionate about connecting people to nature through design. Her experience spans from planning to built work, with a focus on integrated campus contexts. She brings to each project—as well as myriad corporate initiatives—strong critical thinking, a willingness to engage in thoughtful debate, and a commitment to quality. Caroline provides critical thought and design leadership for Sasaki's campus landscape and planning practice and is helping to strengthen and expand Sasaki's national presence as a campus planning and design leader. She also serves on Sasaki's board of directors as the Chair of Firm Culture and holds a master of landscape architecture from the University of Pennsylvania and a bachelor of arts from Georgetown University.

Coronavirus: Impact on Campus Planning



BARBARA WHITE BRYSON

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LEILA R. KAMAL

Principal & VP, DSK Architects + Planners What does the Covid-19 pandemic mean to the future of higher education, institutions, facilities and campuses? Data informs. Bigger may not be better. Flexibility and adaptability are key.

In May 2020, the corridors of higher education echo only with the memories of student laughter and faculty debates. Occasionally, a lone researcher will stoically wheel a piece of equipment past empty conference rooms and classrooms, but no crack of the bat, no squeak of the sneaker, and no cheer of the crowds disturb university sports fields, stadiums, arenas, or recreation centers. Almost every office in every building across vast college and university campuses in the U.S. is unoccupied. Yet the teaching and business of higher education continue without the benefit of the millions of square feet of facilities. Even so, those same universities and colleges still bear the costs associated with financing, maintaining, and operating those facilities. Higher Education institutions cannot remake the

campus planning and capital construction decisions of the past, but what can universities learn from the pandemic to shape the campus planning decisions of the future?

ON SHAKY GROUND

Under growing financial pressure, and in the race to attract students, some institutions were on shaky ground before the pandemic hit. As universities continued to grapple with a troubled business model, online delivery models, reduced state funding, growing deferred maintenance issues, and declining enrollments, some institutions have merged or even closed their doors for good. In The College Stress Test by Robert Zemsky, Susan Shaman, and

12

...what can universities learn from the pandemic to shape the campus planning decisions of the future?

66

Susan Campbell Baldridge, published just months before the pandemic, the authors observed 10% of America's colleges or universities face significant risk of closing.

Contributing to the stress on the higher education business model has been the cost of owning a growing number of buildings. Since the Great Recession, space growth has ranged from 8.5% to 19%, depending on the institution type. Initially, this expansion was needed to support continued enrollment growth. However, around 2011 a shift occurred, and enrollments began to decline - a change that seems to have gone unheeded by institutions relative to continued space growth. The highly competitive environment apparently only fueled the perceived need for more buildings to provide better housing, dining, recreation, and other amenities to attract students to campuses. In 2015, colleges and universities in the U.S. spent a record \$11.5 Billion on construction for an estimated 21

million square feet of space. These projects were usually paid for by tax-free bond financing and sometimes driven by a donor 'naming gift' covering less than half of the total cost of the project.

By 2017, 9% of collegiate budgets across the country were used to pay debt service on capital projects. According to The Atlantic, colleges and universities owed \$240 billion based on Moody's bond rating service reports. That amount had risen 18% in five years at public universities. "Just the interest payments come to the equivalent of \$750 per student per year at public universities". Additionally, budgets for university facilities and maintenance had not increased since 2010, resulting in reduced regular maintenance for buildings and infrastructure, growing deferred maintenance backlogs, and an inventory of buildings difficult to repurpose - presenting yet another tough reality that was dragging down the business plan.

ENTER A GLOBAL PANDEMIC

On 11 March 2020, the threat of the COVID 19 disease was designated as a Pandemic. A few major universities had already begun to transition to virtual instruction and had started to close their campuses. Over the next month, almost every educational facility and learning institution in the United States made a similar transition to virtual learning to accommodate the need for 'social distancing' due to the COVID 19 Pandemic.

When asked by The Chronicle of Higher Education about how the COVID-19 crisis might change that calculation, Bob Zemsky posited that weaker public institutions would undoubtedly be impacted due to reduced or delayed state funding and that anticipated enrollment reductions would also stress weaker colleges. His estimate of endangered institutions increased from 10% in The College Stress Test to 20% in the short term. Universities are each losing tens to hundreds of millions of dollars through summer 2020. If students do not return to campus in the fall, hundreds of millions more will be lost.

THE FUTURE STATE

Even if universities survive this crisis they will have to re-examine their business models and ask some tough questions. Hiring freezes are already in place at most institutions. Endowments have taken a significant hit in the market downturn, and institutions that rely on those endowments are examining how they can restore their principal and live on reduced distributions. Construction projects are being re-examined and delayed.

Many universities are already redesigning curricula, not only to provide the ability to go online in the fall if necessary, but to provide greater financial efficiency in the long run. Weaker programs will likely be cut, and larger classes will be taught by fewer faculty.

Paradigms will shift as well. Most universities will quickly realize online teaching is not as difficult as they had believed, and many students do well in the virtual environment. As a result, the number of classrooms on campuses could be reduced or leveraged for other programs.

...Imagine a scenario where campus space use will be more clearly defined and more highly utilized year-round.

FLEXIBLE APPROACH

Working from home can be efficient and provide focus. Connecting by Zoom or similar video technology can be effective as well. In this new shifted environment, universities may need fewer private offices for faculty, particularly if they are used only 20% of the time. In a more drastic shift and to attract more students, university facilities may, finally, be used year-round, providing students and institutions flexible programs and degree options not available today.

A recent Harvard Business Review article proposed another flexible approach "...students could take

commoditized courses online at their convenience and at much cheaper cost. They can use precious time they spend on campus for electives, group assignments, faculty office hours, interactions, and career guidance, something that cannot be done remotely. In addition, campuses can facilitate social networking, fieldbased projects, and global learning expeditions that require F2F engagements. This is a hybrid model of education that has the potential to make college education more affordable for everybody." Imagine a scenario where campus space use will be more clearly defined and more highly utilized year-round.

Sports programs and related facilities, as confirmed by the Covid-19 crisis, are a financial risk to universities, especially now that there are no basketball or baseball champions to bring in the big-ticket or TV revenues. Most institutions struggle in ordinary years to manage big sports business. Last year the NCAA reported only 29 programs had revenues exceeding expenses, and nearly \$8 billion in expenses had to be subsidized by other institutional resources across the country. Today, every program is losing millions of dollars in revenue, while institutions retain the costs of their largest and most expensive facilities.

Quarte Quarter



Gordian (once Sightlines) was prescient when it reported in 2018, "Many institutions have above average space per student and below average wealth per student. Any negative return on endowment assets could force these institutions to raise tuition, increase debt or implement austerity measures at a time when they can least afford it. It is crucial for institutions to square their campus growth ambitions with their financial realities to make certain they can afford the long-term costs associated with maintaining their existing institutional assets and today's ongoing expansion. Their survival may depend on it."

SUMMARY

The most important lesson learned by higher education during this pandemic is that the cost of infrastructure (energy plants, buildings, roads, landscape, technology, and debt service) is a heavy financial burden to carry when students and faculty are no longer around. Every college and university has looked hard at their business plan these last weeks and been stunned to learn that after salaries, the cost of financing, operating, and maintaining the physical plant is one of their largest expenses. Institutions are also coming to the painful realization they have strayed far from their core businesses of teaching and research into facilities-intensive businesses of housing, dining, recreation, sports, parking, and transportation. All these can be lucrative but come with a high, inflexible infrastructure cost.

Smart universities and colleges will recognize the need to approach campus planning very differently in the future, starting with an understanding of how much physical plant an institution can and should afford within its business plan. Fundraising must be grounded in an understanding that although new buildings may be easier and sexier to sell, they come with long-term permanent costs that must be fully understood and embraced before gifts are accepted. Space must be strategically managed with a clear understanding of the cost impacts associated with poorly managed space that is seldom used. This approach means any space used less than 60% of the time should be repurposed. Most spaces should be thoughtfully designed to serve double or even triple duty. In the Chronicle of Higher Education on 10 April 2020, Robert Kelchen noted financial flexibility must be a priority for higher education from now on. The traditional campus building owned by departments and deans and dedicated to a singular function is rarely flexible. Bigger is not better for the physical manifestation of universities and colleges. If we in higher education learn nothing more from the pandemic than this, we will be in a better position to manage the future.

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Leila R. Kamal, AIA, LEED AP, is a Principal and VP with DSK Architects + Planners. Over the course of two decades as a practicing architect, Leila Kamal has developed and led diverse design initiatives that advanced her client's mission and purpose to create enduring architecture. From directing large, complex design projects to creating research programs, her client-focused approach has earned her the trust of public and private institutions and organizations.

A Dialogue with Katerra

DesignIntelligence[®] Quarterly



CRAIG CURTIS

DesignIntelligence Quarterly

19

FAIA, Design Director, Katerra

Craig Curtis speaks on supply chains, scale, platforms and mass customization in a design-quality-focused organization

DesignIntelligence (DI): Katerra has a rare position in the A/E/C marketplace as a vertically integrated company. Yet your background had been in traditional architectural practice. Can you share your background, how you got here, and your current role at Katerra?

Craig Curtis (CC:) I spent most of my career at the Miller Hull partnership. I joined the firm in 1987 after spending a few years down in California after university. I was there from '87 for almost 30 years. It was a fantastic experience. Dave Miller, Bob Hull, Norman Strong, and I were the four partners for quite a few years. The firm grew and I led the charge to open an office in San Diego for the firm. I had some incredible commissions there - a worldwide U.S. Embassy contract and a GSA land port of entry at San Ysidro, the busiest border crossing in the world, and the largest GSA project at that time. That kept our firm

afloat through the recession. I was fortunate to be in that position and to work alongside Dave Miller and Bob Hull, my mentors for 30 years. A fantastic experience and a great run. We grew the firm from 8 when I started to close to a hundred when I left. Nice steady growth with a deep bunch of talented people - which is what you need to do high-profile work.

At Miller Hull I had hired a guy out of college named Peter Wolff. Peter was one of the Wolff brothers in a familyowned Multifamily development business in Spokane. He was the lone architect/designer of the family. He wanted to go into architecture and bring higher design to his family business.

After several years at Miller Hull he went back to work for his family developing Multifamily apartments. We remained friends for years and did projects together. Both when he was at Miller Hull and later, when I designed a couple projects for him when he was back at his family business. In 2015 he told me about Katerra. I could tell he was excited about it. More passionate than I'd seen him in a long time. At the same time, I was at that point in my career, 55 years old, thinking, do I just want to coast into the sunset at Miller Hull and not try anything else in my career? I've got at least a good 10, 15 years left. Do I want to try something else?

Pete convinced me to go to work parttime with him and launch the Katerra design office in Seattle, starting part time. I quickly realized there was nothing part time about Katerra. It was full time and more. In January 2016, I severed my ties with Miller Hull and went full Katerra. It was a nice long transition. I gave my partners plenty of time, six months of transitioning out. No hard feelings or any hardship put on that office when I left.

I joined Pete and we opened the design office of Katerra in January 2016. I recruited another ex-Miller Hull guy who was at Olson Kundig, Will Caramella. Pete brought along another young industrial designer he was working with named Will Root. The four of us started Katerra's design arm. The company was only about 40 people worldwide, primarily a supply chain company in those days. We realized the company needed to have construction, manufacturing, and in-house design capabilities to accomplish the vision.

DI: It existed as a supply chain and manufacturing company first?

CC: Yes. It started because Michael Marks, our founder and CEO, was friends with Fritz Wolff, one of the brothers of the Wolff company, a successful Multifamily developer. Michael had been in the consumer electronics business and had been an entrepreneur. He and Fritz started talking about Fritz's business and Michael said: "Well, you must get a great deal on things like drywall or doors because you can aggregate that demand across all of your projects."

Fritz said, "No, that's not how this business works. We have different contractors, they have different subs, they have different suppliers who take them fishing every summer. There's no way of controlling where I'm going to get my doors, windows, and flooring. Even if I specify it, there's no guarantee until the end." Michael was shocked. "That's not how the rest of the world works. How can that possibly be the case?" he said. He volunteered to help Fritz put together a supply chain for Wolff's Multifamily projects, and quickly found he could, in fact, get a much better deal on materials.



What he couldn't control was those subcontractors and suppliers all the way up the multiple steps to general contractor. Work had to be specified into the project in order to get it. He had to go all the way back to the design team. They quickly understood to be successful you have to be in control of the entire process from design all the way through installation and occupancy. From there, my role now is as Director of Design.

DI: That notion of supply chain control was part of the founding vision, the initial charter?

CC: Absolutely.

DI: Katerra has made several big splashes in recent years for acquisitions. Is growth by acquisition a key strategy to achieve scale?

CC: I get asked that question a lot. But I like to remind people of the size of the industry. It's massive. Even though we fully intend to have an impact at scale, we can't do it simply by buying a bunch of firms. In fact, we've only made three acquisitions.

One was a very small firm in Spokane and then we made two more significant acquisitions almost three years ago. We have made no design firm acquisitions since, nor do I think we need to, because

those were very strategic. We fit with Michael Green because of the Mass Timber expertise he brought, along with Equilibrium. That was a no brainer because we we're going into the Mass Timber business in a big way. We acquired Lord Aeck Sargent for two reasons. Geographically, they provide us with six offices with good locations and a design headquarters in Atlanta, a perfect place for us to have a second design headquarters. Secondly, they have a deep bunch of talent. A firm that's been around for probably 75 years now. As mentioned before, to do high caliber work you need high caliber people.

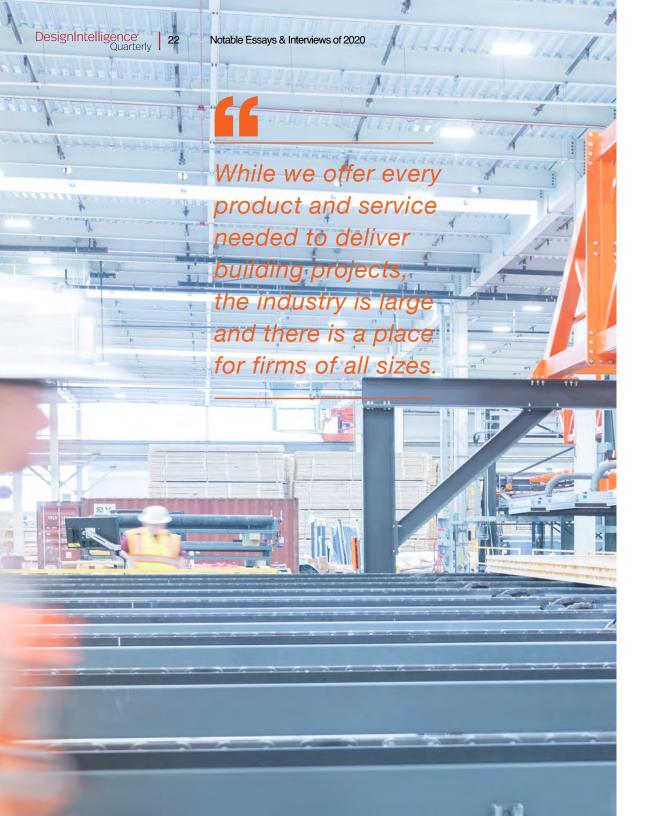
The people there are very, high quality. Processes are in place we can learn from. In the long run that's going to prove to be a smart partnership. I think of it more as a partnership than an acquisition. They got in with Katerra when we were in our infancy in terms of design capabilities.

DI: Talk more about size. Will there continue to be a place in the industry for the small firm?

CC: While we offer every product and service needed to deliver building projects, the industry is large and there is a place for firms of all sizes. Our focus is on designing and building platforms. My dream is that they become accessible for anyone to be able to use. That puts some

To be successful you have to be in control of the entire process from design all the way through installation and occupancy.

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of the information about costs, schedule, and other data - and the attendant power it brings - back into the hands of the architect. I know you've operated as both architect and within the office of a general contractor. I saw the reference to you as a "dual agent."

We're trying to get to the point where we're working together side by side with the builder with equal access to that information. If we're providing platforms anyone can use, anyone could buy one of our bath kits, for example. In the future, I would hope that people would be designing single family homes using our assemblies and being as creative as they want to be, but with access to all that information. It's pre-engineered. The supply chain and the catalog of materials is top notch because everything we do is high-quality design. Most importantly, we can provide you with the cost of those manufactured assemblies. You know, as an architect or designer, what cost to plug into a project. You don't have to wait for a bid from the contractor who has to go out to subs who have to go to suppliers to get the actual number. That's all baked into our manufacturing assembly. It's coming out of our factory, not out of somebody's pickup truck.

DI: That's interesting and it goes against my preconceptions, which were: "Katerra is interested in continued acquisitions, global dominance, trying to be the biggest." What I'm hearing you saying is: not necessarily so. You just want to have more control of what you're doing.

CC: The answer is to scale. If you think about scaling a platform, for example, how did Uber scale? They didn't scale by growing a massive number of people back in the home office. They scaled through a platform approach. Alibaba is probably the best example of how a platform approach can work at a large scale. We could do the same thing. Sure, we can have a major impact at scale, but we don't have to do it by acquisition and by having thousands of architects. We can have maybe a few hundred architects who are providing all the information needed for other architects, who build and use that information to build smarter, to build more efficiently, less expensively and solve some of these social issues.

The reason I'm here is to try to make a difference in providing affordable high-quality workforce housing. Also, a means to utilize mass timber more effectively and promote that as a way to make a difference in climate change. Those two things are important and are two of the biggest challenges that architects have to face right now. Katerra has a good shot at having an impact on both. Sustainability is extremely important to us.

DI: As a lifelong architect at heart, the notions of platform and scale are not household words to me. To hear you talking about that rather than dominance and acquisition is more graspable. I can get my arms around it. We share that aspiration, even though we came at it in different ways. What we have in common is being two career architects who couldn't take the status quo anymore - and did something about it – by making a significant career pivot.

I'm thrilled you had that courage and are now an exemplar for others. What drew you to your current role? Was there an aspect of practicing within a traditional firm that destined you for such a change? Were you a designer, a production guy, a manager? What gave the impetus to want to be in this role? What drove you here?

CC: When I look back at even the top commissions I had as a lead designer, say U.S. Embassies worldwide, that's as good as it gets. Even with those projects - and they were design-build projects - you would think in a program like that, that had been around for so long that we would be effective at managing the design-build process. That it would be

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The answer is to scale.

collaborative and enjoyable. But it wasn't. In 30 years, I can look back and point at fantastic accomplishments architecturally but there are only a handful where I could say it was an enjoyable process through construction. There's so much angst, and so many battles to fight around the cost of a project versus design quality. That's what I got tired of. To have an opportunity to join something and think about a completely new way of delivering a project without all that baggage and banging your head against the wall constantly. The same old battles over and over. That's what was most interesting to me. When I joined, I had no idea that Katerra would become what it is today, on our path to becoming what our vision is for this company. It's fantastic. I'm thrilled about it. But when I joined it was very small, just an idea and we didn't know this is where it was going to head.

I have loved being part of growing the design organization and learning about how almost every other industry in the world is run. Much differently than design and construction. It's really been eye opening. I've learned so much and I've met so many people from outside the industry who are running this company in a way I couldn't have imagined when I was working for a boutique design firm. DI: Most firms in traditional design practice don't give much attention to the notion of supply chain. They're self-focused. Architects are educated and cultured that way. We're lucky if we even remember to call our consulting engineers and God forbid - the subcontractors and contractors and manufacturers, who are often seen as "second-and-third-class citizens." You obviously embraced going about that in a new way.

What are some of the advantages of the integrated approach to design, construction, manufacturing, and supply chain you're using? What are some of the synergies, unexpected consequences, and challenges?

CC: Designing for platforms instead of individual projects is a new way to think about practicing. We're designing for entire platforms. For example, our Multifamily platform has a catalog of materials. The advantage is we can curate that catalog specifically to who we want to be, just as Apple has a distinctive look for all their products. If you're buying a phone, a laptop or whatever. Whatever product you're buying from Apple, you know it's going to have that certain look. That's been very successful for them. It's widely recognized as one of the best designed product lines out there. That's essentially what we want to be.

We want to have a fine catalog of products we've fully vetted that meet our standards, not only for aesthetics, but for sustainability, longevity, warranty and all those things. We build our platforms around that, which is quite a different way to think about designing.

DI: Has the COVID-19 crisis had an impact on your supply chain?

CC: There has been very little impact. Part of the reason is we have a diversified supply chain. The recent trade war pushed us to make sure we've always got back up plans for every one of our products.

We're well diversified geographically. We've got nearly a hundred people in the company involved in supply chain and they're all over the globe. The advantage to a company like ourselves is because we have in- house all those people canvassing the globe for our products, we can react very quickly to a crisis like this. We're not tied to one particular manufacturer, or one location. We have lots of options. DI: The benefits of what you're talking are clear for an integrated company like yours. What about firms not in a position to control their own supply chain. Are there some principles that could apply to a design only or a construction only firm? To share with those who can't go your route?

CC: That's a tough one for me to answer. It's been a while since I've operated within just a strict design firm. I'm not sure how this would impact a firm like Miller Hull, for example. But the beauty of Katerra's supply chain is that it's accessible to the whole industry—any architect or GC can reap its benefits.

DI: Having made the transition from strict design to supply-chain-focused scale and platform design, have you ever crossed over to the "dark side" where you've said, "Oh my God, I got what I wanted and now it's oppressive. Now I'm a factory guy. I'm a manufacturing guy. Where did the creativity go?"

CC: Not at all. Designing at platform scale is challenging and creative. I thought doing a project under the GSA Federal Design Excellence program was difficult. Designing a platform that can be rolled out and provide design excellence over multiple buildings and still provide mass customization is an order of



magnitude harder. We have a lot of talented architects here at Katerra. All are surprised and humbled by how difficult it is to design in this way. Because we're not about the lowest cost solution or lowest denominator. We're about providing design excellence in a new way and still providing the kind of flexibility in our platforms that allows for fantastic architecture.

Mass Timber is going to be a big part of everything we do in the future. That alone leads to some beautiful new ways of thinking about design. That's a technology we're going to see more and more of over the next decades. I can't wait to see the award-winning architecture that Mass Timber provides.

DI: That's exciting. All I've ever attempted to do is to be systematic within a given project. To take that across a global supply chain organization long term, I imagine, requires lots of talented people to help. I can only imagine what the struggles and challenges would be. **CC:** Coming out of COVID-19 there's going to be a heightened awareness on healthy buildings, well buildings, biophilic design and environmental responsibility. Maybe one good thing that will come out of this is that people will care more about the health and wellbeing of the people who work in their buildings. I hope we can use this to make sure we think hard about providing healthy building materials and wonderful places

for people to work. Whether you're in a home office or in a commercial office building, I think we'll see more attention to it.

DI: I hope so. Plenty of others in the industry can benefit from those things already baked into the Katerra culture and value set.

Craig Curtis, FAIA, is chief architect at Katerra where he oversees new building platforms while ensuring they meet and exceed sustainability goals. Craig was a partner with The Miller Hull Partnership for 30 years before joining the Katerra team. Craig's projects at Miller Hull included the Bullitt Center, the world's first commercial office building to meet the stringent requirements of the Living Building Challenge, and the \$450m replacement of the San Ysidro Land Port of Entry, the busiest border crossing in the world. Craig's success with the design of many award-winning projects was possible because of his integrated design approach: relying heavily on his team of architects, engineers, and contractors to solve complicated problems simply, creatively and elegantly, together.

Research A Culture of Inquiry

DesignIntelligence[®] Quarterly

TALL REAL PROPERTY AND ADDRESS.



BILLIE FAIRCLOTH Partner at KieranTimberlake

As a partner at KieranTimberlake, Billie Faircloth leads a transdisciplinary research team to better understand questions around the built environment. She spoke with DesignIntelligence about the integral role a culture of research and the power of inquiry play in design process.

DesignIntelligence (DI):

Your website tells us that you "conspire to pursue an answer to the question, 'Why do we build the way that we do?" What is the answer?

Billie Faircloth (BF):

This question comes from an essay called "Architecture and Construction" written in the early 1980s by structural engineer/architect Eladio Dieste. He was reflecting on several decades of work from his practice in Uruguay and trying to understand the differences between his approach and the dominant pressure of a market-driven construction practice.

This question resonated with me because I grew up in the industry. My father started out very young working on construction sites and in the middle of his career opened his own construction firm. I was employee number two, behind my sister. At age 14, I had already listened to many years of conversation about building and construction.

In hindsight, this question — which I believe is the question in our industry — points to the larger, broader work we have to do to understand building culture, by which I mean the culture that exists around the things we build.

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Why do we build the way that we do?



The question points to two things: the agency we have to shape the outcomes of the things we create, and simultaneously, the agency we feel we lack to control the outcomes of the things we have created.

The question can only be tackled through collective intelligence consciously, through talking about the outcomes of our design and building activities. The outcomes can only be understood if we're willing to see and learn from the things we have created. KieranTimberlake was founded to ask these kinds of questions, both about the things we're creating and their outcomes.

DI: Research is so integral to the culture of your firm. How is doing on-project integral research changing your process?

BF: It can be incredibly powerful to allow architects to pause and ask a targeted question associated with specific systematic inquiry, allowing them to have a high degree of certainty about their intuition. Over the last 35 years of this firm, we have committed to building a research culture and to evolving in such a way that we continue to realize — we hope — better and better versions of that culture. The first step is to provide the resources to answer questions and to allow questions to be the basis for design invention and innovation.

There are a lot of assumptions around what a program of research is. Many believe research will be a kind of panacea to address, solve, or cure something. As we have engaged this process of culture-building, we have never approached research as a cure-all. That's not the point.

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The first step is to provide the resources to answer questions and to allow questions to be the basis for design invention and innovation. DesignIntelligence Quarterly

no shortage of questions

Rather, we have approached research as a way of helping us expand what's possible; to identify the goals and aspirations we should be aiming for and to put in place rigorous systematic inquiry so we can meet those goals and achieve our aspirations. For our practice, research is not a program — it's not a division or a studio. It's a position we have taken philosophically; as a firm of more than 100 individuals, we should be able to ask questions, plan ways of answering them and use those answers to elevate the profession.

We have never suffered from a shortage of questions. We have always defined projects, their objectives and the methods to interrogate them with clarity, whether it's a modular vanity, a multifunctional wall or the vegetative dynamics of seven installed green roofs. All those projects can be defined in terms of the questions we're asking, the anticipated outcomes, and how those outcomes might produce knowledge and enliven our practice.

DI: As you wrote in your 2019 article for Architecture Australia, "Searching and Searching Again: Research in Practice," your firm shares an impressive list of developmental milestones in your research evolution: a "commitment to return profit to [the] practice

to support proactive research (2003); the declaration of an ISO-certified design research process that is audited annually (2005); the decision to hire a dedicated, transdisciplinary research group (2008); codification of a research query process for data collection, analysis, modelling and simulation, physical prototyping and original experiments (2011); the strategic growth of the research group to 10 percent of our overall staff (2012); the first successful public release of an internally developed architectural tool for use by the profession (2013); the further articulation of a design computation platform as a companion to our more established research platform (2015); and, most recently, the formalizing of a collective intelligence model in which every architectural project begins with a complementary team of architecture, research and communications staff (2016)." Were these milestones part of a plan or recognized reflectively?

BF: We have built infrastructure here to support research. Some of that infrastructure includes decision points — what do we want to do next? What we want to do next can be guided by our own strategic plan for research. It's a three- to five-year plan in which we have identified a range of subject



We want everyone to have access to what they think might be done or a question they might want to ask — this too is proactive research.

areas we would like to prioritize for proactive research.

But we also prioritize collective intelligence and want research to originate from every place in our firm. We want everyone to have access to what they think might be done or a question they might want to ask — this too is proactive research. We have a history of it in our firm — projects like SmartWrap[™], Cellophane House[™], Ideal Choice Homes, the Green Roof Vegetative Survey, and more recently the work we did with UNICEF, Designing the 21st Century Ger project in Mongolia.

Not only do we have a filter given by our strategic plan, but we also have a process

for stating the question we want to ask, the importance of that question and the expected outcomes. We have the ability to dedicate resources, staff, time and money to these questions.

DI: But did the decision to commit to this culture evolve over time, or was there a plan from the onset?

BF: It absolutely evolved. It began as a declaration: "We are going to grow our research culture and we are going to return profit to grow that research culture." Yet this has grown into a process that is integral to our firm's work and to our design philosophy.

When I started in 2008, the firm was in the third or fourth generation of research. Then, the decision was made to take the next step, to grow a dedicated research group and make it transdisciplinary, one where members in the group have backgrounds in subject areas like materials engineering, environmental management, urban ecology and physics. The premise of such a research group was part of a strategic plan, but we recognized that we needed other people's knowledge and methods to sufficiently see the gaps in our own industry. At every milestone reached, we have continued to look forward and ask: Now what? What's next?

DI: In this world of accelerating pace, how does adding inquiry to your process impact scheduling? Given never enough time, how are you able to do more — ask and answer questions — within the same deadlines?

BF: We have certainly been in the position where a question we are attempting to answer for a project could benefit from more time. What we began to do early on was to test the questions we could answer over the course of a project.

Much of the work we engage falls under normative categories. In some instances, we're asking questions that require us to map an observation or to diagram a certain condition. In other instances, we are measuring, collecting data, analyzing it and interpreting it to help guide a decision. Sometimes, we are actively building a model to interrogate a certain condition.

For a given project, we might engage anywhere from three to 10 different questions depending on project scale, scope and duration. But the work we are doing is connected to a decision to be made. We want the results of the work to be actionable and either tell us to do something or not to do something, to engage something or not to engage something, to support and amplify the design process.

DI: In 2016, Metropolis magazine published the article, "How Architects KieranTimberlake Turned Their Office Into an 'Incubator," which talks about the HVAC experiment and some of the lessons learned from the work you did within your own office space. This included people sweating and complaining. What were your takeaways from the challenges of experimenting on yourself? Did it enhance your empathy for your clients and partners to whom you're doing this on many occasions?

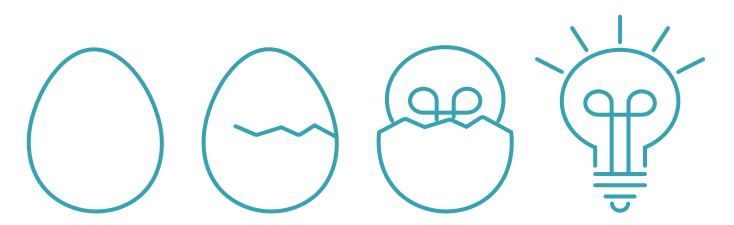
BF: That's exactly why we did it. In the past, when we have challenged a client to consider minimizing resource consumption, we have thought, "There might come a time when we could test this out ourselves." In the experiment, we

integrated over 300 sensors in our building to understand the relationship between different spaces, conference rooms, desks, et cetera. Ultimately, we failed to eliminate HVAC, but we succeeded in learning quite a bit about ourselves, our building, our culture and what it takes to know a place.

DI: Since the publishing of "Refabricating Architecture" in 2003 and projects like the Cellophane House, there has been a rising interest in prefabrication. Yet, many people are not ready for it because it can also eliminate options. What has been your experience in this realm? I find many clients and partners aren't ready for it because it shifts decision-making flexibility forward — the late changing of minds we've conditioned them to enjoy. **BF:** We can look across the industry and see the continued interest in, and promise of, offsite fabrication. And we can continue to see companies emerge that are attempting to vertically integrate all aspects of design fabrication and delivery into their offerings. We continue to persist in applying principles of offsite fabrication when and where it makes sense. But infrastructure for offsite fabrication is sometimes unavailable, and there is not a distributed network to deliver projects using offsite fabrication.

We have been fortunate to work with clients who also want to persist in that mode.

It's an interesting manifestation of an answer to the original question: Why do we build the way that we do? People are



refabricating ARCHITECTURE

How Manufacturing Methodologies Are Poised to Transform Building Construction

Stephen Kieran James Timberlake

lcGraw-Hill New York trying — and have tried for many decades — to change the nature, process and relationships in building and designing building construction simply through the delivery.

DI: Looking ahead five or 10 years down the road, what is your vision for the future of research at KieranTimberlake?

BF: Research hasn't changed — it's a way of thinking, a design philosophy. It can be informal, and it can be formal. We will continue to do it because it's integral to the way that we think.

What has changed, as we have matured our own internal practices, is that now we desperately need to focus. The industry needs to focus on engaging projects day in and day out to reduce embodied and operational carbon. This goes beyond research. It requires us to approach our projects from the outset with a mind to tackling the whole carbon picture. My focus over the past six months has been to tackle this question with a group here at Kieran-Timberlake.

Now, we need action. How do we tackle some of the big challenges we face as a society, like climate change, injustice, human health and helping communities thrive? After a decade of building research infrastructure, proving that a transdisciplinary group can thrive and extend agency in practice, I'm committed to focusing on projects that demonstrate how important it is to have both research and design thriving equally and side-by-side.

Billie Faircloth is a Partner at KieranTimberlake and leads a transdisciplinary group of professionals leveraging research, design, and problem-solving from fields as diverse as environmental management, chemical physics, materials science, and architecture. She fosters collaboration between disciplines, trades, academies, and industries to define a relevant problem-solving boundary for the built environment. Overseeing investigations via empirical experiments, prototypes, and analysis, she leads technology development that informs high-performance design, including Pointelist[™], a wireless sensor network, Tally[™], a life-cycle assessment application, and Roast, a post-occupancy survey tool.

She has taught at the University of Pennsylvania School of Design and Harvard University, and served as Portman Visiting Critic at Georgia Institute of Technology and VELUX Visiting Professor at the Royal Danish Academy of Fine Arts. Prior to KieranTimberlake, she was an assistant professor at the University of Texas at Austin School of Architecture. Her articles have been published by the Journal of Architectural Education, Princeton Architectural Press, Royal Danish Academy of Fine Arts, and ACADIA. She is the author of Plastics Now: On Architecture's Relationship to a Continuously Emerging Material published by Routledge in 2015, and the recipient of Architectural Record's Women in Architecture Innovator Award in 2017.

33

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DesignIntelligence Quarterly

Redefining Professional Practice Education: Speculations and Challenges



IRENE HWANG

Assistant Chair of Architecture at the University of Michigan's Taubman College of Architecture and Urban Planning University of Michigan's Taubman College Assistant Chair of Architecture Irene Hwang shares anecdotes that provoke speculation and challenges educators and practitioners of architecture to move in new directions.

As the practice of architecture has radically changed over the past decade, our teaching of professional practice in the academy has remained largely static for decades. To better prepare future practitioners, I share three new directions, instituted through changes to the core, professional practice curriculum at the University of Michigan's Taubman College of Architecture and Urban Planning. Consider these challenges with urgency and responsibility to the discipline and to the new generations of graduates entering the field.

A LEGACY OF GAPS

McKim would indicate to the draftsman where to draw lines and correct them: 'He looked at them for a long time and then said, "Just take out that middle line and move it up a little...No, put it back where it was perhaps a little lower"... it was quite a job to erase and remake the lines smeared in the process, and to repeat that sort of thing for hours on end was hard on the nerves of anyone. —H. Van Buren Magonigle, Pencil Points, 1934

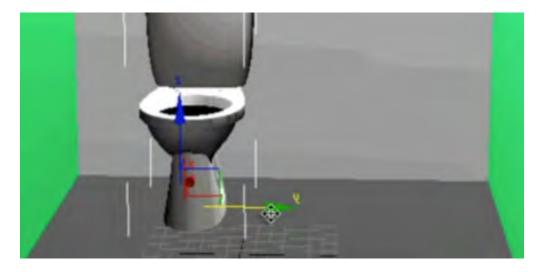
Though H. Van Buren's experience in the office of McKim, Mead and White is near a century old, such over-the-shoulder interactions remain commonplace today. In our primary, core professional practice course, ARCH 583, we show a GIF to our students on the first day. In the GIF, a young professional sits at his computer while his boss stands and directs from behind. As the GIF cuts to the CAD drawing on the monitor, we see a toilet slide to the left. Cut back to the boss, who gestures to the right, and we see the toilet slide back to the right. The GIF refreshes, and the sequence begins again. This interaction is so familiar and ubiquitous, that one only need Google "architect" + "GIF" to find the image; no further descriptors are needed <u>or click here</u>. Nicknamed "Robot Arms" by us, the GIF gets a laugh from our students and is the introduction to Practice, our first course module.

As the discipline and profession diversify through globalization and technological advances, educators face a critical demand for a new mindset in architectural education. one that looks to revise and update inherited leadership and working structures. Increasingly, the primary challenge for design professionals is figuring out how to collaborate on projects over larger and larger distances. Managing these distances is complex and demanding. We find ourselves having to bridge huge gaps in language, time, culture, traditions, preferences, climates, supply chains, technology, and building methods,

The behavior and mindset embodied in the Robot Arms GIF continues to be a legacy of Beaux-Arts teaching. For generations, the rigidly hierarchical atelier provided an effective model to nurture the best work from groups composed of individuals with the same training and from the same backgrounds. In these more homogenous, less diverse contexts, the best solution was also the right solution—for everyone.

The Beaux-Arts atelier model still shapes our discipline, even while culture and society have drastically







Above: University of Michigan, Taubman College, Student cohorts in 1914 courtesy of Taubman College and University of Michigan Bentley Historical Library



Above: University of Michigan, Taubman College, Student cohorts 2019 courtesy of Taubman College and University of Michigan Bentley Historical Library

changed. Just as 19th-century students were indoctrinated to be unquestioning of their master academicians, architecture students today still refer to their teachers as "critics" and have their schoolwork reviewed by a "final jury" at the close of each project. This master-led mentality, first instituted in school, persists in the workplace. Why? We continue to celebrate starchitects and endorse top-down leadership models. We continue to elevate "leadership" as a distinct group held above the rest of the organization. We continue to treat our young colleagues as fungible, interchangeable units of labor. The unanticipated outcome is another gap: one in which our working and organizational structures are falling short. We have much to lose if we continue such practices. By failing to embrace and implement advancements in organizational thinking, which prioritize inclusive leadership through new managerial styles, we remain tethered to the status quo and forgo the benefits of diversity.

We have a long way to go to achieve representative levels of diversity in the field:

- 91% percent of registered (licensed) architects in the US are white (2015, NCARB statistics);
- 2% are Black American (2015 NCARB); 0.4% are Black-American women, or only 477 of ~115,00 total US licensed architects;
- 81% percent of registered (licensed) architects in the US are men (AIA, 2020);
- Until 2020, 95% of Pritzker Prize winners (i.e., architecture's highest, global prize) were men; With their most recent win, Shelley McNamara and Yvonne Farrell nearly doubled the number of women prize winners in forty-one years, from three (3) to five (5).
- Of the top 100 architecture firms in the world (2018), only three (3) are headed by women;
- Of graduates who initially begin the path to licensure, the attrition rate (those who never attain licensure) remains highest among women and non-white candidates. (NCARB, 2018)

Like medicine and law, architecture is a learned profession (not a trade): our education is both extensive and expensive. Unlike medicine and law, the architectural profession has significantly lower compensation models across the board. With the continuance of low salaries, long working hours, and repetitive, production-based tasks in autocratic working environments, our young graduates continue to become disillusioned, fatigued, and frustrated with architecture. While some bear it for a few years, many talented and motivated graduates end up leaving the profession altogether.

THE CHALLENGE:

To stem such loss, in our professional practice teaching at Michigan, we asked: what next generation of skills, expertise, and intellectual frameworks are necessary to help graduates stay and thrive in our industry? How do we counteract the "invisible" curriculum of outdated values, biases, and assumptions that stand to regress the discipline?

For us, we believe our primary responsibility is to help increase diversity in the field and in our profession. We've learned from studies that show how diverse teams outperform homogenous teams.

Social psychologists discovered that in homogenous team dynamics, individual team members conform more easily: they are quicker to accept their teammates have the right answer—even when wrong—leading to poorer group decision-making and mistakes. On the other hand, diverse teams with individuals from a mix of race, cultures, and genders, tended to be more objective and rigorous, with more accurate solutions and better decisions overall. Increasing diversity is not just a matter of race or gender. It's also a matter of increasing cognitive diversity.

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How do we counteract the "invisible" curriculum of outdated values, biases, and assumptions that stand to regress the discipline?

THE CHANGE:

Our first step was to rethink the timing and structure of the course. Instead of taking it for granted that professional practice is the last required course that students must complete to graduate, we made ARCH 583 an introductory course at Taubman College. By moving the course earlier in the curriculum, students now start to think about professional practice from the outset, rather than as an afterthought a few months before graduation. The very nature of professional practice-and how to reshape it for the better becomes one of the first things students think about when they start architecture school.

The course is now designed to introduce new concepts, changing values, and future directions for professional development. We discuss and explore these over three modules: Practice, Service, and Entrepreneurship.

MODULE 1 - PRACTICE:

From day one, we address the historical professional practice curriculum as a baseline and as a point of departure. For us, it's imperative that students understand architectural practice within the US, by first learning the fundamental principles for the delivery of building design through construction. Students gain a working knowledge of professionalism, ethics, contracts, and business practices. Concurrently, we get to know the students and learn about their unique priorities and ambitions. The heart of their learning is the pivot toward understanding and reshaping what architects do and how they do it.

The course starts with an invitation to students to imagine new means and methods for the discipline and for the profession. The Practice module is capped with the completion and presentation of the Firm Audit project. In the Firm Audit, student teams identify a practice that they admire and then study in depth—a familiar approach based on the case-study method. Where the project departs from tradition, is in the nature of the study. Students look beyond firm anatomy (e.g., number of partners, ownership structure, yearly revenue, types of projects, market sectors, fee structure, etc.) to seek insights on:

- Decision-Making: Which partner owns the majority stake? Is the stake evenly split, or do some partners have larger shares with larger influence?
- Office Culture: Are there strong relationships running vertically through the firm, or just horizontally at the top and at the bottom?
- Office Operations: How are projects staffed? Are junior employees considered for their individual strengths and professional development, or are they interchangeable?

- Values: Does the firm support adaptive, on-the-job learning and innovative experimental thinking? Or, do they prefer routine and rote execution?
- **Communication:** Is there smooth and easy communication at and between all levels of firm personnel? Do colleagues feel comfortable asking for help and speaking up? Or, are they made to feel embarrassed if they don't know the answer and discouraged from sharing a different view?
- Diversity: Are different backgrounds and perspectives welcome at the firm? Or, is there an adherence to the status quo and an emphasis on: "This is the way we do things here?"

While it's rare for students to find all the answers, in working through the Firm Audit project, they learn to consider aspects of professional practice that would otherwise remain out of their view. In so doing, students are empowered to reassess their assumptions about practice: they realize that it's possible to move beyond the standard path. For many, this realization brings new meaning to their professional journeys by instilling confidence to forge new professional directions for themselves and for architectural practice. At the close of the Firm Audit, students present their findings to each other, in a horizontal review format, exchanging new visions and new insights into contemporary practice.

PUBLIC ENGAGEMENT AND ARCHITECTURAL SERVICE

Have you ever caught yourself watching the Home and Garden Television Channel (HGTV) and found it rather enjoyable? Last year, when I suffered a sports injury, I visited many waiting rooms during my recovery. In every single one there was a DIY, home improvement show playing in the background. To satisfy my curiosity, on one visit I asked the receptionist about the programming choice. Relieved I hadn't come over to complain, she lit up, and replied, "Oh! HGTV! Everyone loves it. Before, with anything else, we'd see complete strangers come nearly to blows about something that had flashed on the

screen, especially when it had to do with football or politics. No one argues when HGTV is on!"

With the rise of the internet, social media, and streaming content, the public's exposure to design of our built environment is now more plentiful and accessible than ever. Programs like Property Brothers or Good Bones, along with their hosts (twin brothers Jonathan and Drew and mother-daughter team Mina and Karen) draw millions of weekly viewers, elevating HGTV to the fourth-highest-rated cable network in the United States. By many estimates, the global home décor industry accounted for between \$600-700 billion USD in 2019, with the North America representing one of the largest segments, of nearly 40 percent of the worldwide market in 2018. With such a large audience, home improvement media hosts are now the primary role models that most people look to for guidance and instruction about the built environment. Not architects.

Even as the massive rise of interest and participation in design and the built environment takes hold of the American imagination, we continue to see flat attendance in architecture degree programs. Starting in 2008, new-student enrollment steadily declined, only to rebound by a few hundred students annually during the last five years. (Fewer than 7000 new students enrolled nationally in 2014.) If we compare that to other learned professions such as law or medicine, where yearly enrollment is in the tens of thousands, the cumulative impact to the number of professionals in each discipline is staggering: in 2020 there are approximately 100,000 registered architects in the United States; 1.33 million licensed lawyers; and 1 million licensed physicians. It could be argued that our capacity to serve society through the built environment (architecture) is onetwelfth our capacity through social justice (law) or one-tenth of our capacity to serve its physical health (medicine).

What does this mean for architecture's position within society?

What does this say about architects' contribution to a just and healthy world?

THE CHALLENGE:

If we take the cause of promoting equity as a primary mission of the 21st century, then what is the role of architecture in informing the public's priorities and conduct towards the built environment: what we build; how we build; why we build? How will architects seize the opportunity to bring the benefits of their work to the general public? In the face of dwindling resources, population growth, wealth inequality, and overcrowding, how can we increase our ability to make better, more intelligent, societal-level decisions about the built environment?

MODULE 2 - SERVICE:

There is little doubt that home improvement media is highly entertaining. Millions are tuning in. Why then has the enrollment rate of new students at architecture schools not risen? My speculation is this: the general public doesn't know about architecture because the majority of people have had little—if any—

exposure to its benefits and value. Returning to our previous comparison: with 100,000 architects serving 320 million Americans, some simple arithmetic yields one architect per every 3,200 citizens; one doctor for every 320; one lawyer for every 240; one engineer for every 190. The average person's exposure to architecture is a small fraction of that in other learned professions. Conversely, one's exposure to the construction industry (with 7 million employees) is much higher; with one member of the trade for every 45 citizens. For ARCH 583's second module, Service, we begin by asking our students how they increase stewardship and advocacy for the built environment. We propose to them an expanded understanding of "service," one in which architecture connects with people in the everyday, and not only in special instances.

THE CHANGE:

After our students learn about existing standards and methods of professional service in the architecture industry, we ask them to redefine "service" through a public engagement lens. They complete a

four-week assignment where they research, design, structure, and present a public-engagement project for their hometowns. They begin by reflecting on their home communities. They identify a place where they can use architecture (e.g., spatial and systems thinking, visual representation, plus generative and analytical problem-solving) to create sustained benefit for their communities. For the final presentation of a two-minute video, which shares their inspirations, ideas, and approach, we invite community activists and public engagement experts to share a discussion of the work. The resultant conversation is filled with insights into how architecture can serve a larger constituency of people and purposes. For us, the Public Engagement project is the means for students to start shifting the public's impressio of architecture as rarefied and inappreciable into a necessary and ubiquitous aspect of daily life.

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start shifting the public's impression of architecture as rarefied and inappreciable into a necessary and ubiquitous aspect of daily life.

A BUILDING IS NOT ARCHITECTURE

Two years out of architecture school, my father excitedly pulled me aside one night after dinner. I had just flown home to New Jersey for a week-long visit. At the time, I was an intern designer in a well-known architecture firm located in Madrid, Spain. My dad is low key, but he excitedly shared a proposal with me that night. Dad wanted to invest in the design and construction of a new addition to our house. In the previous ten years of living in our 1967, split-level house my parents, who are avid karaoke enthusiasts, had grown frustrated with the layout, particularly on nights their friends were over. Dad was frustrated that the whole group couldn't sing, snack, and socialize together. "The space was too small," he told me. Without the addition, the group would continue to be splintered: people

moving from the over-crowded family room, through the narrow half-stair, up to the kitchen to grab a snack, and back down again.

My dad had it all figured out: I would create a bigger family room and wider stair, reposition the deck, and add on more space to the garage. After considering his proposal, I asked, "Why don't you test-move the karaoke machine, upstairs to the formal living room? You will have an open singing space directly adjacent to the kitchen and the snacks, which you guys can set up, buffet style, in the adjoining dining room."

My response wasn't what Dad hoped to hear. He was confused. Why hadn't I jumped at the chance to work on my first commission? Moreover, in our house, the formal living room was off limits to parties and fun. It was the place for the nice stuff, where family heirlooms and expensive furniture stood safe from spills and accidents. Pretty quickly Dad started to see the benefits of my suggestion. By only moving the karaoke machine (i.e., reprogramming the "living room"), he would have the ideal party spot and save himself from an extensive, costly, and time-intensive renovation. Months later, after a few parties in the new configuration, Dad, a biostatistician, shared that he finally understood the value of what I had learned in architecture school.

THE CHALLENGE:

The architecture industry is extraordinarily undersized in the face of potential demand and utility. Taking a cue from the new business models that emerged in the Dot-Com Revolution, how can our discipline devise new ways of becoming scalable enterprises? Not just in the case where we inject our business models with "tech" and "data," but where architecture itself can sustain scalar growth and impact?

There is a difference between buildings and architecture. While a

building is a built structure that provides shelter for the basic activities of daily life, architecture is more layered, performative, and enduring. Think of a window: in my single-family house (a building), a window need only do two things: allow the passage of light and air. Conversely, in a structure designed and delivered by an architect (architecture), a window is the result of a multitude of layered considerations, far more performative in that the architect will have thought through how that window lets in light and air (circulation, passive or active HVAC, east, north, south, or west facing); its materiality, finish, and detail (culture, craft, and history); its proportion and position (spatial efficiency, composition, and symbolism), as well as its technical and material construction (smart window, low-e glass), among so many others. Simply put: while buildings and the built environment are an integral and ubiquitous component of the human experience, architecture is not. In our current models, where the majority

of architecture firms are small businesses, focused on the design and delivery of buildings, we may have reached a saturation point. How then, can we redeploy architectural expertise (a superior built environment) as a scalable business?

MODULE 3 -ENTREPRENEURSHIP:

Most people understand a business to be the selling of goods or services for profit. Yet, most students arrive to our class without ever considering that the practice of architecture is actually a business enterprise. Like any business, architecture practice involves profit, loss, risk, management, customers, sales, planning, strategy, and a concept/ value proposition. For Entrepreneurship, the course's third module, we challenge the students to rethink the term "successful architecture."

THE CHANGE:

During most of their studio education, our students are not

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For us, the Public Engagement project is the means for students to start shifting the public's impression of architecture as rarefied and inappreciable into a necessary and ubiquitous aspect of daily life. thinking about the business of architecture. Even if their design work involves large-scale issues, their ideas get drilled down and end up hyper-localized in the design of a single building. While some large buildings can serve up to 30,000 people a day, that pales to the impact of large business enterprises like Google, where a single change to the user experience can affect upwards of one billion people. To expand their view, our students' third project is to devise a startup idea for the AEC industry. During this process, students put together a basic business plan, devise a marketing pitch, and learn about the AEC industry's capacities and structures. They also explore how to apply their architectural expertise to the creation of new value propositions. These value

propositions are assessed not solely

for their intellectual merit, but also

for their market viability, profitability,

and potential to transform the industry, at scale.

After five weeks of brainstorming, research, and conceptual prototyping, the students deliver their ideas in a Shark-Tank-style pitch to entrepreneurship experts and realworld investors. Some projects are advancements on existing business ideas. Others create new services that fill in gaps or take advantages of voids in the industry. In a good number of projects, our invited experts have said, "I can imagine this as a new business idea that would secure a first round of seed funding." At the end of the presentation day, top pitches are recognized, and students, faculty, and guests have exchanged ideas and suggestions. As they move forward, our students no longer think of their architectural practices as isolated creative endeavors. Rather, they have begun to view their work as interwoven

with society—through the multiple lenses of practice, service, and entrepreneurship.

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OPTIMISM AND SHARED INSIGHTS

In the two years we have worked to revamp the professional practice curriculum at Taubman College, I have become ever more optimistic about the near and far future of the discipline. Working with co-teacher Daniel Jacobs on the curriculum, and collaborating with graduate research assistants Akima Brackeen and Olivia Raisanen on the supporting research into public understanding of architecture and design-specific leadership, has helped us to create new pedagogy that builds upon the enthusiasm and passion that we all have for architectural education and practice. As we continue forward, my hope is for our colleagues outside of the academy to reach out to us with ideas and suggestions that will further enrich the work of redefining professional practice education.

Irene Hwang is the Assistant Chair of Architecture at the University of Michigan's Taubman College of Architecture and Urban Planning. She holds a degree in International Relations from the University of Pennsylvania and received her M.Arch from the Harvard University Graduate School of Design. Her ongoing focus is in examining and understanding the impact of architectural thinking and making upon society.

Digital Thrivers & the Digitally Unequipped

DesignIntelligence Quarterly



ROBERTA KOWALISHIN

Director of Technology (CTO), DIALOG COVID-19 is going to sort design practices into two categories – the Digital Thrivers and the Digitally Unequipped. Where will you land? Observations about this massive disruption from DIALOG's Director of Technology (CTO) Roberta Kowalishin

Design Intelligence (DI): How was DIALOG ready and able to get all 600 DIALOG employees working from home successfully, securely, and supported by your technology team in less than a day?

Roberta Kowalishin (RK): Innovation is a core value – we experiment with many modern solutions and continue to do so. Fortunately, we were well-positioned to work remotely before the pandemic forced it upon us. Two thirds of our employees are equipped with laptops while all others can access their equipment remotely with virtual desktops that include several choices of modern collaboration tools, automated tools to monitor infrastructure and update employee workstations, and additional solutions that better secure our users and infrastructure. A culture of rapid adaptation is needed in this new normal.

DI: Thank goodness your leadership and tech team invested in a "Business Continuity / Disaster Recovery plan", right?

RK: Not at all. There's been a lot of talk about resilience especially in the technology world - both in our own personal and social health as well as that which is related to our technology. Maybe some firms had more robust plans than we did but predicting for a pandemic response was not a scenario in our business continuity plan (BCP) or disaster recovery plan (DRP). I'll wager that it wasn't in many other tech group's plans either. Instead of spending a lot of time documenting a traditional BC/DR plan, we focused on modernizing our infrastructure to make it more accessible remotely, moved to multiple cloud providers (providing instant resilience) and reduced our own data center footprint.

DesignIntelligence Quarterly

47



We will be rethinking how we approach Business Continuity and Disaster Recovery planning in the future (and I expect my peers will as well). This pandemic has proven that a cloud first strategy and modern IT Infrastructure with solutions from several vendor clouds (For example Microsoft, Amazon, Google, Oracle) and technology that lets users work from anywhere played the most important role in our ability to shift in a day to 100% to work from home.

DI: Yikes, 600 remote studios – everyone working at home. Aren't you worried about cybersecurity?

RK: Sure, we are. Many new threats and scams are using coronavirus as a reason to communicate including plenty of coronavirus email phishing scams and invitations from unknown "helpful vendors". We've been beefing up security layers of "defense in depth" for several years now. We remain vigilant and aware that risks always exist. That's all I'm going to say on that topic.

DI: – Seriously, how can design practices work with customers and do design without the help of technology in the short term? They can't. And what about the long term if employees or clients prefer remote work or COVID forces additional rounds of stay-athome? We all know a new normal is being defined right now. **RK:** Clients will migrate towards designers who are easy to work with, who can work flexibly, and who have easy-touse solutions. We have a solid base of technology solutions, but we can't stop innovating and learning about what this new normal will need.

On the journey to understanding remote work – internally and with clients, the winners will be the early adopters who continue to pay attention to the people, processes and technology solutions that enable remote design and collaboration. This means cloud-based solutions that can be remotely managed, in 3rd party data centers with security controls and redundant network connections.

We know that some firms are still struggling with technology solutions that can't be accessed remotely, with little or no gateway connections to other internet or cloud systems for collaboration, connection, design, documents and shared BIM models. It's not too late to get going on this, but it's may be a lot harder to find technology resources, partners, vendors, experts to help right now. We're all in this together and I'd welcome connections with peers who need help or to discuss approaches.

DI: Reframing the new normal - what are you learning about the humans and wellbeing in our community by working remotely with all this new technology?

RK: A few years ago, DIALOG invested in a joint research project with the Conference Board of Canada, which yielded the Community Wellbeing Framework - a values-based design thinking framework for improving the health outcomes of architectural design projects. Our rationale was simple: given the proliferation of research into the relationship between spatial design and health, design work needed an easy-touse set of guardrails to shore up the results we wished to produce. In the same way this framework sets boundary conditions at the front end of design, it can also be used as a measurement tool once a design project is complete and in use by occupants. DIALOG's Community Wellbeing Framework (CWF) is different from certificationdriven checklists like LEED and WELL because it defines health along welldefined metrics of social, economic, political, cultural, and environmental wellness.

In our first few weeks of working from home, DIALOG's Leader of Social Research and Strategy recognized an opportunity for DIALOG to measure the wellbeing of its 600+ employees during this time when they'd all become designers of their own workplaces. Using these ideas as basis as the work from home experiment continues, we can



There's no going back 100% to the way it was. The effects of this period of history will be a prominent thread in the tapestry of human history.

generate data in the indicator categories established by the Community Wellbeing Framework and learn a lot about supporting employees working from home. This data driven research is needed to understand how to evolve shared, studio workplace environments in the new normal to support our own employees, clients and create healthy, resilient spaces in the future.

No surprise that in fact many of our team members really like the remote work environment and don't want to return to a studio. Others miss the camaraderie. I sense guarded optimism as one of my colleagues noted "I'm optimistic. I think coming out the other end of this change we will see some incredible developments and innovation. I am hopeful that the positives will eventually outshine the negatives and we'll move into the 2020's a revivified culture locally and globally. There's no going back 100% to the way it was. The effects of this period of history will be a prominent thread in the tapestry of human history."

DI: How is it possible to support employees when they are at home and our Tech team can't just walk up to their desk and troubleshoot?

RK: Technology support on any platform has moved well beyond needing IT support to "touch" broken things. We've focused on automating how we make remote changes to software, solutions and tools our employees need, from their workstations, laptops, and virtual desktops. We're continuing to experiment in this area, especially on how we can depend more on cloud-based solutions – and strong dependence on tools in the cloud.

DI: Don't you need more tech people to support a remote work-from-home company?

RK: No, we haven't increased staffing at all. Our overarching approach has been and continues to be continuous improvement and how to right-size the tech team to scale with our operations. We have been proactive by focusing on building a diverse team that's coupled with putting people with the right skill set in the right positions. This approach has really paid off.

One area we underestimated as we were ramping up to work fully remotely, was the need to the one-stop-shop publishing and training hub: in the matter of days, we quickly produced helpful hints, user and training guides. We also began to offer video training sessions and continue to iterate support tools - our team now offers weekly emails and drop-in training – this week we focused on advanced video and webinar functionality.

DI: Are your existing video platforms flexible and robust enough to keep you connected with employees and clients all day?

RK: Yes, we are working 100% remotely using video but this is not enough. How does working remotely make us different from the design firm down the street, or across the country? Video collaboration

is now table stakes for any organization. It's become a commodity and required to do business - whether you're using Zoom, MS Teams Video, Skype, Blue Jeans (now Verizon), Cisco WebEx or others. We're big fans of Zoom and have been amazed at their agility to scale from 30M to 300M customers in a month while recently upgrading security. As an alternative, we also have Microsoft Teams video available for clients with different needs, and we can connect to any other platform our clients use.

At DIALOG, we recently conducted what would have been a two and a half day in-person all partners retreat via Zoom. While we had to schedule ample breaks, the platform enabled us to collaborate with our leaders and external guests in a seamless way.

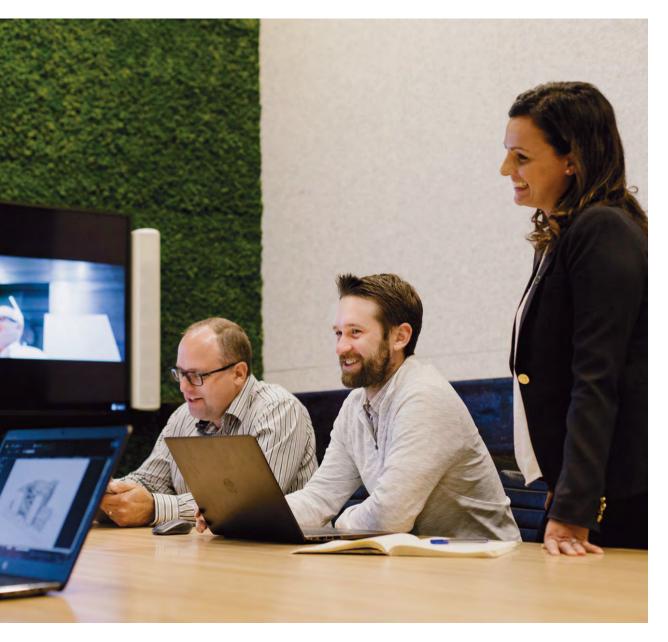
DI: Looking to the future - what other kinds of solutions besides video are needed?

RK: Whatever we do with clients (in a meeting or within a physical space), must also be available online. We continue to experiment with a variety of new tools like whiteboarding, polling, breakouts, webinars, Q&A, sharing models, marking up drawing and designs for different meeting formats and design goal outcomes. In addition to our internal meetings, we're running multi-day client and stakeholder workshops using online

whiteboards, panel discussions and company-wide updates and polls to keep projects moving forward. We've learned in a very short amount of time that productive virtual meeting design takes time. It requires significant planning and a thorough testing of technology solutions. I recommend starting with your desired outcome to determine what technology solution will meet your goals. Sometimes the simplest technology solution (like marking up a document or using a basic whiteboard) is all that's needed. A word to the wise: don't overcomplicate things or overwhelm clients or your company with advanced tools where they aren't really needed or tested well - especially in larger group or with novice users.

DI: But designers, clients, investors, owners, tenants need to walk around spaces, imagine, survey, inspect. How's this going to work if you can't visit a site?

RK: Even before COVID, the pressure for efficiency and quality in design-build and remotely visiting sites at all stages of projects was growing. COVID is making the need for remote site work even more essential and accelerating the adoption of new solutions. Laser scanners, sensors, robotics, drones, robots and construction tools that used to be a novelty are moving rapidly into construction sites. Our 360 cameras are loaned out to super users in



each studio location as we work from home, and they have been in constant demand by project teams to capture site information and allow remote clients and project teams access and collaboration. Sites visits are done virtually on Zoom calls with everyone being able to see conditions. Why have another person on-site when a drone or pre-programmed robot can wander the site and capture updates and conditions? We are also using immersive VR headsets and AR solutions for walkthroughs and expect especially as prices drop this will continue to grow quickly.

Although automated camera equipped drones patrolling a site is a significant change to the way our industry has worked, we need to start simply increasing laser scans and remote work and partnering with construction companies who have tools like IoT (sensor) based devices to monitor progress and on-site conditions. We expect that governments (city inspectors) will start to demand more use of remote solutions as well so that they can playback (and store) the assembly of a project to ensure things were done correctly. This is a challenge that unionized workforce might not appreciate at first, but in time we expect to see everyone adapt - first perhaps for COVID reasons, but also driven by efficiency.

The biggest way to prevent issues on-site is to remove on-site construction altogether, building in factories and off-site facilities where implementation of sanitary processes and solutions improves the wellbeing of workers and the quality of the product (and isn't subject to weather or other environmental delays). Imagine bringing teams from crowded messy construction sites into manufacturing construction indoors. So, we expect to see the new normal drive integrated modular and pre-fabrication more deeply with bespoke design that we are known for and a further acceleration of the adoption of off-site and modular construction into our industry.

DI: Our industry is heavy on paper drawings and stamped approvals, so now what?

RK: Welcome to the future! First, we're pleased to see even less paper (with less access to printers) during this pandemic, and virtual 2D drawings that can be marked up with real-time collaborative virtual markup tools like Bluebeam. We've seen more requests for training and access to digital signature solutions that were already in place for certified professional to digitally approve digital documents in the jurisdictions we work.

Longer term, we are anxious to address the issue identified by Thornton

Tomasetti's CTO Rob Otani who estimates 34% of project cost today is "flattening" 3D models into 2D drawings. Maybe this first step of moving to more digital drawings and e-signatures that eliminate or greatly reduce paper will encourage more of our industry to ask how we can move toward clients and permitting authorities expecting 3D vs. 2D models. Some of our work today already involves more advanced BIM and 3D models and visualizations for clients. We are already working with industry groups and governments to innovate in this area and eventually eliminate 2D drawings with new 3D standards.

DI: Video chats, online whiteboards, polling tools and virtual walkthroughs are great, but is this Radical disruption? Is this what will sort the Digital Thrivers from the Digitally Unequipped?

RK: Not completely. Our Work from Home technologies just let us do our work remotely and prove that our industry can and is innovating and introducing technologies faster. It's about time.

But, as the pace of technology accelerates relentlessly and as our design industry gains agility with change, the push to innovate even faster will continue. Design automation especially of repetitive

design tasks - mechanical, electrical, structural design will continue to grow. DIALOG is already innovating building our Green Toolkit and Green Tracker tools that generate, store and use data from early stage design to provide more information to designers and clients about a project's viability. Our Green Tracker solution collects and automatically submits AIA2030 challenge data to the AIA and we are exploring making this tool publicly accessible to the industry in the next few months. Our Green Toolkit uses and generates data from public and our own private modeling and machine learning to assess architecture - engineering design tradeoffs. Longer term we plan to add tools for other disciplines to other metrics earlier (like total lifecycle costs, carbon embodiment, risk metrics) and drive more collaboration and workflows in the way we work across disciplines. That is Radical Disruption – coming within a few years to our world. COVID-19 is just preparing this generation's workforce to adopt technology even more rapidly than ever. Even small projects to "get in the game" with new ways of technology will pay off as the push to innovate in our industry accelerates.

DI: So, what's on the other side of COVID-19?

RK: The better we get with technology,

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Welcome to the future!

the more our clients will expect efficiency and quality. They will expect us to continue to do more with less; always looking for more automation and better quality. Billions of dollars are being invested in automated design workflows, construction, fabrication, modular and other innovations in our industry. Now that we've proven we can adapt to this new normal, the pandemic will put even more cost pressure on design efficiencies – driving automation in our workflows from early stage design through

construction. In many ways, COVID-19 is technology's chance to shine and prove the investments we've made over many years have been worth it. Unfortunately, it seems that pandemics and disasters (like a few hurricanes and floods early in my career) are a silver lining for innovation and rapid acceptance of new technology. In this sense, a pandemic can be a catalyst for innovation. I remembered one of my favorite colleagues who wandered by my (studio) desk a few months back and commented "Roberta, I'm tired of the pace of technology change" and I thought to myself "How do you think I feel?"

And that relentless beat never stops.

Roberta Kowalishin is Chief Technology Officer at DIALOG, a design practice with studios across San Francisco, Vancouver, Calgary, Edmonton, and Toronto.DIALOG's work includes designing for community wellbeing and urban vibrancy, health and wellness, transportation, education, arts and culture, residential, retail and commercial, as well as mixed-use solutions. Roberta brings out of the box thinking and technology experience to the AEC having previously in consumer news media as the CIO of NY-based Hearst Newspapers, and in cybersecurity and records management as director of privacy and forensics practices for PricewaterhouseCoopers. Roberta was also VP of technology at CapRock Communications, a venture-backed satellite network service. She uses her vast experience from other industries to help us learn and adapt to new and disruptive technologies.

Roberta holds an MBA from MIT, a BCom in Economics from McGill, and Harvard's graduate certificate in Cybersecurity as well as the CISSP (Certified Information Systems Security Professional) credential. She has been cited as a next-generation CIO by the Wall Street Journal and has been quoted in Business Week, Wall Street and Technology, and Information Week.

Scale: Supply Chain Thinking in the Circular Economy

gnIntelligence Quarterly 

FEDERICO NEGRO

Founder and CEO of The Canoa Supply Co.

An Interview with Federico Negro, Founder, Canoa Supply PBC

DesignIntelligence (DI): What's so radically different about what you're doing?

Federico Negro (FN): It starts with the idea that when you're doing one building that's a one-off, that's called project delivery. But when you have to do several hundred, that's called a supply chain. It's as simple as that. Instead of analyzing where things come from and how they get there, working at scale is a fundamentally different framing of the problem of building and operating than most people get exposed to. It's super fun, something I like to nerd out about. Other people may not find it as interesting.

DI: But more will need to. That's an industry problem that may never be fixed. The lion's share of architects may still want to just cobble away on one-off

things, because that's what they got into this business for. But more people may need to go down the road you're on. I had a good chat with Craig Curtis from Katerra. He talked about platform and scale. I had the mistaken impression they were trying to be as big as possible through acquisitions. He said, "No, we're just trying to have a platform, and to scale. We don't want to do all the work ourselves, there's a place for partners and other people." My preconception was wrong. But the supply chain and scale notions you're talking about are at the core of it. Your career has been eventful. You were traditionally educated as an architect and designer. You formed a groundbreaking firm in Case, and then you became part of the unbelievable growth at WeWork. Now, you've pivoted yet again to do a very different thing

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56

DesignIntelligence Quarterly

> It starts with the idea that when you're doing one building that's a one-off, that's called project delivery. But when you have to do several hundred of them, that's called a supply chain.

It's as simple as that.

around supply chain. Tell us about that evolution.

FN: I got into architecture because I love the space. I love design and buildings. I can't get enough of it. After grad school I worked for an architecture firm. I did my share of design, project management and construction administration. I was on the path to licensure. Then, the 2008 recession came. With a couple friends, we spun-off and started a company called Case. At that time, there was very little investment from a tech perspective. No venture capital money. Real estate technology ('re-tech') funding didn't exist.

If there were small funds out there, we didn't know where they were. So we did what we knew how to do, which was sell our expertise. That focused on technology. Trying to help design firms use technology to reposition themselves, improve their design processes, profitability, employee experience, and ultimately, set themselves up for the coming decades. That came in varying packages. All the way from management consulting where we helped companies decide whether they would need a CTO, or whether CTOs might be fundamental in the future in a completely different way. Instead of being a cost center they might be a profit center. All those kinds of discussions, from training, to services and software development for hire.

DI: You almost invented a space that hadn't existed by making yourselves an integral part of a supply chain to design firms who didn't have those capabilities.

FN: If we didn't invent design technology consulting, we made it a household name. In places like New York, LA and San Francisco. Less so in other places. The idea that a technology consultant could be a vendor to an architecture firm was very much unknown up to that point. It took a lot of convincing. People thought: "Wait a minute, we're paying somebody to help with technology and it's not just about fixing our email?" That started to resonate and accelerate. We borrowed a model that bigger firms may have had internally, notably Foster Associates and SSG Group. We loved the energy we had and were seeing in conferences. We saw a different type of practitioner in our peers, and wondered: "When all these people who 25 are 50, what are they going to be doing? What are their roles going to be? What do those architecture firms look like once all these people have worked their way up the ladder?

We tried to get firms ready for that future. We were lucky enough to do well over a few years. We grew to about 60 or 70 people, but by the end of it we found our best clients were large brands that had internal design teams. Companies like WeWork, Apple Retail, Estée Lauder, Disney Imagineering, and companies like that that had internal design teams where space was a fundamental part of their core offering. But they didn't sell services.

They were product companies that used space as a way to deliver their product. From a supply chain perspective that was interesting. Very much like an OR is a fundamental piece of infrastructure for a hospital, an Apple Store is a fundamental piece of infrastructure for Apple. They need it to be open by Christmas. Retail had interesting business practices we saw permeate into other sectors. Most notably, workplace. That's what was interesting about WeWork at the beginning. They didn't invent co-working. They didn't invent a lot of things, but we said: "We've built technology and consulted for retail companies, we believe applying a retail methodology to workplace would effectively create a roll-out model that would allow us to build at speed, improve quality, and drastically reduce our costs and risks on a per-project basis.

Those conversations ultimately led us to join WeWork full-time. They acquired our company. For the ensuing few years we built the internal machine to be able to get all the work done. Several million square feet a year. The last year I was there we did 16 or 17 million square feet of interior renovations. In one year.

It was a fascinating experience from the perspective that we had to build an internal studio. We still needed the knowledge but had to deliver it in a fundamentally different way. A more effective, more efficient way.

When you've got to make a decision about door hardware, that decision is going to get amortized across a thousand projects, so you can take a little bit more time to make that decision correctly. Once made, we're not going to revisit it again for a year or two. Unless there's some innovation or something we want to bring to it. We were of thinking of architecture as a product. That allowed us to pivot our thinking around project delivery and the software we used, our processes, the types of people we hired, and how we did procurement. We did all the procurement for our projects. It gave us a way to map how this stuff gets delivered. We were involved in everything.

We had the product definition, the design of a prototypical space, what we call our design system. That got applied and instantiated across many different locations. Geometrically, environmentally, and - depending on specific base building conditions - that design system would respond accordingly. Then we would procure, build and operate it. We didn't leave. We had five, six, seven hundred thousand people walking through our doors every day.



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This is where the concept of space as a service was born.

It was fascinating. If somebody didn't like orange, I would hear about it. So, across a whole portfolio, we would have to find how many buildings had this specific color of orange. Potentially, we'd have to send crews in to repaint it. If it's just one source or one datapoint it's not good enough. If something becomes a trend across multiple locations, members, and potentially, multiple countries, then you're getting direct feedback as to whether it works or doesn't work. It's no longer: do the best we can for this client and go away.

This is where the concept of space as a service was born. A lot of people get that wrong. Space as service is founded upon the idea that it's iterative. It continues to improve over time. It has to learn from its users. It has to take a page from user experience. As a result, it has to adapt. Being able to be there and recall a chair, repaint a wall, or push out a whole new security system over an entire portfolio, are things we had to manage. From a supply chain perspective, it's not about just procuring for your project, it's about the managing a portfolio of work. That's the part that I fell in love with. The idea that number one, buildings can and should get better over time. Number two is that as architects we draw this line in post-occupancy and call it post occupancy. It's like there's an imaginary

wall. On the other side of that wall we know there are humans and buildings and operations. We've tried to break that wall down. To a lot of firms, it's unattainable. Some people have been able to, and they've not been able to do it at scale. Figuring out what services are on the other side of that wall is hard.

But we got in. We had a front row seat to it and it was amazing. It taught us so much about design, people and how they use space. About how you can measure different things, improve space, and how you change your processes as a result. How maybe even the tools we were using were fundamentally wrong and where we were spending money was fundamentally wrong.

It opened a whole new world for me in terms of how to look at space and experience. From that perspective, all the different layers created what we called a product - which was a typical WeWork location. From landlord-scope infrastructure all the way to the actual tenant fit-out we tried to codify everything. Everything. For low-voltage design, our specifications were handed to local teams everywhere to make sure from municipality to municipality we were abiding by all the codes. We had a standard much like retailers have standards. We could say: here's our

SPACE ASASERVICE

standard, now make sure that it works locally. The idea was that this network of buildings was in fact a network of buildings, and that the buildings weren't singular. It wasn't a collection of buildings it was one giant thing that had to be managed together.

If somebody calls you one day and says, "Hey, this dishwasher we've specified is breaking within a year. I still need to use it and it's broken at 7% of our locations," we have to get rid of it. You then have to develop a process that recalls all the ones in operation, the ones already procured but not been installed yet. Then, we have to push a new standard for future projects and renegotiate all the deals with the suppliers and installers that were providing them.

If we didn't have an internal team, all this would have been layers upon layers upon layers of change orders. Eventually, you realize: I need an architecture group. I need an interior design group. I need millwork experts. I need an electrical engineering group, and a low-voltage group. And I need plumbers. Part of the idea was not to vertically integrate our supply chain but to vertically integrate the knowledge needed to buy that supply chain well.

So, we became a cross-disciplinary

internal design studio, where every team and region had low-voltage people, AV-IT people, architecture people, interior design people, material experts, technical directors, and creative directors. Because we were buying lots of services and products on the outside, we needed to be the smartest people at the table to buy them well.

People would often ask us, "Why do you have a lighting group?" Or, "Why do you have an acoustician?" Because our product is defined by all of the above, not just the architecture. I wanted my architects to be sitting right next to the construction manager. A lot of the aspects of integration people talk about with design and building, we got to do without having to evangelize or convince anybody. We did it because it was the best thing to do for our product.

DI: You're a designer at heart, but you've loved the mindset change to deal with things that scale. Did the old designer's mindset ever get in your way? For example, you've made the hardware decision, but now somebody on the team wants to pick a new one because it's cool, different, or innovative. Were you fighting with yourself in that regard or were you able to cross that line and think like a businessperson?

FN: Architecture is interesting because some aspects, specifically in the world of web and digital design, consider design research to be fundamental. In those fields of design thinking something is cool is exactly the wrong thing to do. It's a different approach, applying different thinking to find the best fit for this particular product at this particular time. None of them are right or wrong, it's just that for us it was all about creating a product that got better over time. I had countless conversations with people who said: "I just found this other cool new thing." I said: Prove it. Test it.

We had a research group and a product

development group. Part of their task was to validate things. If we found something we think might work better, first, it had to be related to a problem we know doesn't work well yet. Second, it had to be proven that it will work better. Go install it in 10 buildings. Test it and see it. Then come back with the data and say, yes, this fundamentally works better.

Aesthetics played a big part. From a creative perspective we wanted to have a strong, identifiable brand. Concessions were made, but all the decisions had to go through a series of filters, the last of which was: is it scalable? If it wasn't scalable it wasn't worth doing. That's fundamentally opposite to the world of art and certain design contexts where uniqueness and rejection of scale are the right answer.

DI: Is it just a different program requirement or criteria set? When you're designing to scale it's irresponsible to do anything else?

FN: Exactly. If part of my task is to make the best product while reducing global cost by 25%, then I need to choose a door handle, not just because one person thinks it's cool, but because I can source it, afford it and it meets code in multiple regions and countries. There's a whole host of decisions to make. For us, it takes a long time to make a decision, especially an expert decision. Sometimes it takes multiple experts to come together. And it takes testing, data, and user feedback. It takes all those things.

Once we've made a decision, we have to make sure it applies across all our locations, or the majority of our locations. Otherwise, we could never be able to afford to do it over and over. Part of the reason we were able to scale so quickly was we built an amazing crossdisciplinary team. Remember, there were no contractual agreements between my engineer and my architect. Zero. They were coworkers. There was no barrier, no insurance layers, nothing between them.

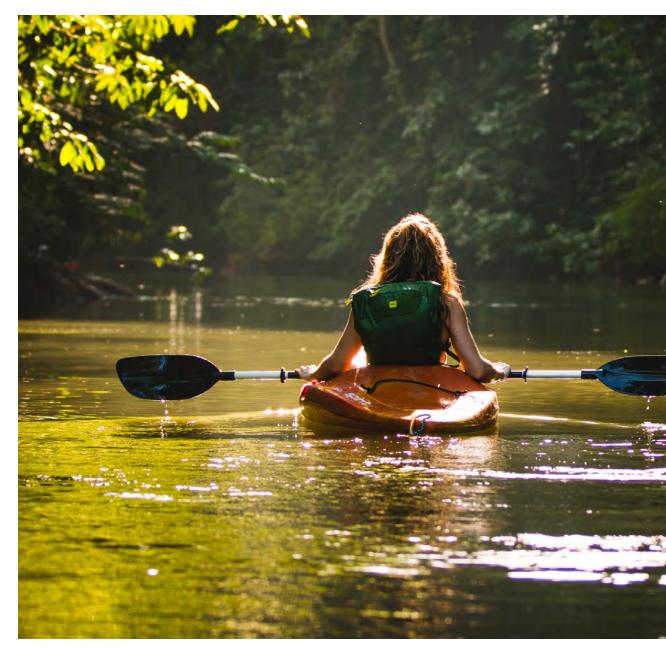
DI: A common mission, can't fail mission. You're talking about the hubris of building it all from scratch. I was astounded by your growth rate, having to figure it out, create a system and deal with the growth - doubling every year. What kept you going? Was it the energy? The people? How did you cope with the accelerated pace?

FN: A common mission, and it's just "go". We have a thousand dollars and I need to yield as many locations as I possibly can with those thousand dollars. That's it. And the product needs to be as good as it possibly can be. The team was amazing. We removed 100% of the typical project delivery bureaucracy, which, by the way is designed to spread risk across a large pool of entities. Here it was one entity. We were the operator and the client, so if we revenue was bigger than the investment in design and construction cost.

Speed was everything, so it didn't make sense to go out of house, redesign, or go out of house for anything besides code consulting, expediting, and those kinds of things. From a design perspective, it's more like designing a car or what I would imagine Steelcase or IKEA go through. You're making something adaptable and applicable to a large pool of people and locations. That one thing has to be absolutely as good as it can be and be the lowest cost it possibly can be - while still remaining good. You're trying to make the design inclusive, not exclusive. We wanted to be able to have a nice workplace for as many people as possible. As opposed to only Google having a nice workplace because they can pay a great architect to do it for them.

DI: And now, another pivot. What is Canoa's mission?

FN: After I left WeWork I took some time off. It had been 12 years of nonstop startup hyper-growth mode. But, after a few months off, I realized I missed it.



What I'm trying to do at The Canoa Supply Company is use the lessons of the last four years, plus consulting years before that. Six and a half years of retrofitting buildings and workplaces. I realized I really enjoy scaling design almost more than doing the design to begin with.

I'm effectively building a company that takes that scaling service and - instead of it being internal to one company - serves different brands that have that same necessity for scale. When I say brands, it could be enterprise companies with many offices, a retail client, or a senior living facility with many locations who wants to be able to make their portfolio more efficient in the way it's designed, deployed, procured, and maintained. We're building technology to help us with that supply chain.

The one big piece I'm adding is the circular economy underlying it all. I want to be able to take an architect's responsibility for the stuff we put out into the world.

To some degree we're looking at models of furniture as a service, for example, where you can buy all this stuff, rent it, or lease it. We're looking at these financial structures to be able to augment our core revenue because we're designing decommissioning into our services. For us, the moment you're done with it it's still my responsibility. There's a big business opportunity there, but it also has to do with our responsibility as architects. We are not defining the design space correctly with the traditional business model. It's not that I don't want to use a traditional business model, it's just too siloed. I want to be able to go to from beginning to end.

DI: "When you get done with something, it's still your responsibility..." Is that because you own it, or is it just your moral, environmental responsibility to care about its disposition?

FN: Both. I want to be able to help people with decommissioning and liquidation or convince them they may not need to buy it at all. They could just rent or lease it. We've researched this. Commercial furniture is usually made to last 20 to 30 years. The first buyer in class A office space on average, uses the asset, say a piece of furniture, for five to seven years. Which means most of them are liquidating it. They've already written it off from an accounting perspective. Most are moving on for stylistic or functional upgrades, or the lease ran out. For whatever reason, most people are letting go of their assets 25% to 40% of the way

through their estimated life. 60% of the life of that asset is still available to somebody. That's money. It's being sold for scrap or thrown out. We're focusing on interiors and retrofitting. A big part of that is furniture. We believe in the future, furniture is going to have more prefab and demountable solutions, all the way to HVAC and other systems. Less construction is going to happen in the field and more systems will be deployable. From a sustainability perspective that's a huge gain. Construction has a very heavy footprint, and also from a time and cost perspective.

We've launched Canoa with a first offering we're calling a "construction-free workplace solution." We believe it can meet 80% of the use cases. We're purposefully evading construction because we can offer something at 15 or 20 bucks a square foot that would typically be 125 or 150 dollars a square foot for a medium or large business. By the way, it's 100% adaptable, so if you're done with it or want to rearrange it, you can do it.

DI: In your financial analyses rent or lease versus buy or build, have you looked at sharing? The granularity of rideshare or bike sharing? Is that feasible in your world?

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FN: I don't have an answer yet in terms of what the right solution is. What I'm saying is we're exploring the space. Mostly because we're effectively creating the company I wish we would have been able to hire at WeWork. If your job is to manage multiple workplaces, retail spaces or restaurants, you're doing that at scale. It's a fundamentally different proposition than if you're only doing two or three locations. Effectively and efficiently managing all that stuff, deploying new ones, and refreshing all that is hard. It takes real technology to do it, and a different type of organization. It also takes a different financial model. Most of our revenue is going to be subscription or product-based revenue. Services are going to be a minor part of what we do needed to do a large customization.

The sharing economy? Sure. When was the last time architects bought plotters? It's been more than a decade. You get the plotter free if you buy the ink and paper contract. By the way, don't even use plotter space, use a reprographic service and they'll do it all for you. Most businesses moved to leasing or renting automobiles, printers, plotters, coffeemakers, and restocking the fridge decades ago. For whatever reason, furniture is still considered an asset and gets depreciated over time as if it was technology or IP. It's not. It's just a chair. If you're going to be using that chair a long time, that's fine. But some types of spaces require refreshing relatively quickly. What we've seen over the past few years used to apply mostly to retail, restaurants and those typologies. Now we're seeing workplace being 100% part of that category, not part of what we're going to build for 10 years or for 15 years. Workplace now wants to refresh every two to three years.

DI: You saw that before COVID was a household word. Now more than ever we're talking about needing less space, and more flexible, adaptable space. How do you see Canoa supporting that in five years? Can you share your vision?

FN: We have a strategy and a few goals we're aspiring to. We've incorporated as a public benefit corporation, so, first, we're going to be transparent. After one year of operation you can apply to be a B corporation, which we'll be pursuing. The idea is to collapse design and installation as a turnkey service through effective technology - because we want to be responsible for what we're putting out "

We've launched Canoa with a first offering we're calling a 'constructionfree workplace solution.'

into the world. We won't specify product we're going to have to be responsible for when a customer liquidates. We know something used is more likely to move quickly if it's made of wood, steel, or aluminum. Plastic things don't have a second life. Usually, even their first life isn't as long as you'd like it to be. We're creating kits or solutions called 'office in a box'. It's 99% plastic free. We're thinking about doing a vegan model. All these go to decarbonizing the built environment. We have to be responsible for what we're putting out into the world. The way we've defined that is if I put something into your space, when you're done with it, you need to call me. I'm going to be responsible for going to get it, and I'm going to try to get a second life out of it, reuse it, or recycle it.

Our supply chain platform includes partners signing up for donations,

recycling, and buying stuff based on weight or container. Because we make it, we take it apart. That's our objective. Where do I see us five years from now? Ideally, I see us having been able to achieve scale where the full supply chain has been proven out. Where we've created a model where we can continue to deliver ever-better, healthier environments for people that are also healthy to the planet. And we're doing so under a sustainable financial model. That's my objective. That's where we're going. Any more than that would be guessing.

DI: A noble vision. Another chapter in what I have to believe is a career only 25% into its journey. I look forward to seeing what will happen. This is radical thinking that could open some eyes and help people.

FN: I'm glad to hear that. Thank you for

this conversation. Sometimes it's lonely out here.

DI: It takes courage and conviction to do what you are doing. I have no doubt you'll succeed.

Federico Negro is Founder and CEO of The Canoa Supply Co. From 2015 to 2019 he was head of Design at WeWork. Previously, he was founder and head of the projects group at technology consulting firm CASE Inc., which was acquired by WeWork. He has experience with SHoP Architects and holds a Master of Architecture degree from the Parsons School of Design, and a Bachelors degree in Architectural Sciences from the University of Illinois. A native of Uruguay, he currently lives in Brooklyn, New York. Intelligence Quarterly

65

Reinventing the Firm

DesignIntelligence Quarterly



DAN NOBLE

President, CEO, HKS

Dan Noble reflects on HKS's firm transformation using a values-based approach. An inside look.

DI: You have had time for reflection during the COVID sheltering in place and working from home period. What have you been thinking about — personally, for your firm, and the industry?

DN: This time has been valuable for reflection. Although we are quite busy, my schedule has been more predictable and stable these past months. That's given me time to think, strategize, and determine what is important in this phase of my life — for me, as well as for our firm. I stumbled into a balance that has enriched my relationships and connections to many facets of life, personal and business.

My outlook is positive. Things are never as bad as they seem, nor as good. We are in a time of accelerated growth in innovation, technology, and focused, quality thinking. Good things always come out of these trying moments when we're grinding away with purpose. We will take these lessons into the future to improve lives and do good. I believe we'll look back at this time as one where we experienced a quantum leap in the quality of our lives. It may not feel that way while we are immersed in it, but time and perspective will be the barometers.

DI: Your firm recently completed a strategic refocusing — a reinvention of sorts. It seems prophetic that you

DesignIntelligence Quarterly

66

accomplished this just before the arrival of COVID-19, and simultaneous economic, racial, and political crises. Are you a shaman, or was it a case of good timing and fortune? How did the process come about? How long did it take? Who did it involve? And how would you score it on the "pain index" on a scale from 1 to 10?

DN: Mostly good timing and good fortune. I've been in this industry

long enough to expect constant cyclical fluctuation. After such a prolonged expansion, we knew we were due for a down-cycle. We had been on a ten-year run and felt like we were on borrowed time. That compelled us to reimagine our strategy and look for ways to continue to evolve — possibly even re-invent ourselves. We felt a change was afoot, but honestly, I don't think anyone could have anticipated what we've experienced this year.



We started the process in the winter of 2017. I had met Dave Gilmore a year earlier, and we were kindred spirits in philosophy, ethics, strategy, and friendship. We hired D.I. and Dave to work with us to understand who we were and who we wanted to be before we jumped into planning. That's something all firms should consider. That self-reflection and imagining forced us to look at every aspect of our business, from how we were structured, to how we invested our resources, to our people strategy.

We better defined our values, developed our mission and strategy, streamlined our business structure, created accountability and role clarity, and formally invested in a powerful Environment and Social Governance (ESG) strategy. Last year we created a Director of Justice, Equity, Diversity and Inclusion (JEDI) position. We put our money where our mouth is by investing in these things – and it all fell into place to put us into a managed position to deal with the crises that presented themselves this year.

We are experiencing a punctuated equilibrium in our society – a

sudden, intense period of change in an otherwise stable world. Revolutionary vs. evolutionary change. I'm grateful we had already put in the hard work to reposition ourselves — not only to survive but to thrive during such a time. To use a sports analogy, we let the game come to us.

We started with a small group of leaders talking about our core values and expanded that to meet with all sector and regional leaders in a series

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The biggest pain point was holding our existing structure and strongly held beliefs too tightly. We needed to loosen up our thinking and let go of our egos. of work sessions. Ultimately, to all shareholders. Dave was instrumental in guiding us through this process. It took over a year to complete and coordinate all the content of the work sessions and nearly another year to test and put the structure in place.

Two years later, we are still learning.

On a scale of 1-10, it was probably a solid 7 – some days a hard 8. Change is difficult. For some, the biggest pain point was holding our existing structure and strongly held beliefs too tightly. We needed to loosen up our thinking and let go of our egos. In that uncomfortable space we allowed ourselves to imagine what could be. We realized we had been operating in silos, and we didn't have some of the business rigor and intention we needed to continue to grow and prosper. Formalizing the Plan was just the beginning of the story. The necessary change enablement strategy that followed was just as important – if not more so. Changing legacy patterns of entrenched behavior takes time, patience, and constant strategic communication.

DI: Can you describe the transformation to build a foundation for readers? What was the firm before, and what is it now? Structurally, culturally, and in every other way.

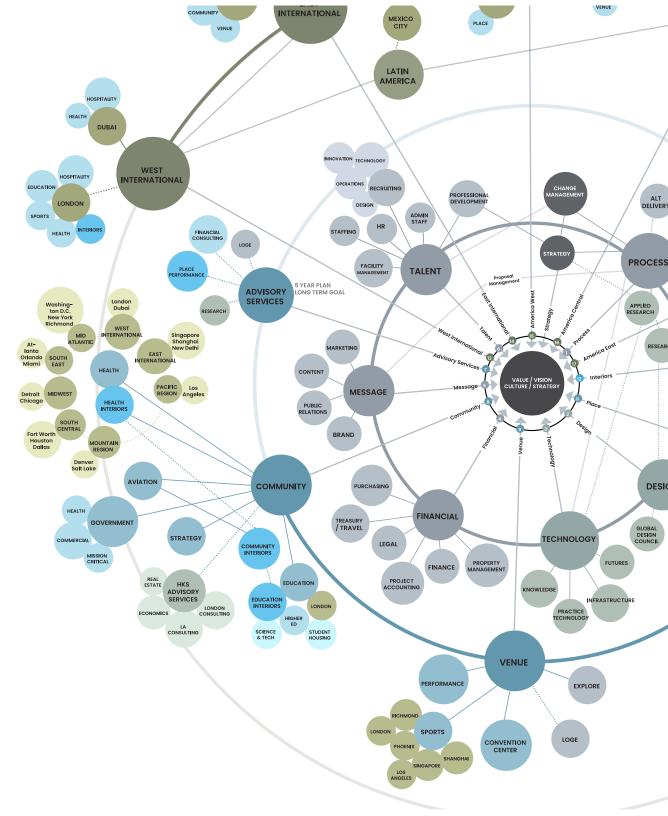
DN: In 1939, our founder Harwood K. Smith created a firm that felt like family and became known for technical excellence, professional management, and outstanding client service. Over the years, many spent their entire career at HKS. If there is one aspect we didn't want to lose, it's the family culture our firm was built upon, and the continuity through generations.

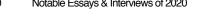
So, when we kicked-off our visioning sessions, we started by defining our values. Our values aren't just our business — they're personal. Relationships, Character, Purpose. These values make us who we are as connected humans and define our firm.

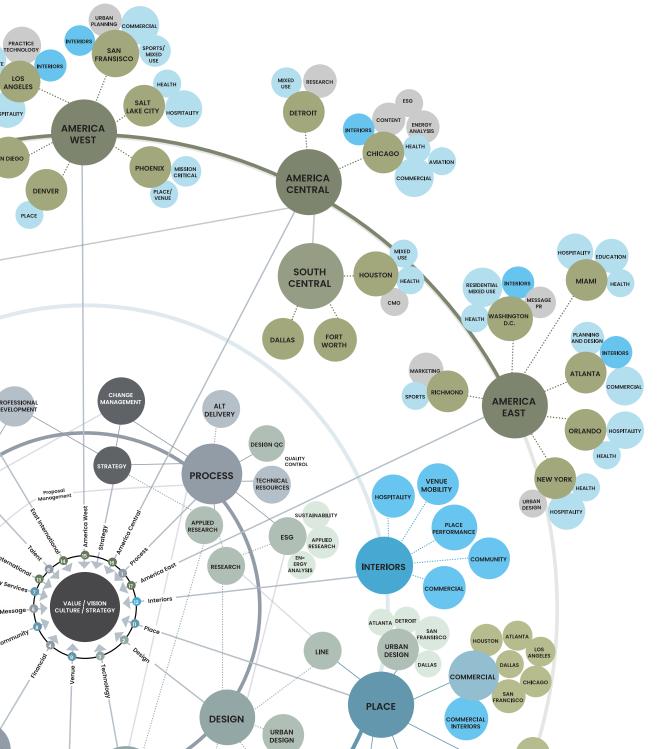
We clarified our vision: "To be the most influential firm in our industry." Beyond the buildings, we want to impact and influence the people who engage with the space — furthering not only our firm, but the industry. We want to create the kind of architecture that heals communities, brings people together, enhances their lives, solves real problems, and is beautiful too. We want to expand our expertise and renown in technical delivery and make our mark as a firm globally known for our outcome-driven, high quality design.

For our organizational structure, we built on longstanding logic. We had always been a sector-driven, regionexecuted firm. Our new plan simply clarified the relationships and drivers between our sectors and regions. By clarifying roles and decision-making responsibilities, we gained accountability and agility in determining our market strategy and in which marketplaces we wanted to invest. We mapped a more robust, equitable, and diverse leadership structure and changed our culture to be more collaborative and forward-thinking.

We also simplified our reporting structure. In the past I had over 80







direct reports. By shifting and distributing the leadership responsibility, I have fewer than 15 now, but I've also empowered others to grow and assume leadership roles to leverage our talent more effectively. I still have an open door, but now I share in the accountability and mentoring with a larger team of leaders.

DI: Why did you decide to undergo such a radical transformation? Your firm had been successful and had decades of longevity. What was wrong with the status quo, or with continued incremental change and evolution? What were the primary factors that drove you to reinvent the firm?

DN: As an 80-year-old firm, we were hovering in the territory of becoming commodifized – which we feared would lead to stagnant opportunities at best and irrelevance at worst. We could no longer afford to call ourselves an "architecture, interior & urban design" firm. We had to organize and resource ourselves to become a problem-solving technology firm that provides design services. That's not just semantics. It's

a seismic shift in strategy. We sought to become a "solutions" firm that influences our industry to create a better world. As designers, we are uniquely equipped to optimize urban design, density, socialization – even pandemic control. Our voices and expertise can generate powerful influence in every one of our practice areas – from community and health groups to schools and city planning.

DI: What initiated it? Were there key indicators, feelings, hunches — or data that prompted it? Client,

partner or associate feedback? Or market and contextual awareness? How did you know it was time?

DN: The recession of 2009 profoundly impacted our firm. Having lived through that, I wanted to understand how we could be better prepared for future contractions in the economy. I love the quote by W. Edwards Deming: "It is not necessary to change; survival is not mandatory." Especially now, agility is THE indicator of a firm's ability not just to survive but to



thrive. How quickly and nimbly can we adjust to the needs of our clients and communities before our competitors do? This dynamic will only be amplified with each passing year.

But it's important to know we did not deny or reject our history to reinvent the firm. We didn't throw the baby out with the bath water, so to speak. We took the best things about our history and improved them and took a hard look at what we wanted to be in the future and figured out a transition plan to get there.

DI: Since your firm reinvention two years ago, in the current context, how did you do? Certainly, you couldn't have imagined any of what is happening now. Are your new systems serving you well? What are the greatest successes? Specific services, forms, systems, or concepts that have been game changers? Any that didn't work as well that need to be refined? Has the firm's new strategy positioned you to better cope with COVID and the other crises we are facing? How has COVID affected those strategies?

DN: We are certainly more agile than we were two years ago. Change is like a muscle. If you don't exercise and flex it, strength atrophies. If you exercise consistently, you are building muscle mass you can leverage when you need it. Our endurance and comfort with change has been enhanced over the last two years of focused effort.

The cross-practice agility and creativity we demonstrated in tackling some tough assignments in record time to deal with the surge of COVID cases is one great illustration of how our culture has changed and strengthened. We worked with the Army Corps of Engineers to transform convention centers and decommission hospital spaces into COVID treatment spaces. And, we did it in a matter of days, not weeks or months.

Our hospitality, health, and advisory leaders came together to define ways hotels could be healthier and adaptable for other uses. We made an acquisition into the senior living or later living building type, because we felt that industry was ripe for re-



"It is not necessary to change; survival is not mandatory."

-W. Edwards Deming

invention and meshed with our expertise in health, hospitality, mixed use, research, and sports.

We wrote research pieces on loneliness/isolation, mental health, and human behavior to understand how isolation affects our work relationships and personal lives. We redefined office space design to create more effective teams and a safer hospitality space, expanding beyond physical environment to digital. We formalized our Advisory services – not just micro, but macro solutions. Rather than merely physical environment, we looked at the implications of how we use space more effectively to rework the client's processes.

Many examples of cross-practice thinking wouldn't have happened in the same way before we implemented the plan. COVID played a role in moving us to a virtual environment, which enhanced our communication and collaboration. The plan also exposed some gaps in leadership and resources, and we have been

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Honestly, we surprised ourselves with how many 'impossible' disruptions we were able to navigate.

addressing those to strengthen those capabilities.

We also realized we didn't have a structure in place to measure performance at the level the plan required. This year we invested in a performance management system that allows us to create and track target Objectives and Key Results (OKRs) at company, practice, and individual levels. This not only helps us measure specific objectives, but also gives us a connected, big-picture vantage of our priorities and investments. In short, we are absolutely better positioned and poised to cope in times like these. Our clarified roles and responsibilities help us make decisions quicker. We're better informed. We don't waste time wondering who the key stakeholders are – we know them and are able to spend more quality time focused on the challenge at hand.

It has also made us smarter in prioritizing our investments. We use the strategic plan as our guide for making difficult decisions. Honestly, we surprised ourselves with how many "impossible" disruptions we were able to navigate. For example, moving an international company of 1,300 to a purely remote working environment in 3 days without skipping a beat, and almost immediately advising our healthcare clients on how to radically transform their operations in the face of COVID.

DI: Has COVID necessitated any further organizational shifts? Service line or locational shifts?

DN: Not significantly. We've moved people around between practices to

balance the need. Hospitality, sports, and commercial don't need that help. Health, education, mission critical, research, and advisory services did. Shanghai, Singapore and Dallas remain busy, so we've shifted resources to accommodate their needs.

DI: You have a strong consulting advisory services practice. Has COVID affected that, or impacted its location and centrality?

Yes, they are very busy and in demand. We've added personnel in London, Dallas, Austin, and California. Both our research and advisory teams have been working overtime to provide service and guidance to our clients and communities.

DI: What do see as you look forward? Your contemplations about the firm, the industry, and the world? How are these uncertain times shaping your view of the future?

DN: I'm an optimist. I see great things coming out of this time of

sacrifice. I believe you make incredible strides when times are challenging. Necessity really is the mother of invention. I've asked our leaders, "Do you want to be the authors of your future or the victims of your circumstances?" I believe, as designers and problem solvers we can help define a better future our communities are clamoring for.

DI: What does the HKS life cycle curve look like going forward?

DN: We will always have peaks and troughs – that's normal in a business. But the behavior and accountability we have in place now will allow us to run the business while intentionally looking ahead.

If we're structurally sound and appropriately diversified, we can stay ahead of the innovation curve using novel ways to support our clients. We believe the work we have been doing will yield a stronger, more equitable firm — one well positioned to meet the challenges of the future. We're excited to explore what is next.

DI: When will you be due for your next reinvention? Will it be just an oil change or a whole new vehicle?

Or maybe abandoning vehicles and inventing a new kind of transport?

DN: As a learning organization we are constantly assessing, iterating, learning, and retooling. It's funny, we look at our business in terms of the machine and the fuel. Our goal is to constantly refine and optimize how our machine (our people, governance, structures, processes, etc.) functions, while ensuring a steady supply of the right, high octane fuel (our people, client relationships, projects, revenue, strategic diversification, etc.). With a balanced focus on these two critical aspects, we don't have to completely reinvent ourselves. Instead, we can simply create the most sustained, optimized performance possible.

DI: What can you share about the experience and process of firm reinvention with others who haven't completed their own? Any advice for how to go about it?

DN: Large-scale transformation is not for the faint of heart. You need real commitment and buy-in especially at the highest levels of leadership. You have to know it's a marathon, not a sprint. It's an exercise in sequential layering. Some changes can't be made until others are solidified. For example, you must have a functional organization structure before you can make more granular changes at the practice level.

You also need an appetite for extreme transparency and trust. It's not always comfortable – but without it, your communication and change efforts will get waylaid before they begin.

So, with some endurance, grit, honestly, humility, trust in your fellow leaders — and a big dose of levity — any kind of transformation is possible.

Dan Noble, FAIA, FACHA, LEED AP, is President and CEO at HKS. An architect, Dan leads the strategy and development of a global design firm. Under his leadership, the firm has won numerous design awards from organizations such as the World Architecture Festival and Fast Company. Dan values character, purpose, and relationships, and instills these values into the firm's culture.

Market Expectations in a "New Normal"

DesignIntelligence

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KEN SANDERS

Managing Principal, DesignIntelligence Strategic Advisors Rapid-response and long-term strategies require granular, client focus. Opportunities abound. Ken Sanders shares postpandemic market thinking.

DesignIntelligence (DI): Anticipating a gradual post-COVID recovery and return to work after this sheltering and economic hiatus, how do you see firms adjusting their market expectations for volume and backlog?

Ken Sanders (KS): My first suggestion is not to have a broad expectation about future volume and backlog. COVID-19 is an unprecedented event and trying to predict or compare the recovery to come with any prior downturn is not going to be very helpful.

Here in the U.S., never in our history have we lost over 26 million jobs in five weeks. And there are more job losses to come. No one knows how long it will take to restore those jobs or return to a similar level of economic activity after a phased reopening, which is just starting.

The answer really needs to start with clients. AEC firms are confronting the short-term and long-term impacts of

COVID, but so are their clients. Leaders should look at this from their clients' perspectives. How is this affecting *their* business, *their* customers, *their* backlog?

Starting with clients is the key to unlocking understanding, more so than comparing this to past economic cycles. For example, COVID has been a disaster for some retail chains and small businesses, but others, like Home Depot, Walmart, or Amazon are doing fine. It's very different depending on the client and market.

In the healthcare market, where one might assume things are bullish, they're not. Many hospitals, not just in the U.S. but around the world, are struggling with empty beds. It's one reason why phase one of the planned reopening allows the return of elective surgeries. Without them, hospitals have had a problem.

The strongest AEC firms are staying close to their clients, and undertaking a

DesignIntelligence Quarterly

76

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Leaders should look at this from their clients' perspectives. How is this affecting their business, their customers, their backlog? deep dive, granular assessment and analysis of their clients, their markets, and projects to better understand the future. That's the way to do it. They're positioning themselves to be agile and move quickly as the world continues to change rapidly around them, to deal with the challenges and opportunities that are still unknown.

Some firms I talk to are looking at their backlog, not just monthly, but daily because things are changing so quickly. At the same time, they're staying strategic and thinking creatively about new opportunities. You have to do both.

This is an unprecedented, black swan event. It's never happened before in our lives. It's unlike any other economic cycle we've been through, and it deserves its own unique response.

DI: The other sense of market is geographic. Any comments on building type or regional markets?

KS: My answer is going to be granular again. Some retail chains have been shut down completely while others are doing fine. That's related to their government classification as essential or non-essential. It has nothing to do with their leadership or performance.

It's the same with entertainment or film production. Theater chains are closed, but streaming services like Netflix have benefited. They're doing great. Amazon has never been in a stronger demand position, and they're continuing to invest in expanding their distribution network globally. That's an example of how you've got to look under the hood at specific clients and what they do to understand trends within that marketplace.

One company I've been thinking about a lot, a great company, is Disney. They're in a tough position. Most of their revenue comes from theme parks, hotels, film entertainment, and cruise ships, all of which have been shut down.

DI: All discretionary.

KS: Yes. That's who they are. By design they're a non-essential company. Much of their revenue stream has stopped.

As the economy slowly reopens, theme parks are going to be an important case study in how good design of public environments shifts long-term. It's not just about public policy, screening, PPE, and social distancing. It's about how we design public environments where people still feel safe. Perception is reality. In the case of Disney, will visitors ever feel safe in the same way again packed into lines and along parade routes at theme parks? That's an interesting question. I don't know the answer, but that's one example where the "new normal" has yet to be understood. The issue is: can AEC firms help clients like Disney? Absolutely! They are going to have to reinvent how they entertain customers in ways that still generate good revenue and margins, but where their customers feel safe. That is going to be a big transformation.

Similarly, there's a huge opportunity to reinvent dining or retail venues as building types that are both experiential and safe. The issue of safety is not going to go away when the economy reopens. We're going to bring that with us going forward as individuals, families and groups.

The same with healthcare. How can healthcare environments be more flexibly designed to deal with sudden changes in demand? And based on what we're learning about working from home and virtual collaboration, what are the new mobility strategies? How will they affect workplaces and real estate portfolios of the future? All those are opportunities for design innovation in places where people can be creative, not focused on cutting expenses and retrenchment, but thinking about this as opportunity.

DI: Great observations. Rather look at overall markets or economic trends, we need specificity and granularity - the conditions for this client, segment, or building type. In contrast to what we see on television every night, when it comes to markets, we're not necessarily "all in this together."

KS: Exactly. Firms need to dive deep into their own client base. I can think of three leading healthcare firms. What they're dealing with is going to be very different depending on the services, project types, and geographic markets they're providing. This question about broad brush predictions... all of us need to set those aside and look at individual clients and markets. That detailed analysis will yield a better understanding.

DI: What about new services? I talked to a a national leader of a sports design practice. As a forethought research exercise, they're doing an investigation on what it means to hold mass sporting events. What does that mean when you get out of your car, scan your ticket, have to go to the bathroom, the hot dog line. Can you still tailgate? Will there be a section for the young, carefree, crazy, drunk people still willing to sit together? And another for those of us who are more careful, and perhaps willing to spend more for our ticket because we're spaced out every four seats? That's one example. Does anything else come to mind?

KS: That's a great example. The safety overlay is going to influence and affect the

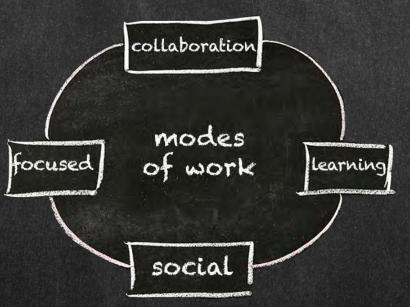
design of entertainment and sports venues. Again, it's not just about the practical considerations of keeping people safe, it's about the emotional dimension of that.

People have to feel safe whether they are or not. It's important to differentiate between those two. I couldn't agree with you more. That is a new frontier with opportunity for firms regardless of the project types or markets they work in.

The other observation is that all of us have wanted for years, if not decades, to transition away from charging by the hour and move toward charging for value. One of the things I'm seeing now is clients valuing and rewarding speed, agility and responsiveness. Because they're confronting a fast-changing uncertain world they want partners and advisors who can respond with them.

Leaders, individuals and firms that can demonstrate those characteristics are in better position for higher margins and repeat business.

DI: I hope people are smart enough to seize the opportunity to redirect the way they provide services and get paid, to be quicker and more valuable. If we don't get it now, I don't know if we ever will.



KS: A crisis can produce opportunities to rethink value propositions and rewards.

DI: You started with clients. You're still serving on corporate boards and keeping in touch with clients and your network. You're one of the first to articulate the possibility that this sheltering experience could result in a reduced demand for office space. How do you see this forced experiment we've had of remote work and work from home affecting clients' facilities planning thinking?

KS: We are all learning more about what works and what doesn't work in terms of virtual collaboration. The ability to collaborate and collaborate virtually is foundational to effective crossdisciplinary AEC teams, which almost always involve talent from multiple companies. This notion of being able to collaborate virtually well remains important.

There are four classic modes of work: social, learning, collaboration, and focused. Some people add a fifth: rejuvenation. When you think about it, only social truly needs physical interaction. Focus and rejuvenation are introverted, where you're mostly spending time on your own. Learning and collaboration are increasingly happening virtually, online. Not always, but increasingly.

I'm not arguing, and I don't know anyone who does, that teams can work as effectively 100% of the time remotely. Physical connections are important to building relationships and trust. Physical separation is not emotionally sustainable. Virtual cocktail parties are fun on Facebook, but they're already growing old and tired. People are saying, "That was fun the first or second time, but now I want to be with my friends. And I can't."

At the same time, firms are discovering teams can continue to produce, be productive, and are becoming more comfortable with collaborating online and virtually. The missing ingredient is they don't have physical contact, which is a problem. That needs to be restored.

But do people really need to be 100% co-located 40 hours a week, full-time? Maybe they can get together one or two days a week and they'll be fine. The question is what is the right balance going forward? How can we leverage what we're learning?

The flip side is also true. People have learned that working from home may or may not be a good place for focus depending on the presence of a spouse, partner, children, or roommates. There are many variables and dimensions. For AEC firms, it's an opportunity to demonstrate to ourselves and to our clients what we've learned through this crisis. Ways that create new value and better experiences. It may also be a headwind in terms of corporate real estate because people may be more comfortable than they were before allowing people to spend part of the week working from home or off-site. They may implement more aggressive mobility strategies and desk-sharing, reducing overall demand.

DI: I love your breakdown of the four ways of working. When you look at "work" analytically and break it down into those functions, only one is social. Rather than assuming, "Work is work. We go into the office, have lots of meetings, they're inefficient, the processes are what they are," if you analyze the functions - only one requires being together.

KS: Social activities demand physical connection. You want to hang out in person. The other four, in many but not all cases, can be accomplished virtually. What's the right balance? Perhaps it's not to have everybody physically co-located 100% of the time. I think that model is going to fade away.

It's an exciting design opportunity, not just from the standpoint of workplace design, but real estate strategy and designing your portfolio real estate and dealing with density and mobility. I'm looking forward to seeing the work that firms are going to do in that regard.

DI: Our unanticipated external event has accelerated what we're talking about.

KS: Yes. I'll tell you another story which addresses your question. One of the companies on which I serve as a board member is Clarus, a product manufacturer. They're one of the leading manufacturers of glassboards. Basically, a glassboard is a whiteboard made of glass. Clarus offers them in a variety of fixed and sliding and portable configurations. They are popular products in collaborative workplaces, hospitals, schools, sports lockers rooms.

In response to COVID-19, Clarus developed a cool new product called TherMobile. It's a glass partition on wheels with a vertical slot in the middle at eye level that allows temperature checks while minimizing exposure between the person being checked and the person performing the check. The screening of workers, guests and visitors will be key as we re-open. How do you make sure they're not sick?

This product facilitates that. It provides a transparent safety barrier between the

THERMOBILE

TherMobile, a non-porous mobile board that serves as a protective shield during the health screening process, is your first line of defense against COVID-19 at the office. How will you take the temperature of your employees from a safe distance or handoff necessary documents at the entrance? TherMobile's small cut-out window allows you to do exactly this, all through a non-porous, easily cleanable safety shield. Thanks to the natural properties of glass, it can be sanitized completely, protecting all parties during health screenings.





Thermobile, courtesy Clarus

two people involved, but through the slot it allows the visitor to get tested. As companies reopen their workplaces, as nursing homes reopen to visitors, as healthcare screening is strengthened at airports and hospitals, this product helps people stay safe, and has amazing potential.

But the real story is that Dony Dawson, VP of Design at Clarus, and his team developed this product in seven days. From napkin sketch to manufactured product for sale, seven days. It was an incredible turnaround, and relates to my earlier point about speed, responsiveness, value, and rewards. Being smart and moving fast usually generates rewards. With TherMobile, three things came together. First, recognizing market opportunity. Second, executing quickly. Third, applying design innovation to create new value. All three of those things happened at the same time. Because Clarus' design and manufacturing teams are co-located in one facility, their integration played an important role in rapid prototyping, turnaround, and being able to pull this off in seven days.

It's a wonderful story and amazing credit is due to the team at Clarus. A great example of how you create opportunity out of crisis. The worst thing any company can do is to retract into survival mode. As a leader, of course, you need to be realistic, willing to make tough, painful decisions. You have to be transparent and authentic in communicating with all your people through good times and bad. But you also need to be creative and agile in exploring brand new opportunities. And you need to encourage everyone in your firm to do the same. Good ideas can come from anywhere. That process starts with your clients and customers and looking at problems from their perspective.

DI: That's a fabulous story on so many levels. Our conversation is about markets. Your story is an example of seeing a need, imagining the market and filling it - an example of what can happen at record speeds in an integrated way when it has to. For thousands of years architecture has been thought of as slow moving. "Good design takes time..." Architects haven't valued speed despite our clients valuing it. Most of the AE community has complained for decades about the accelerating pace rather than doing something about it and responding in a different way.

Your quick response story makes me wonder. If firms are now monitoring and thinking daily, vs. in the past, annually or not at all, extrapolating the status quo into the future, is there another side to that continuum? I would imagine firms might now have rapid response plans, Plan Bs, Plan Cs, and "Black Swan" Plans now, but is there a need to balance the quick / agile perspective with a longer-term view?

KS: It's both/and. You have to get more granular and assess what's going on weekly or daily rather than monthly or quarterly. But in a tactical granular way. That's important to navigate through a rapidly changing business environment. But don't take your eye off the long term. Stay strategic, creative, and opportunistic.

Many firms are experiencing a tough environment. Projects put on hold. Projects canceled. Suddenly you look at your staffing capacity and pipeline and there's an issue. What's unique about this circumstance is the speed at which it's happened. Even when the financial crisis occurred, notwithstanding the Lehman bankruptcy drama on that infamous Monday morning, it took months for it to play out, and years to recover. Here, this has happened in weeks. It's heartbreaking and unsettling. People are losing their jobs. They're losing their ability to provide for their families. To cope, I believe one of the things you should do is cut from the top. The top folks should experience salary cuts, cuts to their bonuses, or to their compensation package first. Rather than letting somebody go, you can also

look at salary reductions and/or reduced workweeks. There's a lot available to firms to sustain employment and navigate through this environment.

Many people, of course, are losing their jobs because the restaurant, retail store, or hotel they worked at is closed. Working from home is a white-collar privilege, after all, and. workers in hospitality, retail and restaurants don't get to work from home. The only place their job exists is in that facility. So, there's been a disproportionate impact on lower-income and blue-collar workers. Those of us in service or high-tech businesses just go virtual and on we go. The disproportionate social impact, not just in the U.S., but globally, is part of the tragic reality we're grappling with. But whatever your circumstance as a leader, you need to realistically align your investments with the work that's available to you while also doing your best to preserve jobs and employment.

I've been pleased to see the companies I work with doing just that. That's been a good sign. But we're far from done. We still have a lot of choppy water ahead of us, but I'm seeing strong, enlightened leadership from companies across the industry.

DI: That's encouraging. Resilience seems to be needed more than ever, not

only in leadership, but in our buildings. If there is too much space, or the wrong kind of space, will clients take a more serious look at existing building stock, building reuse, and repositioning? The people leading the sustainability movement have been arguing that for a long time.

KS: Great question. This crisis has underscored the importance of real estate flexibility and adaptability. We're seeing convention centers turned into field hospitals. We're seeing empty hotels turned into housing for the homeless. We're seeing these crisis-driven real estate transformations. When we design facilities in the future, it's going to be increasingly important to think about different scenarios and how this facility could be transformed into something else.

We've been talking about that with regards to parking garages for years. There's an oversupply of parking garages when you think about the transition toward ride-hailing services and eventually self-driving cars. What's going to happen to all those garages? For the garages we build now, can we design them in a way that helps facilitate their transition into a different building type down the road rather than tearing them down and building anew? The sustainability and environmental responsibility component of that has only been underscored by this crisis. Going forward, the notion of flexibility, adaptability, and resilience will be an even more important ingredient of real estate design.

DI: Agreed. If granularity and forging opportunity from crisis are key, if you're back in the position of running a design firm tomorrow, or advising somebody who is, what strategies would you deploy to gird your firm for future cataclysmic events?

KS: Staying close to your clients should always be a top priority, especially during times of rapid change. Flexibility, diversity, and agility are more important than ever. And investing in scenario planning. What would we do if this happened? What would we do if that happened? I'm not claiming anyone could have predicted this once-in-a-lifetime pandemic. Black swans are called that for a reason, but the value of scenario planning is it allows you to preemptively establish priorities.

If you suddenly had a huge surge of new work or clients, how would you deal with it? If you suddenly confronted an economic downturn, how would you deal with that? I have found that firms who spend some time on scenario planning are best equipped to navigate through uncharted waters, because those priorities and sensibilities are already established. Then it's about making decisions and acting. You're not stuck like a deer in the headlights in analysis paralysis. You're not over or under-reacting. You're simply better prepared.

Strategic outsourcing is another opportunity. I like to look at outsourcing based on a yardstick that measures client value and client experience. On the one end of the yardstick is, "What does my firm do that is closest to our client and creates the most differentiated value and experience for them? And strengthens their loyalty and generates repeat business?" That's one end of the yardstick. The other end of the yardstick is, "What things are central to running a business, but my clients may not even know about, and they don't create differentiated value?"

If you think about all the things a firm does, you can line them up on that yardstick. Those activities that are furthest

from your clients are often the ones best suited for outsourcing. For example, do you really want to run your own phone system? Your own IT security? Your email system? Computer servers? Most people don't manage their own real estate. They've outsourced that to a real estate company to manage for them. Activities furthest disconnected from creating differentiated client value are the best candidates for outsourcing. That's not to say those services or the people providing those services aren't important. Those activities are essential. But it's healthy to assess what's vital to keep inside your firm and what things you can invite others to take care of for you. That's one way of purchasing flexibility and agility. Coming through this, I predict that many firms are going to take a renewed look at strategic outsourcing.

From a construction or product manufacturing perspective, we're also seeing reassessments of global supply chains and the associated risks. Independent of politics, companies want to understand more about where their products are coming from. Consumers too. Where was this thing made? People are leaning more towards localized procurement when possible. That helps the environment and improves supply chain reliability and robustness. The crisis has illuminated the risks when a company or a government is dependent on one or too few suppliers.

And finally, as I mentioned earlier, AEC firms should revisit their own real estate portfolios and strategies based on what they've learned during this shelter in place phase. Think about what a safer workplace looks like. How much physical time together is required? Can companies produce the same or better results with smarter mobility strategies and less real estate? That strategic question will take some time to figure out, but I would suggest spending time on it. All these are design opportunities. Not only for clients, but for AEC firms.

DI: Everything you talked about reminds us to look beyond ourselves. It's not just about us.

KS: Yes. I'll share one interesting statistic. In the month of March this year, total deaths in the U.S. are down compared to the same month last year. I think we all believe and understand the economic shutdown has reduced COVID-19 deaths. But you know what? It's reduced all deaths. The shutdown has saved more lives than have been lost due to the virus. I'll repeat that. The shutdown has saved more lives than have been lost due to the virus. It makes sense. There are fewer car accidents. There are no elective surgeries. There are no bar fights. The bars are closed.

I don't know anyone who would argue in the interest of saving lives that we should continue sheltering-in-place permanently, that we should be locked down forever. The point is there is a gigantic push and pull right now between health and employment. It's epic and unprecedented and the stakes are huge. It remains unresolved, not just in the U.S. but

globally. That push and pull is going to continue long after COVID-19 is extinguished. There are going to be long-term impacts on culture, health, emotional safety, and environmental design. Those impacts remain unknown. I'm saying this as an optimist. In architecture, engineering, and construction firms, uncertainty and change are scary and challenging. But they are also fertile ground for creating new opportunity. Even if this virus is fought back and beaten in short order, its long-term effects and impacts are going to continue. People should think and be creative about that, to transform those shifts, when and how they occur, into new opportunities for themselves and their clients.

DI: Great insight. This is not just a guns and butter economic decision. It's an economy versus life and quality of life decision. It's not a four-week decision, it's a multi-generational decision.

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...uncertainty and change are scary and challenging. But they are also fertile ground for creating new opportunity.

Ken Sanders, FAIA, is Managing Principal of DesignIntelligence Strategic Advisors and a former Managing Principal and Board Member of Gensler.

Technology Transformation: Are We There Yet?

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DENNIS SHELDEN

Director, Center for Architecture Science and Ecology (CASE) & Assistant Professor, School of Architecture, Rensselaer Polytechnic Institute

In this wide-ranging discussion, RPI's CASE Director Dennis Shelden shares his journey and vision for industry change.

DesignIntelligence (DI): You've had an interesting career in the technology space. You were one of the early pioneers and leaders at Gehry Technologies, migrating to Georgia Tech to run the Digital Building Lab (DBL) and take over for Chuck Eastman. Now, you have a new opportunity at another leading technological institution, the Center for Architecture Science and Ecology (CASE), and as Assistant Professor in the School of Architecture at **Rensselaer Polytechnic Institute** (RPI). How did you get into technology?

Dennis Shelden (DS): My personal career trajectory is in some ways a

microcosm of the larger evolution of technology in practice and its potential for cross disciplinary integration and value creation. I was very fortunate to have gone to MIT as an undergraduate in the 1980s, when CAD and other digital tools like structural and energy modeling were just beginning to mature to the point of relevance to building practice. Although I went to MIT intending to do something related to computing, I discovered and fell in love with architecture while I was there. Architecture had - and has this expansive agenda about the world and projections of the possibilities of change through creativity and invention. This possibility is also very apparent the

DesignIntelligence Quarterly

86

tech world today, but it wasn't so clear at the time that technology was going to be the profound social driver it has become, and architecture had that appeal.

Computing allowed me to have relevance in numerous aspects of building, not just architecture but also the various associated engineering fields, software and building product firms, and I was able to surf the growing technology wave into experiences across the silos in building space. I worked for a company that was pursuing real time building energy and controls optimization in San Francisco, and then Cyra Systems, who developed the first cloud of points laser scanner that was ultimately acquired by Leica. During grad school I also got a chance to work with Arup in New York on both structural and energy modeling teams. In San Francisco I had acquired a used Sun Unix workstation, which was the hardware platform Arup was using for their proprietary software at the time, so I was the only intern that could access their software on a regular basis. Those early experiences helped me

form an expansive view of how information technology can connect and cut across the distinct disciplines concerned with the development of buildings.

It was during grad school in the mid-1990s that I got introduced to Frank Gehry's practice through an academic collaboration they had with my advisor at MIT - the late William J. Mitchell. The Guggenheim Bilbao was just finishing up at the time. What I saw on visiting the studio was incredibly groundbreaking. At the time they were using the Unix version of the aerospace software CATIA, which had several firsts: the first commercial curved surface modeling, real time rendered navigation of models, and an orientation to design-for-fabrication. They weren't just using CAD to draw and render, they were using the models as a new way of understanding building: lighting, acoustics, and structures, and a way of thinking through how the projects were put together and discussing ideas directly with fabricators and builders. It was clear to me that I was seeing the future of the profession,

precisely in this possibility of digital information connecting design across the myriad of building disciplines. I finished my PhD qualifying exam that semester and left MIT to take a technology leadership position in the firm.

Bilbao created an enormous amount of interest in the Gehry's work and the methods of the firm, and we were able to use that demand for the architecture to drive adoption of the firm's digital tools and methods into collaborating firms on project teams. The tech team that I directed took on a number of services both for the firm and for collaborators, including research and development of new software add-ons as well as specifying, assisting in procurement and training of partners. These services were provided to the teams as part of the firm's architectural services fees and contracts. It eventually became clear that this was both an added complication and risk to the core architectural services, and that ultimately the resources required to support this agenda would exceed what could be "fit" into the firm's design services. And, that there was

an emerging opportunity for the methods and tools we were using beyond Frank's practice. These really were the underlying motivations of the formation of Gehry Technologies: to develop technologies that could connect design, engineering and fabrication together on Gehry's projects and beyond in the broader industry.

It's worth noting that there was, and I think still is, an important back story about the role of technology in the practice. Frank Gehry has always had a passion about re-empowering the architect. Digital technology has been a way of defending the agency, role, and value of the architect in the context of a supply chain where it was increasingly being eroded. Working out the details of the designs virtually - "down to the bolt", and incorporating the knowledge of fabrication and detailing into the design and its documentation, has provided the firm a powerful weapon in de-risking the project, countering the voices of those who have closer control of the project during construction, and defending against "value engineering" the design out of the project.

DI: I don't recall ever hearing about that side of Gehry's motivation. That's not what gets talked about with him. It's always about the art and the form. But I can make the connection because in his early work he used inexpensive common materials — chain link fence, wood studs, corrugated metal siding, and asphalt — as a way to claw out of the diminished architect's role and combat the perception of busting budgets. Likely also to create a brand and a unique materials palette. His later use of technology to adapt standard construction methods is a next generation way of accomplishing that same goal. He reinvented the form, not the familiar means of construction.

DS: Absolutely. That's the story that doesn't hit the Simpsons. First of all, Frank's buildings work. They work because the program is incessantly thought through, and because his designs adhere to budgets remarkably well. I know the lore is everything but that, and the few times there were issues on projects, everybody would shout from the rooftops. But the fact is, there's a point around GMP where pricing is locked in, and the detailing and system strategies have been so comprehensively worked out and vetted across the team that there is very little of the sort of ambiguity that leads to errors and disagreements .

Another remarkable fact of the work is that despite the geometry, under the hood, the projects use relatively conventional building systems and details, just applied differently. Disney Concert Hall and Experience Music project are great examples. The connection detailing is consistent with conventional curtainwall, it just happens to be expressed across different geometry. Being able to use the digital model to convey to these proposals to the trades is hugely valuable as a means of controlling risk and therefore cost. That has been a big part of the firm's success: using digital technology as a way of adapting relatively traditional ways of building to radically new geometries, then aligning and clarifying intentions, and maintaining consistency, control and understanding. And I think that is again a microcosm of the larger

ambitions of building information modeling as it has expanded into broader practice.

DI: When did you return to academia?

DS: I had been teaching at MIT as a professor of practice while I was CTO of Gehry Technologies. After Trimble acquired the company, I got the unique offer to take over Chuck Eastman's program, the Digital Building Lab at Georgia Tech. Professor Eastman has been one of the pioneers of building data and BIM, and the program had a phenomenal heritage as a leader in developing the open data standards around building information exchange. The possibilities of taking what I had been working on in the context of a commercial tech company, but deliver it through an open, not-for-profit organization seemed like a great way to broaden my potential impact on the profession.

In bringing my experience from the professional and the tech worlds to

academia, I'm working on a couple expansions of the BIM agenda now. One is about post-occupancy, but it's beyond the narrow definition of the term. One of the things that the tech revolution in the broader economy has shown is that tech advances don't just transform tools and methods of work, they have the potential to connect to and thereby rewire social structures as well. The digital transformation in our industry – of BIM and related technical advances – has been about reworking delivery process, but it hasn't to date fundamentally impacted what buildings are or how people and organizations interact with them. I think there is a dramatic opening right now to see the building model as a part of life of the building and for it to be a lens for bi-directional information flowing between the building and its occupants, and ultimately back to designers.

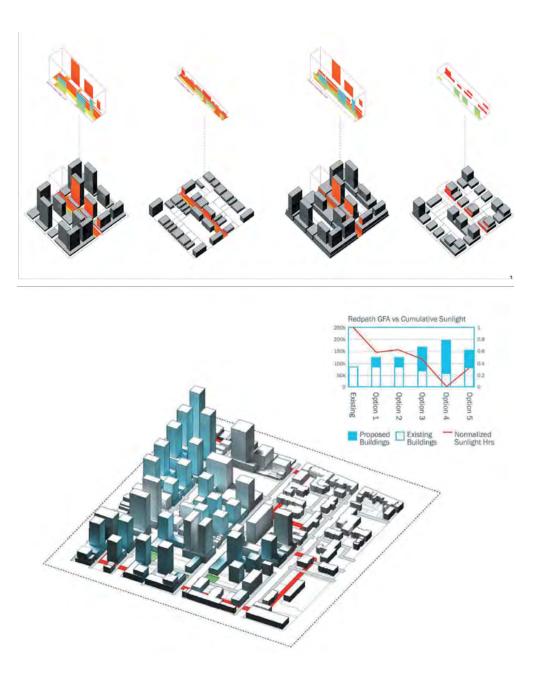
DI: I thought you were going to say the Internet of things.

DS: Yes. IOT is another one of the names for it. The idea is that the

building becomes intelligent and it becomes a partner of the people and organizations it serves, not just in terms of energy and maybe lighting or security but to the functions of the organizations and communities directly. One of the areas this is already playing out is in retail. The "Amazonification" of the retail experience is no longer about making everything virtual, but about reintroducing digitally enabled life back into the building and urban context. The digital model and its assets can contribute to the user experience of the built environment, and maybe to hybrid online and in person experience. I think that has tremendous future opportunities for architects- to reconnect to the end users of buildings in an ongoing way that extends far beyond traditional design.

I've also been interested in the possibility of design agency across scales as well as across disciplines. I experienced the ability for designers to drill down in terms of higher fidelity detailing of buildings, but the same technologies offer the possibilities to expand design to increasingly larger scales beyond the building – to the campus, city and planet.

Traditionally there has been a major disconnect between architecture and urban planning, with very different tools and modes of control associated with each of these disciplines. The difference between BIM and GIS is one manifestation, and these technologies are converging, but I also think the approach to affecting change at the city scale is coming into the sphere of what design looks like from the lens of architecture. Because of the scale and the decentralization of decision making across urban contexts, city planning has had to rely on relatively low fidelity, arm's length ways of understanding and directing the design of urban context - through prescriptive and reductionist tools like zoning regulations. The coupling of BIM modeling developed through generative means with the sort of scalability provided by the cloud, connected to real world data coming from IoT intelligence in the world, suggests that we can design solutions



at the scale of cities – with all their richness and complexity, and with the same level of detail and precision that we can now design buildings. We've done work where we can take zoning and building codes, simulate their full extent at city scale and generate and test those building performance codes, which can then be reflected into more precise and informed planning guidelines.

I started working on some of these ideas at Digital Building Lab (DBL), but the program was still very focused on the pragmatics of using better modeling and data to improve the building delivery supply chain. CASE offers a much larger agenda - to rethink the products of building around much larger societal and environmental agendas, in light of changing tools but also maybe to rethink even what a built project is. We have the ability to tackle humanity's macro-level challenges and the impacts of the built environment with precision and efficacy. We can do this at scale, virtually in the classroom or through associations with professional

projects and real cities. That's my motivation now: we have the tools and the capacity as architects to stand with confidence and hopefulness about tackling the massive environmental and social challenges in front of us.

DI: A much broader agenda and range of tools. It's not a big leap to see the connection between what you just talked about and things like COVID, Black Lives Matter, wildfires, climate change, and floods. Way beyond the notion of BIM, to simulation analysis. Did we miss any other initiatives at RPI?

DS: The agenda of CASE spans from traditional building systems, research, smarter facades, and smarter ways of managing energy sources, to much larger ambitions about ecology, sustainability and humanity, specifically I think around the possibilities for increased design efficacy at scale through connected data, digital tools, and alternative models of project and innovation delivery. Through my experience as a startup founder I have become passionate and fascinated by alternative models of innovation and social impact coming from the tech world.

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...seeing what's happening in other sectors of the world. I am passionate and fascinated by the alternative models of innovation and impact coming from the tech and venture capital worlds. ... This other world is offering infinite amounts of capital.

When we started Gehry Technologies, we got a little investment, but we operated under a fairly traditional services business model with existential pressure to make the books balance every quarter. This is true of many of the innovation labs that come out of architecture firms, Architects want to innovate, but their ability to invest in innovation is limited to what they can charge clients under fairly constrained services contracts or out of very limited profits. The cyclicality of projects and the overall building economy makes this investment very difficult to sustain and grow long term.

There is a whole other world of growth driven capital investment that is familiar from the broader tech world vernacular. This wasn't as large a cultural influence and it certainly wasn't available to architecture until recently. Today there are truly unlimited amounts of capital available to pursue transformative innovation that can scale to tackle large and important problems. Revenue is – sometimes - relevant to these business models, but shortterm profitability isn't a significant motivation or constraint. On the flip side, there is innovation happening – by individuals in firms or universities – that has tremendous impact without needing a capital at all. The infrastructure for distribution of innovation over the web is so powerful that individual or small teams can have significant impact.

The second part of this is to see the built environment as the vehicle for the sorts of cultural impact that have to date occurred in the on-line world. I'm convinced the built environment will be one of - it not the - platforms for next generation technology innovation. As part of the work that I started at the DBL and have taken to CASE, I'm interested in thinking about how we can create analogs in architecture for the sort of value creation driven by the internet and world wide web, using the physical environment as the platform.

The technology we developed at Gehry Technologies that really interested Trimble in the acquisition was a cloud-based tool called GTeam, now called Trimble Connect. It's a BIM and project data management system wrapped with social network constructs, which offered a new take on how cross project collaboration could be supported. At Georgia Tech I was able to learn from some of Chuck Eastman's work around open data standards. In this connected work of building information, IOT and digital twins, there's an opening to create for the building industry what the Internet and Web data have done for technology companies.

DI: It's fascinating to hear you talk about the scale. Maybe it's finally time. After 40 or 50 years of slow gestation, being last in the industry productivity race - flatlined on Paul Teicholz's productivity graph — it's not a surprise. Why is that? Because we didn't have the money to invest. We didn't have the scale. And we didn't have the motivational DNA to be innovators or entrepreneurs. For all those reasons, it's no surprise the architectural community has lagged. Now, maybe these external chaos events are converging. The rest of the world is finally seeing our potential and how we might connect — and vice versa.

Maybe we're finally at the tipping point. Are we there yet?

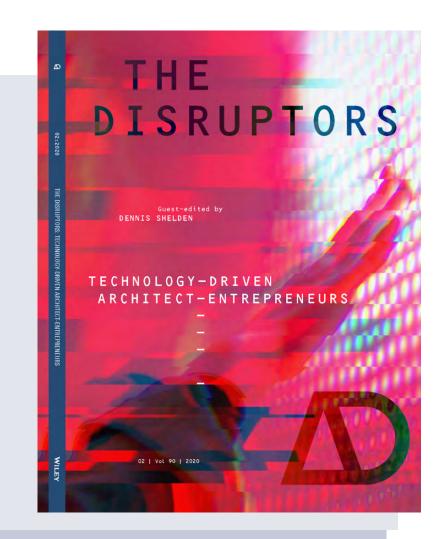
DS: I think we are, and maybe have been for the past five years. Part of the limits to innovation in building has simply been the inability to leverage advances beyond the individual project. That has created a barrier to the scales of innovation experienced in mass produced manufactured products and software. But as we all know the cost of digital firepower keeps dropping exponentially, and at some point in the past decade it crossed a tipping point where the cost of technology adoption ceased to limit architecture's potential as a first tier innovation industry. One example of this is the use of drones on construction sites. The price of drones quickly dropped after their introduction. Soon they appeared in two places as commercially viable technology: in the movie industry and on construction sites. For me that had a powerful message – that the building industry no longer had to wait for the aerospace and automotive manufacturing or entertainment industries to mature technologies before we had access to them as was the case for BIM. Augmented reality is another example. Technologies are coming to the built environment



first, and the entry price of these innovations is low enough that we can afford them in the context of project budgets.

I think the industry transformation is finally happening, but it may happen more through alternative delivery structures and companies that re-organize to create value at multiple points in the supply chain. The risk is that traditional firms may incrementally get pushed out. We're seeing this already. There's competitive pressure through alternative business models and business entities, some coming out of manufacturing, some coming out of integrators. The traditional mentality: "I work in this defined role, and I'm going to keep my head down and shed risk to others because I don't have the fees or scope to assert control," is going to face more threats from other delivery models and companies. This opportunity is bi-directional. Architects can now take on roles they traditionally weren't able to do because they didn't have the credentials, the tools or the capital. Digital modeling and the large sets of easily accessible tools are

creating opportunities to take on some of these broader roles. Architecture firms are reaching out and taking on these broader services opportunities, but other entities are also saying, "Hey, can we just inhouse the architect? Do we need an external firm?" I recently guest edited an issue of AD called "The Disruptors: Technology Driven Architect Entrepreneurs", to take a broad look at the types of new firms emerging and the new agendas being taken on by existing practices. There is huge variability in the ways innovative practices are taking on



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To me, it's a call to action, because the traditional models will continue to erode. The position of architecture as a contained place — with defenses around it in the building delivery value creation chain — will be pressured to rethink the boundaries of the discipline. these emerging cross disciplinary opportunities. You see this most in manufactured construction because the traditional, "You draw something and we'll figure out how to build it," doesn't work in manufactured building. The design must intrinsically be part of not just the product, but the system you're building within. To me, it's a call to action because the traditional models will continue to erode. The position of architecture as a contained place — with defenses around it in the building delivery value creation chain - will be continually under pressure, requiring us to rethink the boundaries we impose on the discipline.

DI: That's powerful. Have you read George Johnston's new book, Assembling the Architect yet?

DS: I have not yet, but I think highly of his work, so I look forward to seeing it.

DI: It's a fascinating history of what the profession did to itself, in constantly building walls and defensive posturing. Licensing and other issues. Whining rather than doing something about it. What you're saying now is reinforcing the need for change. Maybe things have converged. Maybe it's finally happening.

DS: Technology is the wild card in this. The history of the last half of the 20th century was a sense of the technical complexity of buildings getting beyond what an architecture firm and their fees could manage. As buildings got more complex, the process became harder to control with the available instruments of service. That's where risk shedding and building bigger teams came in. But technology has upended that, because now we have the capacity for a broader reach, a more detailed understanding, and ultimately more control without overwhelming our abilities to manage information and our associated contributions to the project.

DI: Let's talk about the human element. How do we change the minds of non-change-ready principals, the people afraid of technology? How does a technology

guy like you learn to become a change agent?

DS: Take Geoffrey Moore's technology adoption curve. There are good reasons to be anywhere on that curve, including being a late adopter. But if you are anti-technology longterm, you're at risk because the history of humanity has been intimately intertwined with technology, not just the digital technology of last 50 years.

DI: To be against tools is hard to accept.

DS: I'm starting to work with architectural practices who see this exciting future and are keen to at least explore new opportunities in this expanded world of practice. How do you, as an internal change agent in a firm, move the next generation — the digital natives and future leaders —to take advantage of emerging opportunity in a way that manages risks? Yet every firm has great people who grew to create the central value of their firms using certain pre-2020 methodologies, and the unique differentiation of the firm

is intimately intertwined with that existing process. The question is: how do you evolve that process and yet preserve the unique things that differentiate? The good news is today's software development is obsessed with usability by "normal humans". There are very mature technologies to be brought to bear in developing a firm's approach, and they do tend to interoperate with one another. You can craft an approach that's uniquely yours and supports the unique qualities of the firm without having to create from whole cloth or rely on excessively technocratic workflows. You ought to be able to go to a designer that works in colored pen and show them technologies that can integrate or replace, make their work easier, faster, more compelling, and give them a better, maybe bi-directional connection between design and final product.

DI: Great point. If you can't relate it to their world and make it be about them and their culture and language you have no hope. Has COVID impacted your work?

DS: Absolutely, in that I think it points to the urgency and market interest in built environment innovation. When COVID first hit in March and April, there was a lot of interest in people declaring what is the future of architecture held, given what we knew at the beginning of the crisis. Like many, I didn't feel like I had a clear idea of what the future held, but the obvious answers suggesting an architecture of distancing and sequestration, and a flight from the urban social context - didn't make sense as a long term conclusion. The lesson to me has become about resilience and reconfiguration. I see COVID, and hurricane Sandy, and the incredible impacts of climate change and globalization we're seeing, telling us that architecture can no longer assume the built environment is static. When we build buildings, there's very little sense that the world will be different in five or 10 years. We don't design for future proofing or radical change in program or context. Maybe it's aspirational, but I think the takeaway is that developers, owners, investors and governments are going to need to take a more

...architecture can no longer assume the built environment is static... we're seeing reactions now that must happen in months, and this won't be the last one. We have to understand that's part of architecture now. dynamic view of the future of the environment.

We've all seen some amazingly positive responses in the last couple of months. The first is the reconfiguration of cities. Take New York City. Streets are starting to move from everything being about cars and parking, to bicycles and outdoor dining. Things you see in other parts of the world more than in the U.S. I think we're going to need to see the urban context in different ways. We might have to design cities so that they can be partly shut down, but as part of this they should have ways of, re-opening, re-using and reconnecting themselves. It points to a dynamic about the built environment you can read everywhere in the current narrative. It's a view of resiliency — not about putting up walls, but about creating a dynamic reconfigurability and adjusting the urban and building fabric.

It's not just an aspirational, ethical, or philosophical problem. Futureproofing is becoming a business value proposition. And that's one of the most exciting, positive things happening. These things were happening before the pandemic, but we're seeing reactions now that must happen in months, and this won't be the last one. We have to understand that's part of architecture now.

DI: How is CASE organized to take on this mission?

DS: The exciting thing about CASE is that is a completely integrated design, research and professional collaboration with an integrated agenda and team. It is a unique place to rethink the relationship between design, science, engineering, and research, and between education and the professional world. Because we have a charter that's endemically about the relationship to the city and the professional community, we have the opportunity to rethink the rules of engagement of academia and research with professional practice. The dynamics of the business model of academia are changing. The baby boomer children and undergraduate population was at its highest in a generation in 2009 and has been

declining since. But at the same time, it is becoming clear that learning and innovation training is going to be a lifelong imperative for working professionals. We're starting to work with some architecture firms by offering our classes to staff in these firms. Because everything's online now, they can just dial into our courses. Reciprocally, we see a way of engaging students and firms in an applied research model where students go out into firms not just as interns but as embedded innovators and researchers, and we are working on building programs that support these students and firms in connecting back to CASE.

We are looking at the redevelopment of the educational model into something much more applied. A model in which we're blending professional life, student life, research, professional practice, and education. CASE can be the vehicle to pursue this. Applying this new approach is imperative to solving issues of environment, resilience, and rethinking professional practice through technology. We can take this on through an education and innovation delivery model with intimate bidirectional ties to the professional community and to the environment itself. In some ways this pandemic — by virtualizing

everything — has opened doors to working in more fluid ways than we had just a year ago.

DI: That is compelling. A case for reinvention. The advantages of starting anew in a self-contained way where you're in control rather than to trying to change centuries of inertia in the traditional institution. Dennis, this has been fantastic.

DS: Always a pleasure. Good to talk to you.

Dennis Shelden is the director of the Center for Architecture Science and Ecology (CASE) and Assistant Professor in the School of Architecture at Rensselaer Polytechnic Institute. He is a licensed architect, entrepreneur, and author whose experience spans architecture, engineering, and computer science applications to professional practice and the built environment. He holds three degrees from MIT: a Bachelor of Science in Architectural Design, a Master of Science in Civil and Environmental Engineering, and a Doctor of Philosophy in Design and Computation.

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