



DesignIntelligence®
Quarterly

Radical INNOVATION
2021 **Q4**

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CONTEXT: Radical Innovation

As 2021 draws to a close, this compendium of 4th Quarter 2021 DesignIntelligence offerings concludes our investigation of Introspection, Interaction, Interdependence with an immersive look at Radical Innovation. To a large extent, each of us believes we are creative, innovative agents for change. But are we really? Questions emerge...

- Have we ascended through these stages to benefit from collaboration?
- Can we overcome the innate desire to create one-off solutions and shift to higher-leverage impacts? Should we?
- Are we positioned to make the major leaps required??
- Do we have the right people, processes and technology to solve the wicked problems arising from multiple concurrent crises on environmental, economic, social, and health fronts?
- Can we rise above the status quo to break the bounds of our inherent systemic limits?

These questions and possible answers are examined herein. Some of our industry's leading minds have shared their thinking in written works designed to enlighten and share, challenge and energize. In this Q4 issue you'll find discussion on topics ranging from single firm goals to international industry transformation.

DI President and CEO Dave Gilmore opens the discussion In Search of Radical Innovation in his definition of terms, and quest for common sense dialogue. My article, Into The New, investigates the sources and practical applications of radical and incremental innovation.

In his piece, Radical Innovation at Geopolitical Scale, frequent UK contributor Paul Hyett challenges systemic limits. Scott Simpson's essay, Small Ideas, Radical Results offers an appreciation of everyday, accidental, and opportune ideas in effecting change.

In her engaging interview Red Zone to End Zone, Anne Ellis, Executive Director of the Charles Pankow Foundation illuminates her organization's process and risk profile for funding transformative industry research. From Jensen Hughes, CEO Pankaj Duggal shares his firm's innovative ways to mitigate Risky Business. HKS's Global lead for Healthcare Research Deborah Wingler shares her mission at the intersection of research, experience, strategy and design to get clients comfortable being Wildly Uncomfortable.

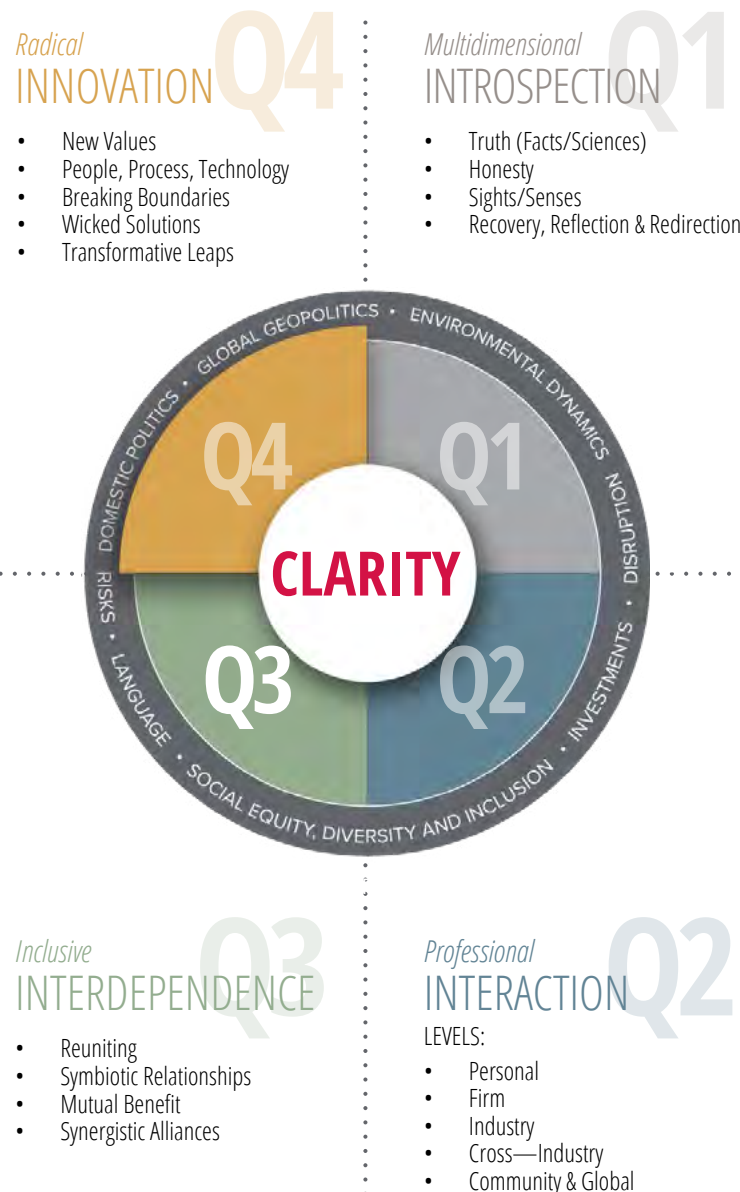
Sabrina Kanner discusses Brookfield Properties' perspective on pushing the edge as a major developer her interview entitled Paths Unknown. Jacobs Global Solutions Director Gary Lapera outlines his global organization's approach to Radical Integration. Finally, in their piece, Technology Laggards, from the New York Building Trades Employer's Association, Lou Coletti and Reid Rubinstein challenge us to embrace technology in accounting for our onsite labor work force.

We hope you have enjoyed being with us on our journey through this year's themes and that you have been able to use this content as a springboard to discovery. In building momentum from introspection to interaction, interdependence and innovation, we are optimistic to hear about your breakthroughs and ongoing quests for improvement. To be considered for next year's series of essays and interviews please contact us.

We welcome your input.

Michael LeFevre, FAIA Emeritus
Managing Editor, DI Media Publications

2021 EDITORIAL ROADMAP



ESSAY

In Search of Radical Innovation

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DAVE GILMORE

President and CEO,
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IN SEARCH OF RADICAL INNOVATION

DesignIntelligence CEO David Gilmore defines terms and suggests essential change via other's perspectives

TERMS AND TIME. MEANING AND CHANGE.

How do we define the terms “radical” and “innovation”?

Our use of language has morphed over the centuries. Over time, word origins often alter so much that they come to take on their opposite meaning.

Take, for instance, the word “sophisticated.” The heart of the word is “sophia” (Σοφία), meaning wisdom. Between 500 and 300 BC, a sect of moral philosophers arose and became known as the Sophists, speaking “words of wisdom” to anyone who would pay. Plato labeled the Sophists fakes, counterfeits, surface simpletons who wove words to impress and tickle ears. In those days, someone labeled as “sophisticated” carried the connotation of shallowness. Yet, our use and understanding of the word today is quite the opposite. When we refer to someone as being sophisticated, we assign attributes such as mysterious, complex, worldly and deep.

The point is clear: Words morph over time. Meaning shifts. For these reasons, owning a guide to etymology is helpful. Having a good command of origin languages such as Greek and Latin is equally assistive where language use is concerned. But here's the concern: Can we deploy these literacy skills to effect change in the built environment?

To answer, let's examine our opening question? What are the true meanings of "radical" and "innovation"?

Radical is derived from the Latin "radix" and finds its original meaning in the image of a root. In other words, the origin of radical is origin. It speaks to fundamentals and foundational themes. Said another way, radical is related to essential.

Innovation is derived from the Latin "innovāre," which means to reform or change. It begins with a thing and reforms it. It changes it. This change can be toward a new form, use, application or way of thinking. Fundamentally, radical innovation is "essential change."

INDUSTRY CHANGE REQUIRED

The built environment industry is in desperate need of essential change. Marked as tardy, wasteful and irresponsible, our industry must change essentially. This will only occur through the applied thinking and functional processes of radical innovation.

Owners, investors and developers hold most of the cards in the built environment game. They dictate the rules for what pencils out as acceptably profitable or not in their prospective models. They select fulfillment services based on a significant but finite list of attributes: good reputa-



When we operate from the perspective of "other," we discover a basis for authentic innovation (aka change).

tion, portfolio of innovation, relationally acceptable, offers options and comes in under budget in the proposal process. But architecture is far more complex and aware of positive and negative implications related to design outcomes. Environmental impact is now front of mind in the design community — how a site is selected, the 50-year urban landscape shifts that may occur, the specification of materials, the immediate and intermediate carbon expression of the project and more. Social impact is also at the fore in this relatively new endemic world. How people close by, nearby and passed by will be affected by the coming and going of people, transport and supplies are all under the watchful eye of the design community as it contemplates responsible design.

DIALOGUE REQUIRED

What's missing between the owner/investor/developer and the design community is common-sense dialogue, not back and forth monologues. Authentic sharing and listening — one to the other and back again — are needed. Such an essential change (aka radical innovation) would transform how sites are selected, money is invested, expectations are set and managed, and communities are impacted. Perhaps common sense, being not-so-common, is a radical innovation for such a time as now.

Another radical innovation necessary in our industry is common-value/common-winning relationships through which to deliver projects. The pitting of parties against each other only escalates the total construction cost and sets up adversarial conditions. Oh, the initial bids may look like a bargain, but the change orders, party-to-party disputes and work delays due to all parties being in it for themselves under a poorly conceived set of contractual

instruments based on a false pro forma ... well, that seems a bit shortsighted doesn't it?

When the primary stakeholders across the project continuum understand one another's ambitions, risks and valued perspectives, something radical begins. This isn't a new concept. Integrated Project Delivery (IPD), Public Private Partnerships (P3), and other project-delivery structures point to such collaborative planning, effort and outcomes. Many have been in play for decades. Why aren't they the rule rather than the exception? It's time for radical innovation (aka essential change), don't you think?

STEPPING OUT — INTO "OTHER'S" PERSPECTIVES

When we operate from the perspective of "other," we discover a basis for authentic innovation (aka change). What is the "other" perspective? It's the perspective gained when we intentionally step out of ourselves, out of our myopia, out of our biased views and into the perspective of others.

Several years ago, I engaged in the training of Imago Dialogue, a relationship integrity method of communicating. I was moved when the instructor said,

By an act of sheer will, step out of yourself and into the shoes of the "other." Get behind them and look through their eyes at their reality. It's then that you'll understand that your perspective might be a dramatic distortion in their eyes. When we see through "other" eyes, gaining the "other" perspective, an entirely new world of possibilities opens before us.

To look ahead, let us imagine a table around which are seated every primary stakeholder in the funding, risk underwriting, regulating, conceiving, designing, supplying, constructing and operation of a building project. Imagine if each of these stakeholders purposely prepared themselves to come to the table having set themselves aside, intentionally posturing to see through the eyes of everyone else at the table as the project is discussed and agreed to. Might the journey of the project be markedly different from the typical project? Might the outcomes be measurably different? Might the relationships begun and sustained through the project reshape all their go-forward realities?

Radical innovation ... essential change ... each begins with uncommon sense — stopping, stepping back, taking a few deep breaths and deciding that the insanity of the past can no longer be in vogue.

Now is the time to transform the built environment industry by leaning into the “other” perspective.

Dave Gilmore is president and CEO of DesignIntelligence



ESSAY

Into the New

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MICHAEL LEFEVRE

FAIA Emeritus

Managing Editor, DesignIntelligence

Into the New

DI Managing Editor Michael LeFevre considers radical innovation's sources

RADICAL INNOVATION DEFINED

From its Latin origins, radical means “at the root”, relating to change or action, affecting the fundamental nature of something. In the political sense, it implies complete political or social change, something revolutionary or reforming. Innovation comes from the Latin *innovationem* and *innovare*: ‘to renew or restore, from in- “into” + *novus* - “new,” to bring in new things after established practices. In a business context such characteristics are thought to offer such unprecedented performance features and dramatic change that they transform existing markets or create new ones. In search of radical innovation in the design and construction industry we investigate this need and look for precedent.

¹ Etymology dictionary

WHY INNOVATE?

The desire to venture “into the new” is elevated among design professionals. Our parents, instructors and counselors tell us we are “born to create.” It’s in our DNA. For those who gravitate to design roles within architecture, the challenge to make something original is ever-present. The avant-garde, modernists and other design movements proclaimed in their very names their self-declared destiny to create anew in their *zeitgeists*.

Except for classicists and traditionalists bent on preserving the past, innovation is an expectation among design professionals. Most of them — regardless of their era — awaken each day to rock the boat. They have been

conditioned to believe they are destined to rise above the work of those who preceded them and transcend their predecessor's. In practice, countless tech-savvy support professionals — those without whom no building would be realized — believe they can and should change things for the better. New technology. New data management. New processes. New training. Somewhere in human nature, and at penultimate levels within the architecture and engineering professions, is the belief that we must change and make things new, to make them better.

CO-DEPENDENCY?

Most of us who practice design and construction do so because we love it. This infatuation and dedication to our vocation yields a fascinating culture. As much as any other profession, we are beholden to our work. It borders on being an addiction or co-dependency. Ask any architect: How are you doing? Chances are they'll tell you what project they are working on. Next, ask them what they are doing for the three-day weekend coming up. A good number will admit they are continuing to work on a project — whether at the office or at home doing renovations. The source of these addictions is our love for our field. It fuels our constant quest to study and

improve what we do and how we do it. We are in search of something new. And in many cases, we rely upon our projects to find it and define ourselves.

NEW = GOOD?

At the core of this belief set is the primitive-brained sentiment that tells us, almost without fail: new = good. This default thinking drives and sustains those who create. But is new always good? History and data would tell us emphatically: certainly not. Despite this evidence, designers across history have ignored it. Why? because they are born to, trained to, rewarded to. Their reason for living is to create. Their egos demand it. These are not scientists or maintainers of status quo. These are artists who live to create. They are change agents via the buildings they imagine. They believe — and countless masters have reinforced their beliefs — that buildings have the power to change the world and create noble, functional, beautiful experiences for humans. Even statesmen have reminded us:

Few of us are immune from the belief that beyond our responsibility to create buildings and change the world, our calling is to innovate.

² From Wikipedia: my emphasis in underlines added.

Innovation: the practical implementation of ideas that result in the introduction of new goods or services or improvement in offering goods or services. ISO TC 279 on innovation management proposes in the standards, ISO 56000:2020 to define innovation as "a new or changed entity creating or redistributing value". However, many scholars and governmental organizations have given their own definition of the concept. Some common element in the different definitions is a focus on newness, improvement and spread. It is also often viewed as taking place through the provision of more-effective products, processes, services, technologies, art works or business models that innovators make available to markets, governments and society. Innovation is related to, but not the same as, invention: innovation is more apt to involve the practical implementation of an invention (i.e. new / improved ability) to make a meaningful impact in a market or society, and not all innovations require a new invention.

INNOVATION OR IMPLEMENTATION?

While the prevailing notion of innovation revolves around breakthrough new ideas, its true definition leans to application and creating or redistributing value.

²Without application, discovery of the new holds little value.

BIAS EXPOSED

In January 2021, in our annual DesignIntelligence editorial planning meeting, we set forth the fourth quarter theme of Radical Innovation. It was to be the hoped-for resultant of the first three quarters that would explore the human dynamics inherent in Multidimensional Inspection, Professional Interaction and Inclusive Interdependence. The bias is obvious. Like so many before us, we believed the unspoken assumption ourselves: Radical Innovation is not just good, it is necessary. This issue of DI Quarterly interrogates that premise. What does it take to innovate radically? Do we need to? If so, why? Finally, how have others achieved it, what are its roots and what sustains it?

WHY NOW? WHY RADICAL?

In acknowledging our default bias to innovate, we acknowledge the underlying beliefs that prompt this theme. Now, more than ever, to cope with the convergence of social, political, human, economic and environmental crises, we need new ways of solving systemic problems. Our old ways and individual intuition are no longer enough. In these times, we issue the call to venture “into the new” because we must. At its linguistic and mathematical origins, radical steers us to look “at the root.” Nowadays, our bigger, wicked problems cry for change “at their root.”

Like you, I smile when I stumble upon manifestos calling for “radical change in times like these,” only to discover they were written hundreds of years ago. In many ways, things don’t seem that different, because they are always changing and because the need for adaption and evolution never subsides. For a several-hundred-year, data-rich perspective of change, readers seeking to consider the facts should look to Steven Pinker’s “Enlightenment Now.”



“We shape our buildings, then our buildings shape us.”

— Winston Churchill

PERSONAL VIGNETTES

To open the proceedings, I'll share some self-proclaimed radical innovations I've been a part of in my career as a practicing architect. As glimpses of on-project, in-process change, they offer possible perspective for aspiring innovators. Based on the definition of innovation as practical implementation and redistribution of value, these project anecdotes validate a longstanding truth:

When it comes to realizing design, necessity can, in fact, be the mother of invention.

Having been inside these projects and processes, I'll share behind-the-scenes tribulations and elations that accompanied these journeys — the human side of process improvement and radical innovation, the experiential side of re-invention. I hope you enjoy the ride.

The 5% Rule

At the dawn of a career that began by meticulously hand-drawing mid-century modern houses in graphite on vellum as a young architectural intern in 1968 (age 14), I fell under the tutelage of architect Tivadar Balogh. His mentor was Robert C. Metcalf, FAIA, then dean of the University of Michigan College of Architecture and Urban Planning. Tiv Balogh, with his bald head, bold moustache and horn-rimmed glasses, had worked with Bob and a cadre of Midwest modernists in a small office doing modern residential work since the 1950s. The group, which included Metcalf, Balogh, William Werner, Henry Kowalewski and acclaimed structural engineer Robert Darvas, served on the Michigan faculty for decades.

It was a simpler time. Their projects had predominantly flat roofs. Don't ask me why, because they were in Michigan and had to accommodate several feet of annual snowfall. In the heyday of Modernism, no other ideology was tolerated or considered. Each house was sumptuously hand-drawn with poché'd, wood-grained walls. Handcrafted details of wood cabinetry, millwork and window and door jambs accompanied each set of lavishly prepared construction documents — a testament to the love that had gone into producing them. Each house was made of wood and typically organized around a linear plan. Clerestory windows and cantilevers were frequent design devices, and clear, vertical grain Douglas fir or redwood were the default siding materials, punctuated by insulated Pella windows.

Admittedly it was a sheltered view of the design options available, but it was ours and we adhered to it religiously. This kit-of-parts materials palette and reliance on Mondrian-like, Breuer-esque planar formal asymmetry resulted in a body of work still revered by midwestern architectural patrons 50 years later. Its beauty was its simplicity. While the elements of each composition were constant, their assembly was unique. Far from formulaic, these projects were of their place, bespoke architectural works. While we never focused on innovation as an end, we used what Bob Metcalf called the 5% Rule. It postulated that on any given commission we should not reinvent or rethink more than 5% of the project. We used what worked, but always added a new wrinkle, design feature, or unique aspect as a controlled, concerted push for R&D. And it worked. We didn't have leaky roofs because we used details that had proven themselves over time. We didn't have to reinvent the process because we drew the same way on each project. The 5% Rule served us and our clients well. In its time and place, it was almost radical.

Evolving Tools, Love and an Integrated Approach:
the Manufacturing Research Center

My most celebrated project as an architect was the Manufacturing Research Center at Georgia Tech, a project I led while practicing with Lord, Aeck & Sargent Architects. Winner of an esteemed Progressive Architecture Design Award Citation for unbuilt work, this project combined a host of design and production technologies to give form to its award-winning concepts. In just five years of design and construction from 1987 to 1991, it combined physical modeling, hand-drawing, AutoCAD and 3D BIM with Bentley/Intergraph software in an integrated approach — an amazingly full set of media in such a short span. It's "functional flexibility" program operational criteria merged with a machine

aesthetic and formal metaphors to produce a building celebrated in international publications while winning urban design, AIA and R&D Magazine Lab of the Year recognition.

In hindsight, what we were doing was deploying rapid prototyping as described by Michael Schrage in "Serious Play." We were leveraging a methodology of integrating architecture and engineering as practiced by our multidisciplinary forefathers: Gropius, Mies, et al. We didn't think it radical or innovative at the time. It was simply how we worked. At the core of these methods were some radically innovative concepts and beliefs, as well as faith in new technologies, but most were implemented — and succeeded — as the result of



Author photos.

persistence, hard work and long hours. But there is no denying the most important factors:

- We loved what we did.
- We had passion for it.
- We worked as a collective.
- We believed in the new.

With the fervor of religious zealots, we fought for our machine aesthetic, for our building and for the deployment of new technologies. Together they constituted our new ideology. And we were rewarded for our beliefs, not financially, but in the ways we cared about most — professional recognition as innovators by our peers.

A Culture of Stewardship

In an early exploration of green architecture that began in 1995, long before LEED became an acronym, my late colleague Terry Sargent designed Zoo Atlanta's Action Resource Conservation Center (Zoo ARC). In a prescient use of local materials, he deployed Stone Mountain granite rubble, donated Coke bottle walls, a wooden curtainwall, and — years before such strategies became commonplace — a green roof. The building's leaf shape formed the context for a coiled, copper-clad metaphorical "snake" auditorium roof sitting atop the primary green roof. Innovation abounded on this pioneering project. Beyond its naturalistic geometry and locally sourced materials, its most significant innovation was in the delivery approach: The team managed a litany of materials donated by local businesses and volunteers to work within strict budget limitations. What was so innovative? The construction manager, Holder Construction, the design team, Lord, Aeck & Sargent Architects, and many of the trade contractors committed

to managing the donated systems out of a sense of civic duty and stewardship because of pride in their city, the institution and each other. This service, and volunteerism were remarkable in realizing the project. Technologically, the building would never have been realized without the early CADD leadership by the construction manager. AutoCADD was used to layout the freeform geometry in the field to enable construction of non-perpendicular surfaces. Without this toolset and these attitudes of stewardship — all pioneering, all significant — the project couldn't have been built.

Eight Months to Reality: E*Trade

In 1997, I joined national CM firm Holder Construction Company in a breakthrough position. We called it Planning & Design Support Services. When a mysterious unnamed client asked for a site test fit, I was excited to respond. "I'll need a few weeks and possibly \$20,000 to explore it," I told my colleagues. "You don't understand," they countered. "The client is going to be here in the morning. We need this tonight." "Gulp," I thought and set about facing my challenge. With little more than a site-boundary Xerox, I sketched a site plan and crafted what I called a "weasel clause." It reminded readers that no zoning, site study, or other due diligence had yet been conducted. It recorded that I was not acting in the capacity of an architect, rather as a site test fit visualizer to test the vision and suggest its potential. Architects and engineers would need to fully evaluate and validate the sketch, my note warned.

The next morning, the client arrived. It was E*Trade. Seeing the sketch, they committed to purchasing an option on the property. The following Monday, we mobilized a 12-person design team from our frequent

partners Ellerbe Beckett. By the end of that first day, we had formed the team, confirmed the program and set the building footprint. Eight months later we had designed and built E*Trade's showpiece, a \$68 million-dollar Regional Operations Center under a design-build warp-speed contract. This project's radical innovation was in defying the laws of convention to set a world-record pace. The client was in an arms race for speed-to-market. Leveraging a common, can't-fail mission and shared incentives, we made project decisions based upon speed and delivery and negotiated cost as a secondary consideration. We did this in response to client values and priorities. Rethinking our prior biases and behaviors involved a radical transformation of past attitudes and practices to deliver a project in eight months that would have taken three years under conventional methods.

AIA Gold Medalist Antoine Predock had designed a stunning solution for the Flint RiverQuarium in Albany, Georgia. But it was 40% over budget. After failed attempts with two other construction managers, they approached our team at Holder Construction to solve their problem. Their charge: Get the project back in budget in two weeks and it's yours. Our radical innovation? We brought multiple groups together to interact live:

- Expert trade contractors who knew their systems and costs.
- World-class architects.
- The owner to defend his program, scope, vision and objectives.
- Expert collaborative builders.

A secret weapon — me, a bilingual communicator who could sketch, interpret and translate design-intent language into value analysis alternates “live” in meetings.



Top: Zoo ARC, Jonathan Hillyer photo

Middle: Flint RiverQuarium, Tim Hursley photo

Bottom: Mercedes-Benz Stadium, Atlanta, Georgia

“I can tell you right now I can cut 40% out of the curtain-wall number if you’re willing to accept that detail,” the glass subcontractor said. For this radical innovation we used no new machines or materials. We simply listened, talked and sketched to visualize together to do what all those before us had failed to do: return to budget and realize a visionary design. We shared immediate, honest feedback. Radical and innovative, yet not really. We simply got rid of the time lags and drove out the waste. We worked together. When we were done, Antoine Predock’s project architect, Sam Sterling told us:

“Without your pulling us out of the budget inferno we wouldn’t have had a project.”

A Tale of BIM Adoption

In 2003, a new technology began to emerge in the design and construction industries. Building Information Modeling (BIM) offered the potential of integrated data, 3D digital models and a host of other advantages. Seeing this emerging market force, my colleagues within Holder Construction Company tapped me to spearhead a new initiative in adopting BIM for companywide deployment. This assignment taught me to recognize customer needs, turn them into opportunities and convert them into solutions. In the early days, our merry band of early skunkworks modelers explored new software and potential uses. Early small wins parlayed themselves into greater demand, company acceptance and eventual firmwide integration. Five years later we had created an industry-leading team of 25 of the best BIMmers in America. In discovering collision detection, visualizations and the invention of a facility management software solution, we had migrated along the implementation

continuum from awareness to adoption, implementation to integration, and ultimately to the transformation of the entire company.

During this rollercoaster journey, the highs were high and the lows were low. Lows included constantly fighting and begging for internal funding. “We need big monitors,” I pleaded. “We’re wasting days scrolling and zooming.” “But the impact companywide is millions if I give you monitors,” was the retort. Now, everyone in the company has two huge monitors, but in those days, I fought the fight. In their full complement, our radical innovations were severalfold: technology, hardware, software, training, marketing, partnering, risk management, metrics, benchmarking, leadership support, executive oversight, and, most of all, belief in the new world we were creating and the willingness to crusade for it.

A Civic Icon: Atlanta’s Mercedes-Benz Stadium

When Atlanta Falcons owner Arthur Blank announced design and construction of a new stadium for the team and the city, his challenge was to create an iconic structure as a legacy to the city and nearby communities. This first-of-kind facility aspired to “reinvent the gameday experience.” Over the course of the ensuing four years, enabling that vision would require stretching the marketplace and blazing new trails. Convincing trade experts to help us find a way to design and build a phalanx of innovative stadium features, such as an eight part-operable roof, required new-order skills in innovating project delivery, subcontracts and teamwork. Despite industry conventions, we found new ways of removing the obstacles to allow innovation among all partners. Sure, long hours, world-class expertise and belief in achieving a

highly visible mission were required. But the real genius came on the soft side: persuading and cajoling risk-averse professionals how to mitigate those risks to achieve the near-impossible.

The Spaceship: Apple Park

My final project involvement was in a BIM oversight and design management support role for the new Apple Park Campus in Cupertino, California. Designed by Foster + Partners as Steve Jobs' legacy project, the building was a glass and metal spaceship, three miles in circumference, detailed in the spirit of an iPhone. With such a world-class owner and team, the level of design and construction sophistication required an equally talented team of construction professionals to realize it. The objective was clear: to realize such a once-in-a-lifetime project, Apple would not relent to changing the design or compromising the experience of its workforce merely in response to a budget concern or logistical excuse. For one of the most valued design brands on the planet, only the finest execution of their vision would do. To do that required innovation at all levels: the finest owners, the most knowledgeable trade experts from across the world, and so on across all team entities. But the greatest project innovations will likely never be appreciated. Those include such "means-to-an-end" solutions as an onsite concrete casting plant, onsite rail guided glazing rigs for the world's longest curved glass segments, precast concrete grinding beds to achieve the high-gloss, terrazzo-like ceiling finish on the underside of the precast concrete curved double tee members, and a litany of others. In great achievements like the Apple Park campus, innovation runs deep — and goes to the root.

IS RADICAL INNOVATION POSSIBLE?

The stories above are merely my own memories of radical innovations, personal recollections that such achievements are possible within the design and construction industry. But were they radical? To answer that question and test the contrarian view, we should ask: Is it possible to innovate at the root? What if innovation merely happens in context-driven ways, at the fringes? What if it is really incrementalism in disguise?

In an essay he admitted was more notorious for its title than its content, public policy scholar Charles Lindblom, championed the merits of an incremental approach over revolution in "The Science of Muddling Through." Despite my proud sharing of a handful of personal and team breakthroughs above, I wonder if they weren't simply incremental Zen moments — that is, being present, looking for opportunities to see things anew and acting on them. Recalling our editorial themes for this year, without my introspective awareness, professional interaction with, and inclusive interdependence upon my teammates, many of these so-called radical innovations (or perhaps fringe incremental improvements) may never have come to pass. Yet, they did.

As you look to your own attempts to innovate at the core, consider your co-workers. Those who contribute to the efforts. Most likely, you won't come close to approaching innovation without them. Reflect on the great leaps in history, such as those made by Thomas Edison and Henry Ford, and more recently, Steve Jobs and Elon Musk. In architectural circles, examine Louis Kahn's ateliers and Renzo Piano's Building Workshop. In boundary-breaking, multidisciplinary new fields, we can learn from Neri Oxman and Greta Thunberg.

At the core of their greatest achievements is collaboration with dedicated, talented teams. Edison famously advised: “Invention is 99% perspiration and 1% inspiration.” My experience supports his advice. I believe persistence, teamwork and incremental improvements helped realized the innovations of the celebrated list above. None of them worked alone. None of them achieved a eureka moment without prolonged effort.

TO INNOVATE, ADAPT, USE WHAT WORKS, DO WHAT YOU LOVE — AND KEEP TRYING

“Adapt and overcome.” “Get comfortable being uncomfortable.” These adages find their roots in the Marines, Army, Navy Seabees and other U.S. military branches. They express the necessary attitudes of service personnel at war. In their contexts, there are no excuses. Their battle plans will change the moment they begin their campaigns. No one will be there to respond to their excuses. To stay alive and execute their missions they must adapt and innovate — radically. While I am hardly an advocate of military conflict, the parallels to the challenges we face in design, construction and operation of the built environment are instructional. The stakes are higher. The

problems are bigger. We need to keep adapting, overcoming and pushing “into the new.”

The “tales of old” shared above hold dear places in my life’s journey as a disrupter, innovator and student of design and construction. They may seem quaint to you. Some were new and some were quite old. Some used radical innovation in processes. Others relied on people and interpersonal skills to communicate, share vision, and deliver projects in unprecedented ways. Others activated cutting-edge technology and infrastructure. The megaprojects for the Atlanta Falcons and Apple relied on world-class motivation, desire, commitment and teamwork, in addition to the above, to stretch the marketplace and accomplish things never seen before to realize first-of-kind results.

Which of these mechanisms do you employ to achieve radical innovation? All you can, I hope, and more. But there’s a common thread in all these examples. In our journey into the new, maybe the important things are to love what you are doing, to keep looking, keep trying and keep harnessing the power of others. I’m still at it. I’ll let you know when I find the answers. I hope you’ll do the same.

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ESSAY

Small Ideas, Radical Results

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**SCOTT SIMPSON**

Senior Fellow,
Design Futures Council

Small Ideas, Radical Results

Often Simple Things Matter Most

Unlike kangaroos, human beings don't have a convenient pouch to carry things around. For thousands of years, we've transported our goods using bags, boxes and carts. As technology advanced, we've added trains, trucks, ships and airplanes to the repertoire. Now we can send almost anything we want anywhere in the world quickly, conveniently and cheaply. Why, then, did it take thousands of years to create something as simple as a suitcase with wheels? After all, wheels are ancient technology (think chariots) and luggage is just as common, but it wasn't until 1970 that Bernard D. Sadow invented a rolling suitcase. (He was subsequently awarded U.S. patent no. 3,653,474 for "wheeled luggage" in 1972.) His invention changed the way we travel, and it's probably fair to say that the market penetration for Mr. Sadow's simple but brilliant idea approaches 100%. Why did something so obvious and so useful take so long?

It's easy to overlook simple things, yet it's the simple things that often have the biggest impact. Consider the lowly gutter, which was first used in the Indus Valley civilization several thousand years ago. The problem with gutters is that they get clogged with dirt and leaves, creating backflow that can result in serious damage to the

buildings they are intended to protect. Cleaning gutters can be dirty and dangerous work, yet it wasn't until 2005 that Matt Kaulig, working out of his basement, came up with the idea for the Leaf Filter Gutter Guard. Simple and ingenious, this system allows gutters to drain better than ever and eliminates the need for cleaning entirely. Problem solved, and it only took 3,000 years.

What does this have to do with the design and construction industry? First, the industry has been around since the dawn of civilization. Second, because people spend much more time inside buildings than they do outdoors, it affects everyone on the planet. Third, it's both inefficient and a serious source of pollution (data show that 30% of all construction materials wind up as waste and 45% of carbon emissions worldwide are generated by activities related to construction). This makes it an ideal target for innovation: the bar is so low that there's nothing but upside!

Start with something as basic as getting things on and off a construction site. First, large quantities of soil and rock must be removed, then the process is reversed as new materials are delivered, generally by means of large noisy trucks that cause significant traffic congestion and pollution. Yet we know from using Uber that it's possible to arrange transportation on demand that will take us to our desired destination by the most efficient route possible while avoiding the need for parking. We can also order our favorite brand of shampoo from Amazon Prime and it will reliably arrive within 24 hours right on our doorstep, often cheaper than we can buy it at the store. Why can't these same basic principles be applied to construction logistics? Construction deliveries could be scheduled during off hours to avoid clogging traffic and the next day's materials would be on-site and ready for



*Problem solved, and it only took
3,000 years.*

installation before the workers arrived. Ditto for waste removal. Practical and prudent supply chain management could easily cut on-site waste, perhaps in half, which would save billions of dollars annually. In concept, such an approach is no more difficult than putting wheels on luggage.

Another thought is to eliminate some design and construction altogether. For example, the first space most people encounter in a hospital or clinic is the waiting room. This sends a very strong nonverbal message: "You are now under our control. We expect you to wait for service. We'll let you know when it's convenient for us to see you." Yet there are no waiting rooms in grocery stores, department stores or schools. How come? Technology exists that would enable health care providers to schedule appointments more efficiently and let patients know when the doctor and the exam room are ready. (Some restaurants use pagers for the same reason, and those pagers could easily be replaced by existing cell phones.) Eliminating waiting rooms would not only save space, and hence construction cost, it would also speed up "throughput," enabling doctors and nurses to serve more patients in a typical day. This would greatly lower

operating cost as well. With more efficient operations and faster throughput, the number of exam rooms could be reduced, increasing the overall savings. Add to this the prospect of telemedicine for routine check-ins, and it's easy to see that "process design" could generate significant savings in health care delivery. A 5% reduction in the \$3 trillion of annual medical costs in the U.S. each year comes to \$150 billion — not a bad payout for a few simple tweaks.

There are two kinds of innovation: accidental and intentional. In 1968, Spencer Silver was working for the 3M Company on creating a new adhesive. In the process he accidentally stumbled upon a sticky glue that was relatively weak and didn't leave a residue, which made it reusable. This led to the invention of Post-It Notes. Legend has it that they were first used to mark the pages in Mr. Silver's church choir book. It took 12 more years before the invention was commercialized. Post-It Notes now come in 27 sizes, 57 colors and even 20 fragrances. Some 50 billion of them are sold each year, all thanks to a happy accident.

Inventions can also result from deliberate intent, even if they take a long time to discover and develop. Charles Goodyear spent many years (and most of his family's fortune) trying to devise a way to process the sap from South American rubber trees so it would not crack in winter or melt in summer. After a decade of fruitless work and lots of blind alleys, he cooked up a mixture of latex sap and sulfur on a hot stove and got the result he was looking for, which he named "vulcanized rubber." His invention had many industrial uses and should have made Mr. Goodyear a wealthy man, but he spent most of his money defending the patent in court and died \$200,000 in debt. Though he did not found the company,



When it comes to the process of invention, Edison had it right: it's 1% inspiration and 99% perspiration.

Goodyear Tire & Rubber was named in his honor. When it comes to the process of invention, Edison had it right: it's 1% inspiration and 99% perspiration.

A quick scan of today's A/E/C industry reveals plenty of potential for innovation based on simple ideas that already exist. (Legend has it that Henry Ford got the idea for his automobile assembly line from visiting a hog processing plant in Chicago.) Computer-aided design (CAD) has been supplanted by building information modeling (BIM), and ever more sophisticated software exists that enables designers to illustrate their ideas remarkably quickly and accurately, including 4D animations. 3D printers have been around for several years and are now being ramped up from producing desktop models to constructing entire buildings. Robotics are becoming increasingly common on construction sites and in the not-too-distant future could account for the bulk of the work performed in the field. Imagine a squad of "robotic painters" turned loose in the evening and to finish an entire job before daybreak; the robots could mix their own paint, apply it and even clean up after themselves, all without the need for masking tape or stopping for a coffee break. Off-site prefabrication of major build-

ing components is increasingly common, which enhances quality and lowers cost. Drones could replace trucks in delivering materials on-site and removing waste. And so forth.

Some of the examples cited above relate to "product design" (inventing different things) while others relate to "process design" (devising different ways of doing familiar things). Both are important. Process design can be especially powerful because it results in changed behaviors that make traditional methods obsolete. Sometimes the most efficient way to get something done is to not do it in the first place. A good example of this is hydroponic farming, which eliminates the problem of maintaining the right soil mix to optimize plant growth by having no soil at all.

At its heart, innovation is about problem-solving. While some of these ideas may seem rooted in science fiction, all of them are quite real and eminently practical. Often all it takes to solve a big problem is a small idea, like putting wheels on luggage or rain screens on gutters. Innovation needn't be radical — it just needs to be effective. Sometimes simple is best.

Scott Simpson, FAIA, is a senior fellow in the Design Futures Council and a regular contributor to DesignIntelligence.



ESSAY

Radical Innovation at Geopolitical Scale

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PAUL HYETT

PPRIBA, Hon FAIA,
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Radical Innovation at Geopolitical Scale

From cell phones and cities to corporations and climates, we have the knowledge to effect sustainable change, but our geopolitical systems limit us

British comedian Michael McIntyre does a brilliant sketch in which he mocks us for being unable to leave home without taking our encyclopaedias, our photo albums, our entire record/CD collection, our maps and board games, our dictionary, calculator, camera, and compass, all our phone directories and even our torch. [Check it out on YouTube](#) — it's hilarious. Essentially, McIntyre recognises, and describes to great effect, the multi-functional role of today's "mobile phones," and our consequent dependence on them as indispensable accessories.

Few of us will ever forget that day of 9 January 2007 when Steve Jobs unveiled one of the finest examples of radical innovation ever developed, the iPhone, with its touchscreen-operated computer functions, camera and Web-browsing capabilities.

Today's generation of smart phones are widely copied by Samsung and others. Technically still classified as "cell phones" (because they do not require a landline connection), these incredible devices have dramatically transcended mere telephony. Yet strangely, despite now offering such a wide array of technological functions, having so profound an effect on our behaviours and achieving such extraordinary market penetration worldwide, they have no suitable name. No noun adequately describes them. Perversely and bizarrely we still refer to them as "my mobile" or "my phone" or by their brand name as in, "Where's my iPhone?" or "Fetch my Samsung."

With state-of-the-art computing capabilities that drastically exceed those of the first moon landing craft, our "mobiles" surely deserve a proper moniker that effectively describes their breadth of function.

In a personal quest to update their name, I proposed "4thought," after Prometheus. That god of Greek mythology — his name means "forethought" — was known for his intelligence and is acknowledged as the author of the human arts and sciences. But, "Where's my 4thought?" is a bit clunky ... My grandson prefers to simply call it a "Linky," as it connects us to the world of people and knowledge around us. "Is my Linky fully charged yet?" sounds much cooler!

The telephone has been subjected to much development since its invention in the latter part of the 19th century, one major milestone being that switch to radio signal connectivity rather than ongoing reliance on landlines. No one would argue such a significant improvement — which catalyzed and facilitated the mobile phone for everyday public use — would qualify as an innovation,



but was it an incremental innovation or was it a radical innovation? This is a key question, for in this respect, what the Linky did to the phone markets and consumer behaviour is what qualifies it as a radically innovative concept.

To the uninitiated, “radical innovation” may of course seem to be a tautology. Far from it. Radical qualifies and defines the superlative amongst a range of possible categories, including: incremental, architectural (nothing to do with architecture!), disruptive and radical. The American business strategist and author Tony Robbins suggests that radical innovators are people or businesses that create new information or products that transform their industry. Revolution, not evolution!

Our Cities | Timelapse in Google Earth

See how cities around the globe have changed since 1984 through a global time-lapse video from Google Earth.

[*Click here to see video*](#)

In the world of architectural design, calls have long been made for innovation and innovative solutions, but the references have become so overused within the ever-conservative development and construction industry that the word is now as meaningless as it is boring. Yet we live at a time when, more than ever, radical innovation is desperately needed in our processes of building design and city-making.

At the individual level, irrespective of their appearance or beauty, buildings should be designed against far more sophisticated agendas of ecological sustainability. Although we know this as professionals, our approach to materials, component selection and construction remains all too wasteful and destructive, particularly in the context of embodied energy and “cradle-to-cradle” recyclability. In operational terms, we are still at ground zero in embracing alternative and renewable energy sources. We can do so much better in both respects, but still the design, construction and operation of buildings, new and retrofitted, are in dire need of sweeping programmes of radical innovation.

The biggest challenge lies in the planning of our cities, not in the architectures of individual buildings, and here a key clue lies in the issue of compactness: We are still building our cities — whether new, or more commonly, expanded — to unacceptably low densities. Even worse, most of these expansions are effectively unplanned. Little in the way of “joined up” thinking or real forethought exists. In particular, land use/transport reconciliation is non-existent. If you don’t believe me, take a look at this video and consider the awful and inevitable conclusion of such ill-conceived and ill-coordinated construction continuing unconstrained across our globe.

Whilst we cannot go on like this, the awful truth is that we cannot stop going on like this. Despite all our cleverness as individuals, and as corporations, the dreadful dichotomy is this: As we become ever more out of control in our pursuit of freedom, we are simultaneously becoming increasingly under the control of the large multinational corporations. Instead, at the very time when the influence of national governments on our day-to-day lives is on the wane, we need to evolve systems of international governance that ensure national, corporate and individual conducts that preserve, rather than destroy, the planet.

But such governance remains a utopian dream, far beyond our capabilities. Indeed, in the western democracies we are increasingly, at this most critical of times, rejecting the very principles of international cooperation and regulation. By way of examples, the U.K. elected (admittedly by the slenderest of majorities) to deliver what may yet prove to be a death blow to the European Union. Through the collective myopia and selfishness of the majority amongst this “island people,” bold and effective pan-national instruments and processes in the regulation and control of manufacturing and distribution have been dissolved, just when we most need them to be refined and expanded.

Likewise, the USA has (re)turned to isolationist policies, through its recent clarion calls of “America First” and its rejections of the United Nations, the World Health Organisation and the Paris Accord. Think about that: The U.K. and the USA effectively abrogating their hitherto assumed and acknowledged global leadership roles to turn their gazes inward ...

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We desperately need radical innovation in the way we live and operate at city, regional, state, national and international levels. Put simply, our socioeconomic-political systems of governance have not evolved with the sophistication necessary to responsibly manage our expanding technical, manufacturing, and commercial trading capabilities. Consequently, these capabilities have developed unrestrained — to devastating effect — in pursuit of market growth and profit ... This journey to disaster won't be slowed, let alone reversed, unless our political systems are subjected to a programme of radical innovation.

The message here is clear: We desperately need radical innovation in the way we live and operate at city, regional, state, national and international levels. Put simply, our socioeconomic-political systems of governance have not evolved with the sophistication necessary to responsibly manage our expanding technical, manufacturing and commercial trading capabilities. Consequently, these capabilities have developed without adequate restraint — and to devastating effect — in pursuit of market growth and profit.

In short, we allow corporations to make and distribute products and services that are bad for us. We permit their use without adequate control. For example, the internal combustion engine. For example, air travel. For example, plastics. The result is that the pure sands of 18,000 islands in Indonesia are all peppered with polystyrene granules; the white snows of the Arctic and Antarctica are black with carbon soot; the oceans are awash with plastic debris and the very ozone layer that protects our world has been breached with gaping holes. This blatant disregard and destruction has mostly happened in the last quarter century or so; that is, on our watch! And it's getting worse at an exponential rate. Shamefully, we all know all this already — every government knows it, every international agency and corporation knows it, the entire thinking world knows it — but we are seemingly powerless to do anything to stop it. This journey to disaster won't be slowed, let alone reversed, unless our political systems are subjected to a programme of radical innovation.

All of which takes me to the brilliant “rolling workshop” David Gilmore heroically staged in Rome and Venice this October on behalf of the Design Futures Council (DFC).

Bringing together academics, practitioners and representatives of leading professional institutes from around the world, he asked participants to contemplate the United Nations' 17 Sustainable Development Goals in the context of designing and managing our future cities. Borrowing from the theme of this year's Venice Biennale, the essential question was posed in the first session of DFC's Day 1 event: How will we live together? Or, as past UIA president Tom Vonier put it so well, how is it best to live in our cities?

One of the working groups concluded that the design professions already hold the knowledge and intelligence required to solve the environmental challenges the world faces. Yes, even at current population levels, we can still live in ecological harmony with our host environment. They defined the problem thus: The horizons under which our political systems operate, based on four- and five-year election cycles, are too short, and the young are insufficiently empowered for their knowledge and design skills to be used to proper effect.



Venice Biennale 2021, author photo

So, whilst intelligent design is the answer, no amount of design intelligence can have any useful effect unless our political systems at international, national and city levels ensure that such design intelligence is applied effectively. The obstacles in that respect are immense. This was beautifully illustrated in the very first episode of Geoffrey Robertson's brilliant series "Hypotheticals" as broadcast on Australian television in the 1980s.

The programme was named after a teaching methodology developed at Harvard Law School some 90 years ago, in which students were briefed to adopt roles in hypothetical situations to familiarise themselves with the practise of law and to hone their skills in legal analysis and advocacy. Robertson used the technique to brilliant effect in "The Fast Track" way back in 1985 (which was the effective starting date for each of the city expansions recorded in the earlier video referenced above), to demonstrate the utter ineffectiveness of our western, market-economy, democratic systems to get the right things done. [Check it out.](#)

I am also reminded of Brian Anson, who tutored at the Architectural Association in the early and mid-'70s. A refugee from the Greater London Corporation, he had gotten himself fired for opposing plans to demolish the beautiful old Covent Garden Market Hall. It was subsequently saved, in no small part through his efforts, and put to wonderful reuse as a small business, retail and tourist destination. Brilliantly successful, it became one of the city's major landmark destinations.

Heavily battle-scarred after a decade of activism, Anson argued with considerable passion that we should all hang up our T-squares and set aside our drawing instruments to join a struggle for a new political-economic order through which tomorrow's socially responsible architecture could be delivered. I thought him too radical and well adrift of sensible thinking back then; now, I am not so sure.

Because whilst our architecture and planning for cities need radically innovative new strategies, these cannot be delivered until our geopolitical systems are themselves subjected to a radically innovative overhaul.

Paul Hyett is a founding principal of Vickery-Hyett in the U.K., past president of the Royal Institute of British Architects and a regular contributor to DesignIntelligence.

Red Zone to End Zone

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Red Zone to End Zone

*Charles Pankow Foundation Executive Director
Anne Ellis discusses industry transformation*

ANNE ELLIS

P.E., Hon.M.ACI, F.ASCE, NAC
Executive Director, Charles Pankow Foundation

DesignIntelligence (DI): Our theme for this quarter is radical innovation, which connects to your organization's mission to transform the design and construction industry. Can we start with some origins? How did your organization come to be?

Anne Ellis (AE): Our namesake, Charles Pankow, was a 20th-century leader in our industry. He was a civil engineer by training, a contractor by profession and a tireless volunteer in many industry organizations, driving the concepts of competence and professionalism. He shared best practices, knowledge and ideas with the civil engineering profession and the construction industry. He was an extraordinary inventor in his own right. His company held patents in numerous precast concrete

technologies, as well as for job site automation. From the outset he was quick to recognize, adapt and adopt innovation. He capitalized on work others did, knew how to bring it forward, how to sell it on projects and how to monetize it. He was an inventor, an innovator and a successful entrepreneur. A cosmic combination. Late in life, he decided he wanted to establish a research foundation. After many manifestations of what that might be, he decided it was going to be an independent, stand-alone, not-for-profit organization, dedicated, driven by and delivering for the industry. That's our mission: to deliver better ways to design and build for industry transformation.

DI: When did your organization begin?

AE: We began in 2003, but our first grant wasn't written until 2006. Mr. Pankow left a sizable art collection that needed to be sold; plus, the foundation's founding fathers were building the ship as they were sailing it. They needed to understand the constructs of a research foundation. They interviewed a number of people and arrived at a disciplined approach for what that might look like, and it has constantly evolved since.

DI: To lay our foundation, you are a lean, rightsized organization. You're not doing the work yourself, your role is administrative, right? Evaluating proposals, funding the work and overseeing it?

AE: Actually, we are much more involved. All our work is industry-led, often by our own board members, each one accomplished in business and their AEC profession. They work with industry to identify ubiquitous problems that can be addressed. They look for practical solutions, not reinventing the wheel. It's a big world and ubiquitous problems have many solutions. Often by looking at other geographies or adjacent industries, the solutions are already present, it's just a matter of packaging them for our industry or professions. We assemble the teams, involve the key stakeholders thinking about who needs to be at that table. We always start with the end in mind. What does success look like? What are the hurdles to that success, and who needs to be with us to overcome them? We apply our strategic and specific approach to everything we invest in.

DI: You mentioned Charles Pankow's origins as a civil engineer and his early work in precast concrete. You've had a constant structural thread. Are there others?

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We only invest in projects that are “red zone to end zone” — things that just need a good offensive line to push them over the goal line.

AE: It's important to know your core and stay with it. We have two, one is structural. We started in precast concrete and have extended our reach from there, into reinforced concrete, structural steel and now embodied carbon, recognizing the embodied carbon significance in base building design and material selection.

The other core is collaborative project delivery. Charles Pankow was doing design-build long before anybody gave it that name. Rik Kunnath, the current chair of the Pankow Foundation board and former executive chairman of the board of Pankow Management, Inc., is one of the founding fathers of the Design-Build Institute of America. Within collaborative project delivery, we've invested in capacity development around design-build, design management, integrated project delivery and building information modeling (BIM). We funded the development of the first national BIM standards, which are now undergoing an update by the National Institute of Building Sciences.

DI: That first core connects with me, because I've personally traveled those roads for years. On the second core, collaborative work, project delivery and BIM, being in Atlanta-based, I'm familiar with Chuck Eastman's work and the structural initiatives you have funded.

AE: Chuck was a principal investigator on several of our projects early on. He helped build industry capacity when there was none and did a terrific job.

DI: In doing what you're trying to do, it seems a perpetual challenge to break boundaries within our proprietary, self-serving, fractured, fragmented industry. You're in a position, it's your mission and you've got the money, power and leverage to make some of these things happen. I'm curious about your risk profile or attitude. What you mentioned sounded like, "Let's look for the low-hanging fruit. The solution might be right next door."

AE: First, all our investments are in nonproprietary solutions. There are plenty of people investing in proprietary solutions for completely different and important reasons. Second, and related to risk, we invest in late-stage activities. Early on, our first executive director Bob Tener coined this expression characterizing our investments: We only invest in projects that are "red zone to end zone" — things that just need a good offensive line to push them over the goal line.

You can view the BIM standard that way. The technology was there, but the material interests needed to collaboratively organize their data. Subsequently, the data has been incorporated into BIM software and related tools. We helped make that happen.



You asked about silos. I'm a boundary spanner, as is each member of our board. Boundary spanners are individuals within an innovation system who reach out across the silos of stakeholders to technical and business leaders to foster meaningful collaboration for knowledge production. The more stakeholders from different silos involved, and the more diverse the stakeholders, the better.

A good example of the power of diversity is the steel industry's Need for Speed program. They're looking at cutting 50% of the time it takes to build a steel building. They've brought everybody to the discussion — metallurgists, fabricators, erectors, designers — all the stakeholders across the value and supply chains.

"Knowing what we know today, and our needs in the 21st century, what would the solutions look like?" That's extraordinary, and it's only going to happen if you have everybody to at the table. When you look across the silos, not everybody has the appetite for innovation. Those people are few in the industry. You have to find them. But when you announce you're doing something novel, it's amazing how quickly they find you.

DI: Describe your approval and selection process. Is it push or pull?

AE: All the above. We accept unsolicited proposals, but only a small percentage of them get approved for funding. Usually because the people seeking those funds haven't involved industry in their proposal.

Sometimes we'll look at a proposal and see a really cool idea. But from our industry experience, we know there are some flaws in the concept, and some people don't

want to hear that. Other people will invite our perspective and say, "Really? Tell me more."

To entice industry to join an initiative, you've got to have a powerful, compelling solution to a ubiquitous problem. Getting the attention of technical and business leaders is competitive.

We pressure test all ideas. They go through me or a board member first and then the collective board. If it's a safety issue, we reach out to insurance industry leaders and ask their opinion, based on their portfolio of topics. We're always networking and getting reality checks, not only on the problems or the solutions, but is this the right team? If not, who might we need to add? We spend a lot of time on these conversations.

DI: How does the financing and reward-sharing work? Are private businesses in a position to benefit from your work? Are they engaging on their own, just to shape the future?

AE: A few years ago, we saw an opportunity to financially include industry in our projects. We piloted that. When our partners realized they could get multiples of return on that investment in value back, they were willing to invest financially as well as contribute volunteer time. That works well if people know you.

In those instances, you can just pick up the phone, they know our past performance, our record of success, our process for success. Others need time to get to know us, develop that relationship. It often starts with a leader contributing time and knowledge to one of our projects before investing co-funding.

I'm talking to people who are partnering with venture capital and emerging technology companies. They have a similar model. Before they put their own money in, the investor may offer their time and insights while getting better acquainted with whom they are working. It's a common path to partnering.

For all our projects, we set the expectation of dollar-matching. If we put a dollar in, we seek a dollar from industry. If we can't raise the co-funding, either we aren't solving the right problem, we don't have the right solution or we don't have the right team.

Our Embodied Carbon in Construction Calculator (EC3) tool was a good example of our co-funding success metric. The EC3 tool was developed by the Carbon Leadership Forum at the University of Washington and led by Kate Simonen, the CLF founding director and UW's architecture department head. We had funded Kate's foundational work on embodied carbon.

She approached us with a proposal to create a digital tool providing 24/7 free access to Environmental Product Declarations (EPDs) that had been third-party verified. You could locate the EPDs by zip codes. That tool enabled purchasing decisions based on cost and embodied carbon data. Kate brought the structural engineering firm Magnuson Klemencic and Associates to the table, as well as Skanska. They said, "We'll help pilot the tool, the Carbon Leadership Forum can inform the development of the tool." Kate also brought in Microsoft who said, "We'll ask all our teams to use the tool on our campus modernization project," understanding it's a pilot.

That was a cosmic combination. We had the right team, the right topic, at the right time and we had no problem attracting co-funding with over 30 contributors: owners, designers, builders, material suppliers, trade associations and standards developing organizations. We were challenged by some parts of the industry who saw this work as a threat to their livelihood. To her credit, Kate invited everybody into the tent for the discussions. What came out of the development of that tool was a more informed, honest approach to environmental product declarations — what it means when you're using your product-specific EPD vs. an industry-average EPD.

We're proud of that work and so are our co-funders. That tool was turned over to a new organization called Building Transparency (BT), which is well supported by building owners including the tech giants. BT has enhanced the tool and the technology, and the tech giants are guiding BT on developing data standards — not only for that tool, but for the industry globally. This project is an excellent example of industry's willingness to share in financing and how the diversity of participation and passion can propel the industry forward. That's how radical innovation happens.

DI: You mentioned meeting with some resistance. Where did that come from? Competing organizations?

AE: There's always natural opposition. Some say, "We're already doing that." Others say, "That's going to hurt my bottom line or my top line." There are a multiplicity of reasons and rationales.

DI: From human beings ... and businesses.

AE: Change is hard for many. People are so vital to successful innovation. They are key to acceptance and adoption. You have to understand who it touches, who it impacts and what you need to do to bring them along. That's one of Kate Simonen's superpowers. She has a great attitude about bringing everybody into the tent. She asks, "Tell me why that's going to hurt your business? Maybe you could sell more."

DI: You're taking us down an important path: Innovation is about people. You talked about the entrepreneurial mindset. You're an engineer and I'm an architect. Although we're trained to be creative and innovative, much of my education was individual- and ego-centric. It was always about the work — great architecture, innovation in form or process. But that gap around leveraging design work is in embracing that fear of change, management of risk, opening the arms wider to thinking like an entrepreneur and monetizing it. The engineer thinks, "I'm a fantastic engineer. A great innovator as long as I'm within my calculations and paradigms." But when they face change it takes them out of their comfort zone. What do you say to those of us who are challenged with fear of change?

AE: Innovation and those advancing innovative ideas have many forms, different goals and risk tolerances. I frequently encounter people who are wonderful at innovative designs but aren't necessarily innovators. Innovators bring new or modified solutions forward that people are willing to pay for and can be used over and over. Innovative design is often done on one project and rarely gets leveraged on others.

Architects might have a signature look. Structural engineers might have a signature system. It's important to

distinguish high-value, well-respected innovative designers and what they do from what it is we're trying to achieve. They are very different. We aim for solutions that will be adopted and utilized broadly. There are also those who prefer to hold their ideas close and shun our model of collaboration. And there are those that prefer a proprietary route. Our goal is industry transformation. Nonproprietary solutions are key to that.

DI: You got to the core. Engineers and architects are trained with the artist's mindset. To a large degree, much of what we do is one-off. That's why we got in this business — for that variety. "Okay. I solved this problem individually — and in a new way. Now I'm ready to move on to something new."

That mindset has very little to do with, "Let's repeat that, apply, monetize and leverage it over a broader scale." That demands a modicum of business inclination. At DI we've been searching for people interested in that. I interviewed some from WeWork and Kattera who were the poster children for radical change. But they both got out ahead of their skis.

How do we crack that nut? Maybe it's unsolvable. If you're somebody interested in leveraging an idea for more impact at scale, that's a different mindset than to design a cool building one time, then leave it behind and do another one-off.

AE: WeWork and Kattera are great case studies we need to learn from. WeWork did help shift our expectations of workspace. And Kattera inspired a new generation to reconsider industrialization of the design and build process. It may be best to revisit their impact further in the future. But there are many others in our industry

driving change through innovation that scales. Many are working with us.

We've just completed a multi-year roadmap to introduce advanced materials into the market. We spent \$4 million investing in laboratory research to inform code provisions on the use of high-strength rebar for reinforced concrete. The standard rebar used in reinforced concrete in the United States today was 1950s technology. Think about the advancements in metals used in automobiles and transport since then. These higher-strength materials offer huge advantages.

Designers, rebar fabricators, researchers came together as an industry collaboration. We identified the research needed, a research roadmap was created, and we've completed much of the needed research. New code provisions have been adopted. Now the marketplace takes over. It may take 20 years to see what impact this has on the industry. Use of high-strength rebar will probably become prevalent quickly in certain parts of the country and take longer in others. It's the same with embodied carbon.

There's so much embodied carbon sophistication in the Pacific Northwest, but in other parts of the country they don't even want to have the conversation. It takes time. We're a big independent nation. We don't like to have things mandated, ironic as the U.S. design and construction industry is the most regulated design and construction industry in the world.

DI: I want to touch on that idea of getting outside of our industry. With the exception of people like you and your organization, we make one-offs ourselves because we're still building with ancient tools and

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I frequently encounter people who are wonderful at innovative designs but aren't necessarily innovators. Innovators bring new or modified solutions forward that people are willing to pay for and can be used over and over. Innovative design is often done on one project and rarely gets leveraged on others.

delivery models. We are not accustomed to going outside our industry. You attracted Microsoft to the table and were inclusive. Are you going beyond the AECO industry in your purview?

AE: In the United States, any of us can have a rich career and never leave our own backyard. It's a big country and we've been blessed with wealth and significant investment in our infrastructure for the past 150 years. That's wonderful, but it also disadvantages us, because if you don't get up and move around and have other conversations, we're going to miss out on inspirational opportunities in other geographies, market sectors and industries.

Earlier in my career, I represented a significant global industry, the concrete and cement industry. That was the first time I had visibility into what was going on in Europe. They adopted the Kyoto Protocol, and we didn't. Now you're watching these global companies making changes and capitalizing environmentally and monetarily in Europe — and wanting to leverage this in their businesses in the U.S. When I worked with AECOM — 100,000 employees in 150 plus countries in practically every market — we had sessions on adjacencies. What might one geography or one market sector be doing that could benefit another geography or market sector?

There was a time when the U.S. government came to AECOM and said, "We see a need for cold storage in Africa, can you help?" At that time, cold storage was ubiquitous in the U.S. and many other countries. During the pandemic, the challenge in many parts of the world lacking cold storage infrastructure became apparent. Think about how that held back global roll-out of the COVID vaccines. People working for global companies

can capitalize on their visibility. That's why you see companies like AECOM, Parsons, Gensler and other global organizations doing the kind of work they're doing. So yes, there is opportunity and inspiration to be gained from outside our industry and our geographic areas.

DI: Aggregation. The power of being big and working at scale ...

AE: It's not always about being big. I was struck by the presentations at your recent Design Futures Council Leadership Summit on Technology and Applied Innovation in La Jolla. The presentation on what's happening in bioscience buildings right now — their needs and what's driving this emerging market — was fascinating. Gary Kaplan, CEO of Virginia Mason Franciscan Health in Seattle, who talked about instituting the Toyota Production System — basically Six Sigma, Lean and Kaizen in hospital operations. That was someone with a vision, willing to look beyond and try a proven system in a new arena. He is an innovative and inspirational leader. What he did with his hospital was transformational to the wellness of that community.

DI: Maybe it's about perspective and breaking boundaries, not size. You said some of these things may take 20 years to materialize. Since we're at one minute to midnight on the environmental clock and for saving our industry, can we defy the laws of time?

In a construction mindset, we can put two crews on a wall to build that wall in half the time. And the architects always counter with, "Well, that's linear, with objective resources. We have diminishing returns. On wicked design problems you can't always just apply

more resources and do it faster. It's iterative and divergent." Is there any thinking to accelerate the work you're doing? Is it possible?

AE: We need to be careful. There is always going to be a significant demand for work that can be done by hand. But over 80% of the tall building stock in the world has been built since 2000. These are 21st-century accomplishments, innovation that could not have happened without a lot of other innovations preceding it. The more complex structures capitalize on innovations in concrete pumping, exoskeletons, drones, LIDAR and

numerous other technologies, I don't buy into that overused claim that we're not making progress. If you talk to Dr. Leo Sveikauskas, research economist in the U.S. Bureau of Labor Statistics' Division of Productivity Research and Program Development he will tell you that the flat line of productivity in our industry is more likely attributed to the mid-20th-century productivity model used in the analysis — which needs innovating.

DI: What do you struggle with? What's the real problem we're trying to solve?



AE: One of our biggest challenges is finding those right problems to solve, the right team, bringing it all together. It takes time to put the pieces together. During the pandemic, I spent some time reviewing the impact of the foundation's investments, we call it the retrospective project. Looking back at what worked and what didn't work is always a healthy exercise. We had one investment in an advanced diaphragm approach. It was complex, involved different standards and organizations and it needed to get done quickly. From a code perspective, what was accomplished was extraordinary. Unfortunately, the market for it has not materialized.

That's an example of something that didn't work as well as hoped. From our perspective, we hit the results, the code modifications, the research, everything, but the market acceptance, adoption and growth hasn't happened yet. Maybe it will, but certainly not with the speed anticipated.

Then you consider the success of our SpeedCore investments. This was the brainchild of Ron Klemencic, one of the most significant names in tall buildings today, an extraordinary innovator. He saw a way to greatly reduce the steps required to build a core wall for a tall building. Most tall buildings utilize a reinforced concrete wall lateral load system, often from foundation to the roof. To build these walls requires placement of the rebar, then the formwork, then placement of the concrete typically transporting it via concrete pumps, then stripping the formwork and then repeating the process over again, floor after floor.

Ron came up with a way to eliminate the rebar by using prefabricated steel sandwich plates in lieu of formwork. The plates also provide support for temporary activities

and, once filled with concrete, remain in place for the life of the building, providing wall strength and stability. Ron eliminated the rebar and formwork and form-stripping. The first project that piloted this system was Rainier Square Tower in Seattle. They cut nine to ten months off the construction schedule on the first use. You can imagine the potential additional time savings once you're able to capitalize on lessons learned. The uptake of the system is great, as we see it used in buildings from West Coast to East Coast. And now the industry is looking at scaling the system, so it's appropriate for shorter buildings.

DI: It seems so simple in hindsight. We become mesmerized to do it the way we always have.

AE: Yes. And now it's triggered, "Okay, now we have these steel plates, what about the fireproofing, how are you going to do that?" Well, there's capacity in that steel for fire protection. What if we capitalized on that? Now, you're unleashed more innovative conversations. It's like you've given permission and unleashed all that pent-up interest and opportunity for more innovation.

DI: Give us a glimpse into the future — 10 years from now.

AE: I hope the Pankow Foundation is still growing and thriving. I'd love to see it expand, maybe add another core or two. I know the process works, and I'm confident there are going to be more partners to work with us, including the next generation the digital natives who have been raised with an entrepreneurial mindset. We built this amazing industry in the 20th century, but desperately need to design for 21st-century problems and with 21st century tools and technology.

I hope in 10 years we'll be pivoting from prescriptive-based design. We need to think about performance. We can't afford to have another earthquake or the aftermath of the earthquakes, like we saw in the 80s and 90s in California where so much of our infrastructure and buildings were destroyed.

We have to be able to design for functional recovery, for all types of hazards. I'm a structural engineer, so those are things I think about. And of course, reducing the environmental consequences of all our decisions. It's truly amazing how environmentally aware we have finally become in the U.S., but we still have a long way to go.

DI: A wonderful vision. You've helped us see the value of broader involvement, tackling the big problems and what it takes to move the ball the last 20 yards. Thank you.

AE: Red zone to end zone. You are welcome. And thank you, Michael. I really appreciate the conversation. I've loved these questions. They're my favorite topics.

Anne M. Ellis, P.E., Hon.M.ACI, F.ASCE, NAC, is a recognized structural engineer, trailblazer and champion of innovation and industry advancement. Her career extends over four decades, six continents and numerous boundary-spanning corporate roles enabling dynamic growth and innovation in technology, business and operations. Currently, she is the executive director of the Charles Pankow Foundation, responsible for daily operations and an innovation portfolio delivering better ways to design and build for industry transformation.

A trusted advisor to business and geopolitical leaders, she serves on the board of Alpha Corporation and GEI Consultants. Over the past twenty years, Ellis served by appointment of five U.S. cabinet secretaries to their federal advisory committee addressing matters of energy and trade policy.

An industry leader, Ellis currently serves as the chair of the board of directors of the National Institute of Building Sciences, the first woman elected to serve in this leadership role in the institute's 47-year history. Ellis also served as the 90th president of the American Concrete Institute, only the second woman elected to lead this global organization. For her leadership impact at ACI, she was named one of the Most Influential People in Concrete Construction in 2013.

In recognition of her industry and professional accomplishments, Ellis was inducted into the National Academy of Construction, the Virginia Tech Academy of Engineering Excellence and the Virginia Tech Via Department of Civil and Environmental Engineering Academy of Distinguished Alumni.

The background is a complex, abstract pattern of golden-brown and dark brown swirls, resembling marbled paper or a microscopic view of a liquid. Numerous small, bright, circular highlights are scattered throughout, giving it a textured, almost cellular appearance.

Risky Business

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PANKAJ DUGGAL

President & COO, Jensen Hughes

Risky Business

Jensen Hughes President and COO Pankaj Duggal discusses his firm's innovative initiatives to manage and mitigate risk — and transform customers' mindsets.

DesignIntelligence (DI): To set a foundation, how would you describe your organization's mission and vision? Who is Jensen Hughes, what do you do and how are you positioned in the AECO marketplace?

Pankaj Duggal (PD): Last year, through engagement with 400+ employees, we evolved our mission and vision — our purpose and principles — to reinforce our focus on people, clients, industry and performance.

Since 1939, we have protected what matters most to our clients through innovative, compliant, reliable solutions. By adding deep functional expertise and technology know-how, we can address the complexities of safety and security challenges across the risk management spectrum. As the largest global safety, security and risk-based engineering and consulting firm, we offer more than 1,450 people operating in 15 countries and we have delivered projects in 100+ countries worldwide. We are also the largest specialist fire engineering firm in the world, with roots that trace back to Schirmer Engineering, Rolf Jensen & Associates, Hughes & Associates and Aon FPE.

JENSEN HUGHES MISSION AND VISION



Our experts have technical expertise across the entire spectrum of fire and life safety services, in areas such as alarm and security systems design, smoke control, modeling, code consulting and fire forensics. Over the last several years, we have continued strategic acquisitions to expand our global capabilities in fire protection engineering, risk and hazards, security risk consulting, forensic engineering, emergency management and planning and other related disciplines.

With a strong focus on the built environment, roughly half our business aligns with architecture and engineering partners. We work with the world's leading designers and constructors to unleash the power of innovative design through expert technical solutions in the architecture, engineering and construction markets.

DI: How does that relate to your personal mission? Why are you here? What are you trying to accomplish?

PD: With 30-years in the A&E industry and 21-years at Jacobs in a global senior management role, I saw Jensen Hughes as a unique opportunity to understand the safety, security and risk management market. More importantly, it offered me an opportunity to convince my peers and partners in the A&E community of the value in early engagement of Jensen Hughes' expertise during design and construction. Too often, we get brought in too late in the design process to make positive impacts on design directions and outcomes.

DI: Operating on a global scale as you do, what challenges do you face in your pursuit of transformational innovation? How are the topics of R&D and innovation approached organizationally? How are they funded, led, rewarded and implemented firm-wide?

JENSEN HUGHES TECHNOLOGY-ENABLED CONSULTING SERVICES PLATFORM



PD: We are committed to technology-enabled solutions platform and professional services delivery through transformational innovation as a core value. Almost all companies in our industry face the challenge of funding these initiatives and making them a priority. After all, there is so much pressure on the P&L these days from various business needs in the short-term, while R&D and innovation are a long-term play. Creating a balance in the competing priorities and staying focused on the long-term strategic outcomes relative to R&D and innovation have been key to our focus on driving innovation. As a result, these topics are fundamental ongoing job expectations for almost everyone, especially our technical leaders. We have technology experts who are specialists in software development and integration, and all staff are evaluated and rewarded for their contributions in innovation, whether in technology, process or discipline content and expertise.

DI: Can you share some specific examples of innovation initiatives you're pursuing? Things you are putting into practice in key solution areas to add value for yourselves, customers and communities?

PD: The first ones that come to mind are our technology-enabled solutions. We are focused on tools that leverage our expertise and help our customers. All our platforms aim to do 3 things: achieve compliance, reduce overall client risk, and streamline processes to drive intelligent solutions yielding lower operating costs.

One example is called SmartPlan™. SmartPlan is an interactive, database-driven tool we use to help our Industrial clients mitigate risk and integrate their hazardous management, emergency evacuation plans and business continuity plans into one interface on the client side. When something goes wrong, they have everything they need in one place to manage that situation without the assistance of third-party consultants.

Similarly, let's talk about our ProtectAdvisr™ tool. With increasing numbers of fires and disasters, as well as health systems expanding through mergers and acquisitions, the need for real-time coordination, communication and response across organizations continues to rise. ProtectAdvisr™ is designed to aid

healthcare facilities in streamlining their emergency management, life safety and fire safety procedures, improve preparedness, and collect and analyze data. Our user-friendly, web-based technology can be customized for use in a single community hospital, a long-term care facility or across an entire national health system. As the central hub for accreditation/licensure compliance, communication, coordination, response and reporting, using our tool helps facilities save time and money while further improving CMS compliance and safety for patients and staff.

DI: I assume that is digital, cloud-based and accessible on remote devices in case the facility goes down?

PD: Exactly. These tools are digital, cloud-based and can be accessed through mobile apps.

DI: One of your mainstays has always been in structural and infrastructure consulting. What's new there?

PD: In Forensics we are focused on things like concrete aging, structural failures, green concrete and other infrastructure-related areas – all with the purpose to make our world safe, secure and resilient. We're analyzing and doing risk assessment for fires in tunnels and tunnel ventilation issues. We now have an accredited concrete lab in Chicago. These practices relate directly to the U.S. infrastructure bill. The unique innovative aspects of these areas are tools like computational fluid dynamics (CFD), for example, for trains or vehicles carrying hazardous materials. Our industry partners have in-house experts and tools, but not to the extent we do.

Another growing area for us and the country is in energy storage systems with a focus on lithium-ion batteries, which presents a huge fire and explosion risk. This a huge new movement these days. And the emphasis is on reducing cost and size. This is great from a clean energy perspective and its where we need to be going. Warehouse battery racks and shelving are becoming stock now. But these systems come with hazards, manufacturing deficiencies, faulty electrical connections, failed cooling systems and various risk and reliability events. Our focus is on risk mitigation and code compliance.

Manufacturers, clients and the world are eager for these solutions, but local regulatory agencies often don't have the codes and expert in-house knowledge to deal with these emerging technologies. So, the industry has several challenges. Automotive, manufacturing and data center clients are installing large-scale battery and photovoltaic cell installations for backup power. Transportation and commercial and institutional clients are too. The need is tremendous, but the risk is ever-present. We are supporting reviews and end-user clients for safe installations and working with local authorities at both ends to support this rapidly growing market. Our focus is on consequence modeling, looking at different options and scenarios, from start-up through load flow and assessment analysis to commissioning and operations as well as code compliance.

DI: Clearly a complex set of problems that need new integrated systems to collect, analyze, synthesize and visualize the data using systems-based tools.

PD: That's right. Along those lines, we are getting involved with risk-informed maintenance, and the internet of things. This transcends traditional static BIM-based facility management, where your system would tell you to change all the lightbulbs every six months.

We are leveraging what we do in the nuclear and power space, where we do a lot of probability risk analysis (PRA) and looking to cross-pollinate solutions in other industry segments. In the nuclear industry, there is not much room for risk. In risk-informed maintenance (RIM) we look at the lifespan of various components and provide data that tells clients to replace them before they reach the end of their design life, rather than a routine replacement schedule. In RIM, we analyze the probability of a component failure occurring and extend utilization of that component based on the PRA. As a result, you replace it optimally and minimize downtime while optimizing your cost. We had a recent project in which the local authorities were not ready to approve a design, because of the perceived risk of failure. So, we leveraged our PRA team to analyze the issue. They discovered that the risk probability of the failure occurring was less than someone getting hit by lightning. Once the code officials understood that, they approved the design. Using data, analytics and visualization helps leverage our technical expertise. It can unlock minds to help people see and understand things and sometimes even change their preconceived mindsets.

DI: Are there other emerging service areas?

PD: A big new area is in wildfire mitigation and management. This is tied to responses for the events that have been happening in California over the last two decades. It has become an emergent global problem. We



Using data, analytics and visualization helps leverage technical expertise. It can unlock minds to help people see and understand things and sometimes even change their preconceived mindsets.

are also seeing it happening in Australia and Europe. With climate change, these impacts are likely to worsen and become increasingly profound. To mitigate these challenges, we are focused on the wildland and urban interface with technology, integrated solutions and the industry. A wildfire is one thing in a forest, but when it moves to the urban context it threatens humans and our built environment. People are having trouble insuring their properties in California. Insurance companies are now asking for wildfire plans. Visualizations, assessments, wind and weather patterns, and dynamic analyses play a huge role, and they impact design in significant ways — knowing these risks, planning a site, dealing with challenges of fuel storage in high-risk areas and vegetation management. You need mass notification systems, structural hardening assessments, and smart building envelopes, fire mitigating roof, windows, and related systems. We also perform defensible space assessments for things like firefighting access, separation analysis and emergency power recommendations. Solutions could be as simple as having exterior sprinklers and fire protection measures against wildfires. At the community level, we work with the local authorities to help develop the training, drills and exercises for these situations if and when they might occur.

DI: What are some of the pitfalls of such investments for software, hardware, infrastructure and training?

PD: There's a reason we are a leader in this space. When we look at solving emerging problems and deploying them globally, our team always looks to technology-enabled solutions. But we've learned that one can't expect a return on these kinds of investments in 12 months, we are in it for the long play. Sometimes we offer these tools through a subscription service to our clients and industry partners. Our software team works with the discipline

experts to capture the right nuances. It can be anywhere from 12 to 36 months before we can launch a software product, but it's an essential aspect of our business. And it's one of the things that attracts the best talent to Jensen Hughes. Hopefully, we'll continue to shorten those development cycles.

DI: The common theme of risk management and mitigation prevails through everything you are sharing. Designers typically don't think about that. The entrepreneurial mindset is not something most architects, engineers and consultants are predisposed to have. They are not taught it, encultured to it or rewarded for it. Folks within in a code, fire protection and risk management consulting organization like yours, seem like they might be focused on following the rules. Am I stereotyping inappropriately? Enlighten me on some instances in which you are having to innovate to maintain your lead position in the industry.

PD: That's a fair assessment of our industry and its people. I can say that because I am part of the industry. Construction is one of the slowest industry segments to innovate and adapt. Not much has changed. In our space, our people like to mitigate risk, not create it. Do you have to follow rules? Yes, but you also have to think outside the box — to think about things others haven't. As technology impacts other industries, we must get smarter and adapt faster. Electric vehicles are a good example. Look at what happens when an electric vehicle is in an accident and catches fire. In one such incident in Texas, it took 30 times the water to extinguish that fire. There's room for innovation there. The first responders are using water. Perhaps we shouldn't be using water? It's just one example, but we at Jensen Hughes are always pushing to find that balance.

DI: In managing your own risk — the future of your organization — what is the future telling you, and what are some of your responses? How are you looking over the horizon in specific ways?

PD: The examples I just offered illustrate what we are asking ourselves about. If we continue to do what we've always done, we won't be growing and innovating. As a result, we are constantly looking at external industries and the larger global context. At Jensen Hughes we are continually looking at different ways of solving our clients problems while leveraging our global talent base and technical expertise to bring innovative solutions. We continue to make investments in strategic acquisitions that help grow our technical expertise and market presence. Per our Purpose Statement, our mission — and the innovation that enables it — is always driven by our people, our clients and the industry to achieve our vision of increased performance and growth.

Pankaj Duggal serves as the president and chief operating officer for Jensen Hughes, a global engineering and consulting firm with 1,450 employees. In his role, Duggal provides business leadership across the company's operating divisions and supports the achievement of strategic initiatives and financial goals. Previously, he was senior vice president at Jacobs. His interest areas include strategy development, integrated design, safety and risk, alternative delivery, total cost of ownership and high-performance built environment. He brings a strong focus on leveraging inclusion and diversity for growth-oriented business approach and collaborative decision-making. Duggal serves on the Dean's Advisory Board for the College of Architecture and Urban Planning at the University of Michigan and on the advisory boards for the Design Futures Council and the Greater Washington Board of Trade.



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DEBORAH WINGLER

VP & Health Research Lead, HKS

Wildly Uncomfortable

HKS' global director of healthcare research & strategy discusses connections between research, experience, strategy and design

DesignIntelligence (DI): To level-set for readers, your role is a unique one, atypical in the design industry, leading healthcare research and strategy for HKS globally. How do you spend your time? Describe your world.

Deborah Wingler (DW): Every day is different, which is extremely rewarding. Around 60 to 75% of the time, I'm engaging with clients or working on client projects. That can be a wide range of applied research services such as developing an experience strategy, doing current state analysis, conducting a functional performance evaluation or leading evidence-based ideation. The remainder of my time is spent on deep-dive research that focuses on strategic areas of interest for the firm. My focus is on ensuring that our applied research services are constantly being fed by things we're learning in our deep-dive

efforts and that our deep-dive research is simultaneously being informed and evolving based on our client's needs.

DI: Deep-dive research is longer term, not necessarily applied, and potentially done by a different team?

DW: Most of our researchers at HKS do a combination of both deep-dive and applied research to some degree. For example, Dr. Upali Nanda has done some incredible work recently on neurogenesis that focuses on how the physical environment can help support brain health throughout the aging process. As we work on developing an experience strategy for senior living facilities, we can think meaningfully and deeply about frameworks outlined in that deep-dive research to ensure that our applied research reflects and resonates with what we have learned from our deep-dive work.

DI: How do you relate to innovation and R&D within HKS?

DW: At HKS we do them synchronously. They don't live in separate bubbles. Rather, what we are learning on projects and from client feedback informs both our deep-dive and applied research efforts so we can continue to innovate and lead with knowledge within the AEC industry.

DI: You talk about experience strategy and the intersection between research and experience. In my years in practice, we didn't do those things. There was no strategy or research. We weren't focused on experience. It was all about just us as all-knowing, singular beings — and the building. What you're doing is a far cry from the way design was taught and practiced decades ago. Can you speak to your process? How do you engage on a project? How do you bring those three aspects to your work?

DW: I would argue, maybe it's not so different. For everything we design, whether that be products, processes, platforms or environments, there's a core set of experiences we are trying to create. For design to be most effective, we need to make sure that the core experiences we are creating support the outcomes we hope to achieve.

DI: In my experience, there may have been a core set of experiences we were going for, but they were tacit, assumed, not explicit. We were always focused on the building not the outcome or the experience.

DW: When you invert that thinking and first lead with deeply understanding users' needs, wants, mandates and capabilities, then you can develop an experience that enlivens users and supports the health outcomes we all humanly deserve.

In healthcare, we operate in a different context than private industry. Other industries have the luxury of valuing innovation solely based on monetization. However, in healthcare, our valuation of true innovation is based on outcomes and their level of clinical effectiveness. If we believe that the physical environment can support the healing process, then to what degree of clinical effectiveness do we believe that can happen? The onus is on us as researchers to measure that. Therefore, our measure for healthcare is in lives impacted, lives touched — and therefore evidenced in meaningful and measurable outcomes. If done appropriately, monetization will follow.



Other industries have the luxury of valuing innovation solely based on monetization. In healthcare, that's not a luxury we have. Our valuation of true innovation is based on outcomes and their level of clinical effectiveness.

DI: It's still relatively novel that you're doing any of those things. When I put that in the context of my past paradigms, are you speaking a different language than the rest of the design team? How are you aligned with the design team given that you're potentially speaking a different language, have different motivations and operating on a longer timeline?

DW: That's such a great question. Our designers are often essential contributors to the research process. Research helps to inform design, not mandate what or how they design. It provides an avenue for bridging evidence with empathy and linking design intent to outcomes.

DI: That's genius on your part, knowing the mindset of the design community to give them the strategy or endpoint but not get prescriptive or dictate how they get there. Few design professionals would appreciate that.

DW: There are always multiple avenues in which design can respond to solve a given challenge. That's where creativity and true innovation can occur. By definition, for a design solution to be innovative, it must solve a meaningful problem. How can you be solving for a problem you don't know? First you must understand the challenge, then you can meaningfully design for it.

DI: A traditional failing in our industry. We're taught to solve problems and to design, we leap to the solution before we know the right question or the right problem.

DW: You're so right, Michael. If we want something different, then we must do something fundamentally different than we have done before.

DI: Let's investigate that for those who may not have had the luxury of having someone like you on a team — maybe a smaller firm who hasn't engaged with a research team member. We've got a project starting up. When are you brought on board? How do you engage with the design team? What's your process?

DW: It has many forms. Often, I'm on board at the tip of the spear and leading business development pursuits, but not always. When fully integrated into the design process, research can provide valuable and timely information all the way from pre-design through occupancy. At the beginning of a project, setting your operational and experience strategy is essential to understanding what and who you're designing for. Throughout schematic design and design development, insights collected through evidence, user engagement and simulations of varying types and levels of fidelity can be leveraged to identify the highest performing design alternatives. Following occupancy, facility evaluations allow us to measure how well the design performs against the intended outcomes. We always get incredible lessons learned that can be carried forward to other projects. Our lessons learned aren't always in the wins. Some of our best insights come from things we were unable to achieve as we had hoped.

DI: Since your service occurs across the project life cycle, through operation and lessons learned, I'm curious about the economics. How is your work funded?

DW: Are you asking if we make money on applied research services? Absolutely. But to our discussion earlier, we believe a base level of applied research is fundamental to delivering good design on any project,

and that is included in our base fee. For our clients that would greatly benefit from additional services, we are transparent on what we would recommend based on their unique needs.

DI: Because they're further along in their evolutionary development or standards?

DW: Yes and no. For some healthcare organizations, their templated standards are what they want for good reason. It's not right or wrong or that they are further along. Healthcare organizations take different approaches to their buildings. There's a place for all of it. Every project is about understanding client needs and doing what is appropriate. Not everything is for every client.

However, informing your design on the best available evidence is for everyone at a fundamental level. We ask our design teams to document their design intent. We ask them to document what they are hoping to achieve through their design.

DI: Over my career, we cared about the building. Less so, the client or outcomes. We just wanted to do a great building because we were taught to by our educational experience and cultural development. Thankfully, now you're trying to do very different things, challenging owners, focusing on this new set of missions, strategies, experiences and outcomes. You said those things need to be measured because, "Innovation without validation is just another good idea. If you don't measure, how do you know how you did?" I'm struck by these new kinds of metrics. What kinds of things are you're measuring?

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Innovation without validation is just another good idea. If you don't measure, how do you know how you did?

DW: There are lots of layers to that answer. In simple terms, if we want to understand clinical effectiveness and suggest you can achieve 30% greater efficiency because we are going to reduce your walking distance with this new floor plate, then we should be able to measure those efficiencies. There are different ways to do that. If we say we want an enhanced patient experience, there are patient experience metrics commonly used and anybody can get them. Right now, we are in a talent war for staff, and it is not going to get better. Our healthcare clients are in the heat of it, trying to attract and retain top talent every day. If we are suggesting we can create a space they want to be in and create great communication across teams, then that should show up in their engagement and retention scores. These are viable metrics any system can capture.

DI: Your point goes beyond just users and patients — retaining staff has become an equal or greater issue in the COVID-19 era. I'm still having difficulty throwing off my own self-imposed "I do buildings" shackles, but much of what you're talking about is how they're running their business, their processes and outcomes. How do staff outcomes, research or strategy translate into a physical or facility solutions to retain doctors, nurses and staff?

DW: One design feature that has come to light during pandemic is the need for staff respite spaces that help reduce stress and facilitate recovery. Simple things such as: Do staff have access to fresh food and fresh air to support inter-shift recovery? Do staff have the ability to make a private phone call if needed? These features may seem obvious, but many healthcare facilities do not have sufficient spaces to support staff respite needs. Providing spaces that can help staff manage the margin between

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I help clients become comfortable with being wildly uncomfortable.

their load that they carry every day while delivering care and their limits that we all have as human beings in terms of physical, emotional, social and spiritual needs can help reduce staff fatigue and ultimately, burnout.

DI: We may have faced some common challenges. In the last 20 years of my career, I wasn't a mainstream provider, I was a support resource person, often a disruptor. In your role, beyond being a researcher, facilitator and suggester, you must also be a persuader or change agent — exerting force in some instances. What are your techniques for changing minds — on the spectrum from powerful healthcare CEOs busy running their hospitals to designers? It's one thing to be collaborative and build consensus, but somebody's got to set direction, especially when it's a change in direction. How do you pull that off?

DW: I help clients become comfortable with being wildly uncomfortable.

You can encourage and inspire, but at the end of the day, it is our clients who have to decide to take that leap towards innovation — or not. My job is to support our clients regardless of where they may be along their innovation journey to be able to operate and deliver the highest quality, most effective care possible. Making sure we are pushing the boundaries appropriately and at the scale in which each organization operates effectively is where the elegance resides.

DI: All this sounds wonderful when it's mutual, synergistic and you've supported them in the way and pace they need to be supported. But that could take forever cycling through those committees in the spirit of innovation. What's in your bag of tricks to defy the laws of time and shorten the planning cycles?

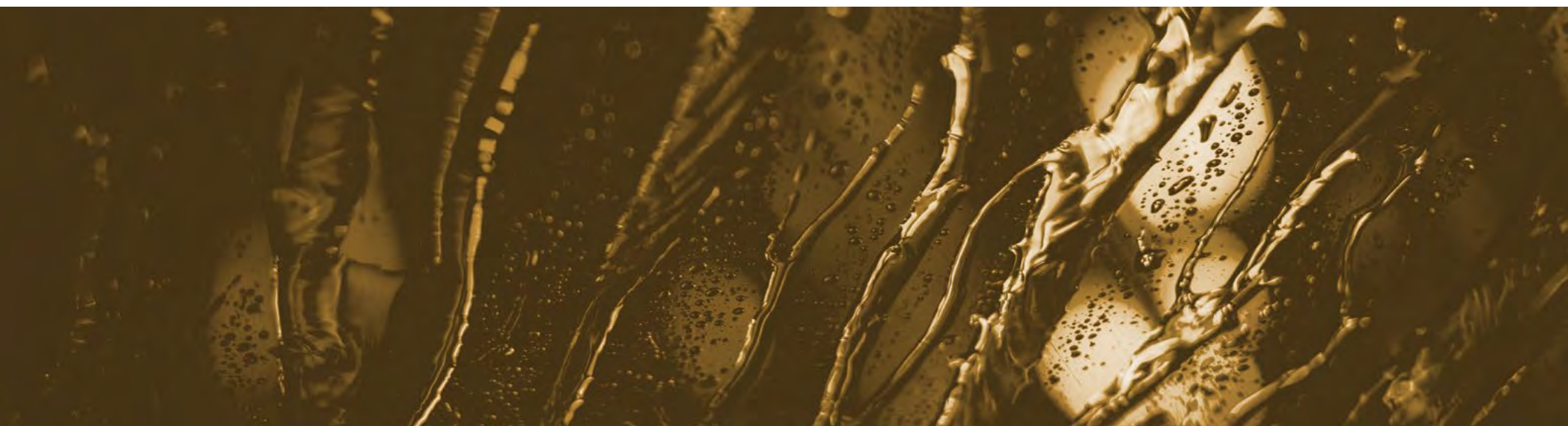
DW: Every project needs a champion. That's where I can have the greatest impact. Sometimes you have multiple champions, but you need to find those people who can champion the innovations. Ultimately, our clients live with the innovations. I come, I leave, but they stay, and somebody has to own those changes. Somebody has to

own the willingness to do the work, to accomplish that innovation. Someone has to own that spirit of continuous quality improvement to say, "This is a huge change for us. We may not be able to make it day one, but we are going to make it by day x. "

DI: If we get to the right person, with leverage and motivation, and get them to own the issue, we can build momentum. I've seen school boards and healthcare planning boards call emergency meetings at midnight to make declarations because something had to happen. They did it because they wanted to, had to, someone championed it.

DW: Exactly. COVID is a prime example. Look at how innovative we could be when we had to. There's opportunity everywhere. Great CEOs surround themselves with people who can be those change agents — vision keepers who can own ideas to completion.

DI: Since we're shooting for radical change, can you give us a glimpse of the future?



DW: In healthcare, the boundaries are blurring so much between what healthcare is and how it is delivered. We are doing things in the home that 10 years ago we would not have considered doing outside the four walls of a hospital. That's just one aspect. If we think about the shift happening right now in trying to get costs of care and quality more aligned, it's huge. We are also facing the challenge of a rapidly decreasing healthcare workforce. It begs some very interesting questions to consider:

- ▶ Who is this new generation of healthcare professionals?
- ▶ What core competencies do they need?
- ▶ What is the most effective way to train them?

By the time they are delivering care, it's not going to be the way we deliver it today.

DI: It's intriguing to consider. I read recently some doctor is using the new iPhone 13 camera to do scans of patients' eyes, likely remotely from their homes. Maybe we are beginning to redefine some of the laws of physics, time and space ...

DW: We are, and I believe the future is limitless. We're poised for some incredible innovations and advancements across the physical, digital and human realms as we step into this new era of healthcare. Exactly what those innovations will be, remains to be seen.

Dr. Deborah Wingler's research focuses on improving the patient and staff experience through research studies to elicit insight into patient and staff physiological, psychological and neural responses to high-stress healthcare environments. As vice president and health research lead for HKS, Wingler collaborates with research and design teams to develop and implement research initiatives that drive innovation and achieve a measurable impact across the healthcare practice globally. Through her research, Wingler has had the opportunity to work with some of the most forward-thinking healthcare organizations, manufacturers and design firms in the industry to support their respective research agendas. Her work has integrated research into the design process at varying scales, from the development of emerging models of care through multi-year capital projects, to the development of tools to support evidence-based design decisions, and the design of products and platforms to support the delivery of care.



Paths Unknown

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SABRINA KANNER

EVP, Brookfield Properties

Paths Unknown

Brookfield Properties' Executive Vice President Sabrina Kanner explores innovation, value creation, mentors and the costs of not investing

DesignIntelligence (DI): I find your career fascinating. Beginning as an English major and evolving into a business curriculum, then working with a contractor, on to estimating, project management at Olympia & York, then to managing design and construction at O & Y and now your current role managing development, design and construction in the Northeast at Brookfield Properties — a commendable career that is being honored by AIANY at their event, Common Bond. Your five-decade perspective in design, construction and development offers much. Our focus is on innovation. I'd like our conversation to explore some of the challenges you face in development practice today. Is pushing the edge of

process an explicit corporate goal?

Sabrina Kanner (SK): Pushing the envelope of results in safety, sustainability, and diversity, equity and inclusion is the goal. Pushing the edge of process is the means to that end. There is no clear path to succeeding at innovation; its very nature requires experimentation and acting on ideas that may not be 100% proven. To do that, you need an open and collaborative environment, the capacity — and permission — to miss the mark on occasion, and, of course, a good team. Innovation is how we gather data, advance into new territory and expand what is thought to be possible.

DI: Where do you see yourself on the innovation spectrum? You mentioned you “try many things” to understand and evaluate what works and how to best use them. For example, new project approaches, low-carbon concrete. You mentioned you’ve had some success with digital twins in their ability to offer feedback loops and performance metrics. Can you share any others?

SK: We are currently implementing power over ethernet lighting and controls to understand better how the system might enhance space utilization and optimize energy efficiency. We have been looking at several technology products in the construction arena that promise to improve safety through recognition of “near-miss” accidents for toolbox discussions and improve schedule adherence through optimizing the floor-by-floor timing cycle. We are also looking at a product that reports on construction deficiencies in real time so they can be corrected immediately, saving schedule and budget.

DI: How do you manage and prioritize such investigations? Trial and error?

SK: With due diligence, spending time to understand a product’s concept, technology and available data, and, often, trying it in the field as a “proof of concept.” If it appears real gains can be realized, we try the product on a project and gather our own data and experiences.

DI: Is it someone’s job to survey the landscape and suggest R&D pursuits? Or is that a collective responsibility? What’s your “innovation risk profile”?

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“There is no clear path to succeeding at innovation; its very nature requires experimentation and acting on ideas that may not be 100% proven. To do that, you need an open and collaborative environment: the capacity — and permission — to miss the mark on occasion, and, of course, a good team. Innovation is how we gather data, advance into new territory and expand what is thought to be possible.”



Photo credit: Bernstein Associates

SK: Finding and following innovative products and solutions is a collective responsibility. The team is aware of challenges to be addressed and if a new product presents itself as a promising direction, we chase it down. I am probably most aggressive in the pursuit of new approaches and may have more exposure to new technologies to choose from. I encourage my team to push the envelope on this front. Great ideas have been suggested by design consultants, tech firms and our own subcontractors. All good ideas are welcome. Some are in design or operations, some are in construction. On a recent project in New York, we deployed a custom launcher to enable the work.

DI: You described some of these digital twin and facility management tools as report cards. They

provide performance feedback that can be used as a guide for reinvestment. Can you give some examples of how you've capitalized on those feedback loops?

SK: Unfortunately, the pandemic, which has hindered occupancy, has also hindered the data gathering needed to provide this reporting, but we are not giving up. Many major markets now have a building performance standard that provides limits of energy usage on various building types and sizes. A significant portion of that energy usage is either residential or commercial tenant consumption and can be hidden within the cost of rent. This is where a reporting or “feedback loop” would be beneficial in informing tenants how they are performing relative to their peers and how they can adjust behaviors to become more environmentally responsible.

DI: As a facility owner and development manager, you're in position to change the rules of the game. Yet you shared that in some cases you're not. For example, many lease structures in Washington, D.C., put the burden of energy costs on the owner. Therefore, there is no incentive for tenants to design and build more sustainably. What is your approach to sustainability and innovation in those constrained cases?

SK: That is a perfect example of how putting the technology in place to share information can have a significant impact on energy consumption and carbon emissions, assuming the correct response on the part of the consumer. Many companies are feeling pressure to pursue environmental sustainability goals and initiatives, including sustainable design. By providing more information, we can provide opportunities for them to act on things their employees and clients are increasingly looking for or demanding.

DI: You face different contexts in owning some of your facilities long-term, and trading, flipping or selling others short-term. Are you challenged to juggle these seemingly contrasting development criteria and mindsets?

SK: We take stewardship of all our properties very seriously. Naturally, we have more capacity to embrace innovation and push the edge in some than in others, but we are continually exploring ways to improve the sustainability and operations of our portfolio. It is always more effective when we are in alignment with the goals of a future owner/user, even if only theoretically.

DI: You were honest in saying radical innovation can be a painful and iterative process, something to be

done only by a collective, not for the faint of heart. Yet your conviction to push on to solve these more complex, wicked problems is admirable. You shared that you have a top-down company mandate to be carbon neutral by 2050. What drives that belief set?

SK: We have always aimed to have a positive impact on the communities we operate. Now there is more acknowledgment of one's environmental impact and more of a desire to mitigate it. But our drive to build sustainably goes beyond a stated mandate. We are in the business of value creation. Today, building sustainably is absolutely intertwined with value creation. And, if we didn't think so, our investors, partners and employees would tell us so anyway. Fortunately, we do think so.

DI: You talk about needing multiple cycles to complete your project learning and feedback loops and that you need to do that in a commercially viable way. Now that we're developing projects while solving multiple concurrent crises, we have a radically different set of metrics. I know you oversee a large team. Are they conversant in speaking the new language and managing these new multidimensional metrics? We're not necessarily just about first cost anymore.

SK: I would say two things. First, when it comes to innovation, we all learn the new language together. If you know the right course ahead of time, that's great, but it's not innovating. When we are pushing the envelope, we are learning together. That requires an open dialogue. We try to encourage new ideas, and we listen to one another. Second, costs still matter! But we have to recognize and factor in the costs of NOT innovating or NOT investing.

DI: It takes courage to venture into the unknown. With a half-century of perspective, what advice would you share with recent graduates entering the development industry amid the post-COVID era?

SK: Seek out mentors. Care more about finding an open and collaborative environment than a specific job title. Vocalize your ideas and be supportive of others'. And in those first years, gather as much real experience as you can. I also believe in extending yourself to help others; it is beneficial to all when we engage in industry nonprofit work — it exposes you to varied thinking while helping your community and, hopefully, improving the world. In so many cases, I may not have known I was on the correct path, and a mentor helped me see it.

DI: What do you have left to accomplish? Is there a legacy mountain still to be climbed?

SK: I am very proud of what we have built and how. And, as someone who has had some wonderful mentors, I am proud of those I have encouraged and helped along the way. I'll miss both those aspects of the job when I'm done. If there is a legacy, it's in the nexus of those two things.

Sabrina Kanner is the executive vice president of development, design and construction at Brookfield Properties, responsible for overseeing development in the Northeast U.S. With Brookfield Properties and its predecessor, Olympia & York, for over 35 years, Kanner has played a key role in the construction, design and development or redevelopment of over 40 million square feet of signature Brookfield projects such as World Financial Center, Brookfield Place, 300 Madison Avenue, Halley Rise, the restoration/renovation of the Winter Garden at World Financial Center after 9/11, and Manhattan West.

Kanner holds a B.A. from Union College and is a member of WX and the National Academy of Construction. Additionally, Kanner sits on the board of directors of the New York Building Congress (vice chair), the Salvatori Center (chair), the Regional Plan Association, Urban Green Council (chair-elect), the Beverly Willis Architecture Foundation, Cedar Realty Trust and the Opus Group.

Radical Integration

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GARY LAPERA

Global Solutions Director, Jacobs

Radical Integration

Jacobs' Gary Lapera discusses innovation at global scale

DesignIntelligence (DI): Before we talk about change, can you ground us as to your role and purview within Jacobs? Global solutions director is one of those job titles with many potential interpretations. Is your focus on technology, projects, certain markets?

Gary Lapera (GL): My focus is on all the above and more. The global solutions director is part of our solutions & technology group, a leadership team tasked with driving innovation, connectivity, growth and strategy across all business lines.

DI: When we think of radical innovation applied at the scale of your organization — approximately 55,000 people across 40 countries — there is great potential. How are you leveraging your scale for impact in your mission for innovation?

GL: Our focus is on radical integration rather than radical innovation. In 2020, our built environment sector, which includes architecture, engineering, cities and places, and interiors/insights pivoted to a future-forward strategy to address the reality that conventional delivery of services and problem-solving is no longer meeting the challenges for the built environment. Our global market director, Monte Wilson, created a plan that challenged the Jacobs design community to build upon our strength — to invent and curate the practice of the future — to build on a platform of radical integration.

The vision is a global practice that is uniquely Jacobs. That sets the direction for the industry. It illustrates the power of an integrated approach that is home to the very best and brightest design thinkers, disruptors, technologists, strategists, visionaries and storytellers.

When I became the global solutions director for architecture, I created a playbook that aligned its core tenets with that built environment vision. One of my 2021 initiatives is to expand architecture's sphere of influence across all our business lines. At our core, we are problem-solvers. If we think beyond mortar and bricks, the design arena for architects expands exponentially. The move from a service to a solutions-based consultancy begins with architects who drive:

- Dynamic collaboration across markets.
- Meaningful inclusion.
- Engagement with exemplars and disruptors across the broadest spectrum of thought leadership.
- Nimble design and delivery platforms.

Think of the process as “creative collectivity” — an open forum for ideation.

DI: You have talked about your investigation of how you deliver what you call the “Big J,” defined as consistent performance and provision of Jacobs services and solutions at a global level. You mentioned an interesting case study: your recent project for an RFP advertised as wastewater treatment project. You see it as much more. Can you elaborate?

GL: The RFP was for a feasibility study for the consolidation of several existing facilities into a central plant. Most people's reaction was: WOW, this is a mega-wastewater project. That's true, in part, but the essence of the problem was to reconsider the transformational role of infrastructure. For Jacobs, as a global leader in water,

we didn't have to pivot to a new strategy to address the RFP. Our integrated teams had delivered other successful programs with similar considerations and were developing market drivers that focused on the impact of infrastructure on our quality of life. Consider the metrics of the investment: For every dollar spent on infrastructure, there is a 5% to 25% return to the economy. How do we envision projects that trend to the 25% ROI? We must move past the notion of these benefits as simply collateral results of a public spend and look at solutions that are directly influenced by ROI across multiple factors — including social equity.

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Our focus is on radical integration rather than radical innovation ... a future-forward strategy to address the reality that conventional delivery of services and problem-solving is no longer meeting the challenges for the built environment.

The World Economic Forum¹ has provided guidance on the subject in their document Infrastructure 4.0: “Infrastructure is more than just a series of assets. It is a system of systems that links the built environment, the natural world and the human experience. Done right, infrastructure investment has the potential to help us build a more sustainable, equitable and prosperous world.”

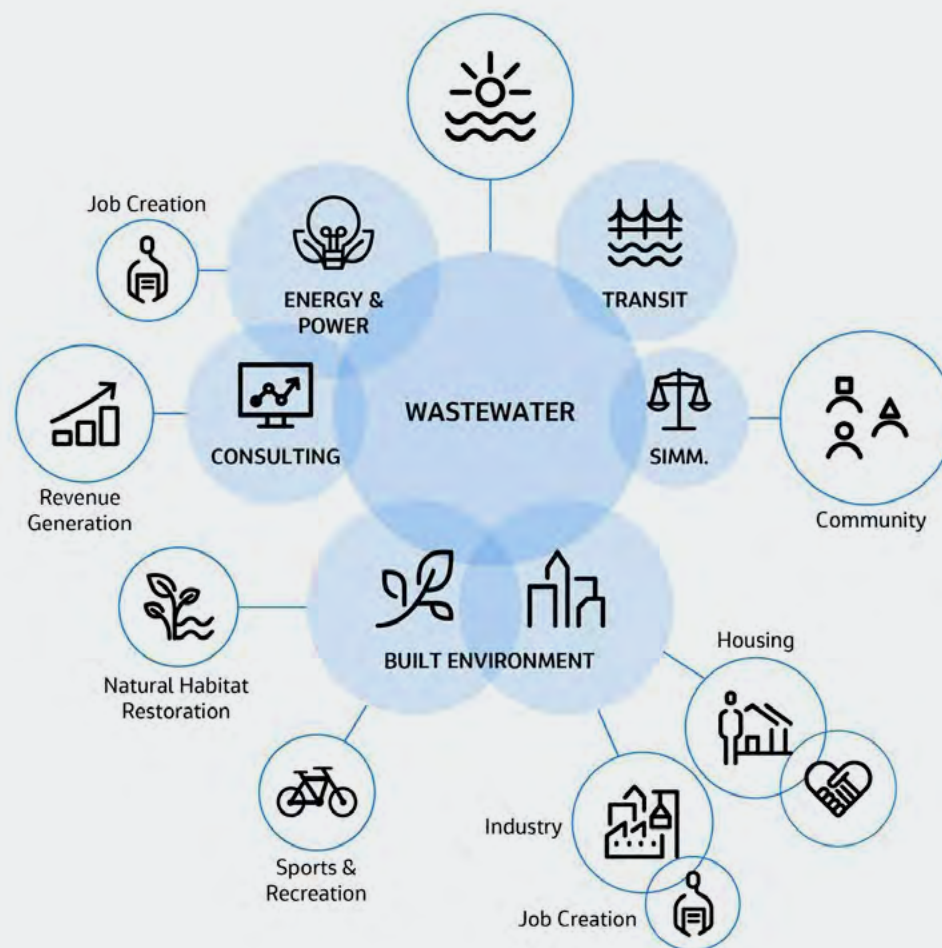
DI: How did your RFP response embrace radical integration?

GL: Our team was built from the community and with global thought leadership. Our submission wasn’t just an RFP response, it was a vision for a comprehensive, equitable, sustainable approach to infrastructure. The technical narrative was aspirational and actionable — its clarity of purpose resulted in a selection without an interview. The team, including our gifted subconsultants, worked brilliantly together, in part because everyone believed in the mission. The team engaged in meaningful dialogue, debated the merits of the feasibility framework and eventually coalesced into a project-specific studio over the course of the RFP submittal. Our strategy was to deliver a bespoke solution and harness the thought leadership in support of the mission. We were driven to deliver the “Big J” to drive an impactful solution. (See diagram).

DI: How are you bringing multidisciplinary expertise to bear? Innovating in your design process? How do you start? Who’s at the table? How and when are technology leveraged — and how does it differ from the processes we learned in school? Share some of the unique aspects of the team and how you’re going about approaching it.

Radical Integration: Project Aspects

author diagram



¹Joseph Losavio and Oliver Tsai, Infrastructure 4.0: Achieving Better Outcomes with Technology and Systems Thinking, World Economic Forum (May 2021), <https://www.weforum.org/whitepapers/infrastructure-4-0-achieving-better-outcomes-with-technology-and-systems-thinking>.

GL: Let's start with why multidisciplinary design. In a recent McKinsey article, The Business Value of Design, the authors make two compelling points. The first is to measure and drive design performance with the same rigor as revenue and costs. The second is to make user-centric design everyone's responsibility. The article builds the case for leveraging the power of design to impact our physical world but also the bottom line. While some would argue profitability and design are incongruous, I believe an approach that values design leads to better resource allocation and ultimately, better design.

I start by determining if the problem has been defined properly and is viable. The next step is setting the table: framing the problem, engaging internal and external colleagues to weigh in on the path forward and creating a bespoke team aligned to the mission. The collaborators are always as unique as the assignment.

They say authentic solutions come from many voices. Architecture is enhanced by dialogue with a broader community beyond A&E. A rich design narrative that's comprehensive, non-biased and looks beyond stylistic conceits will yield a better building, a better master plan, a better infrastructure — and will have enduring value because it was conceived as a positive response to a human condition.

Technology supports the design process, but it's not a replacement for fundamental human design skills: the ability to think abstractly, the rigor to edit and refine, the sense of context and character. There is an intersection between technology, team structure and architecture. The successful balance of all three leads to transformative engagement and harnesses the synergies and resources to deliver a great design.



These models build the case for a “system of systems” approach.

DI: In your quest to innovate in design process, what kind of cutting-edge techniques are you using to reform and reshape your own process of innovation? Are they technology-centric, process-centric, people-centric? What is the root of the change?

GL: At Jacobs it's always people-centric. Inclusion, while not a technique, is a driver that is bringing diversity of thought, experience and perspective to our practice. Our cutting-edge techniques are more who than what. We're expanding our design considerations criteria to include social equity, environmental and socio-economic sustainability, systems connectivity and a celebration of the interdependence of the natural and built environment. Technology and process are vital elements of our business platform. We excel at both because we use and develop them in service of a solution. My focus on both relates to radical integration. For technology, I'm interested in generative design programs that cross disciplines and can create conceptual models with metrics that address integrated issues. These range from ROI to social equity and advanced technical solutions. These models build the case for a "system of systems" approach. For process, that means streamlining design and delivery — and more effective and efficient allocation of resources and capital.

DI: You mentioned real innovation usually begins with problem definition. So often we end up solving the wrong problem, largely because that's what the owner asked us to do. Are you making any inroads challenging RFPs or redefining problem statements to effect dramatic on-project innovation?

To change the frame of reference to yield more of a systems-thinking, longer-term approach?

GL: We're launching a new initiative called Foreseeable™, which brings a way of thinking and a system of solutions that enable differentiated outcomes for the built environment: transformational places — next generation sustainability — financed delivery integration.

I am collaborating with Jim Lew on financed delivery integration. It is a large-scale integrated delivery enterprise agency, which creates complex building programs by defining, designing, delivering and operating projects as integrated value-optimized asset platforms.

DI: Some of your successes and failures in that space would be illustrative.



GL: How much time do you have? Since there's a limit to the length of this article, I'll just say my failures both outnumber and have fueled my most meaningful successes.

DI: Honesty appreciated. As a leader responsible for innovation, what are your biggest challenges? What do we need to know to engage more effectively?

GL: The biggest challenge is building consensus. The lack of predictive analytics for an idea that is forward-leaning and cannot be validated by examples of previous success is a high hurdle to overcome. My advice:

- Be transparent and exact with risk/reward metrics.
- It's better to move on than back down.
- Early adapters matter if they share and invest in the vision.

DI: Since we're shooting for radical change, can you dream for a minute? What's your personal vision 10 years from now — for Jacobs and the industry?

GL: My vision for Jacobs is an empowered architectural community that is driving solutions beyond buildings. James Moore, the global solutions director for cities and places, has defined that vision eloquently: "We design the human habitat." My vision for the industry is a tectonic shift in how we practice architecture.

DI: A closing thought for fellow innovators? One thing they should focus on to be effective.

GL: A good idea is inspiring; a great idea is immediately actionable.

As Global Solutions Director — Architecture, Gary Lapera, FAIA, leads Jacobs' network of over 1,000 architects and designers to foster a design-focused culture, drive strategic growth and lead industry transformation. He has led large cross-discipline teams for complex building and infrastructure projects and embraces how buildings improve the lives of those who use them and the livelihood of those who build and develop them.

Lapera is responsible for leading, growing and connecting Jacobs' buildings expertise with a solutions-based focus at the intersection of strategy, design, sustainability, project delivery and technology. He is also responsible for leading seven technology areas including design-centered solutions teams in architecture and sustainable design along with client/market centered solutions teams in aviation, health-care, science and research, higher education, and transit facilities.

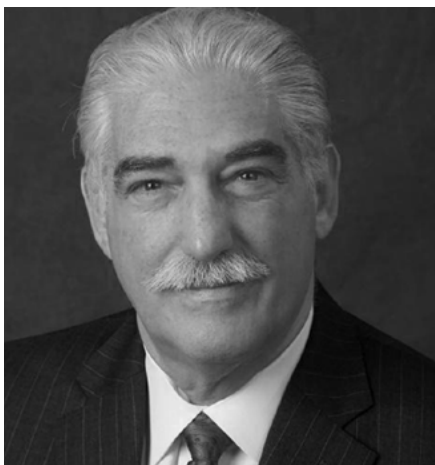
A major focus of his work is the development of the Next-GEN Infrastructure platform, which aligns commercial development strategies with critical government infrastructure projects, creating greater public benefit, more effective capital spends and greater connectivity between public and private markets. He received his Master of Architecture degree from Harvard University and Bachelor of Architecture degree from Cornell University. In 2014, he was elevated to the College of Fellows of the American Institute of Architects.



ESSAY

Technology Laggards?

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LOUIS COLETTI

President & CEO New York
Building Trades
Employers' Association



REID RUBINSTEIN

CEO, FCR, Field Control Analytics

Technology Laggards?

Why is the construction industry lagging in labor force analytics?

Anyone in the construction industry will tell you there has been an explosion in the availability of new technology to control cost and schedule in the last five years. It is a rare construction company that hasn't implemented new estimating, scheduling or building information modeling software in that time. However, the industry has been ignoring one of the largest construction cost drivers: labor.

Understanding labor cost data and what drives labor efficiency is critical to delivering projects on time. Yet, according to the U.S. Bureau of Labor Statistics, the construction industry accounts for 6.4% of all industry employment but has **ZERO LABOR PRODUCTIVITY INCREASES FROM 1987 TO 2019**. Private and public owners are emerging from the pandemic with a reinvigorated focus on project labor costs — not just on the overall labor force, but on specific workers. Interestingly, prior to the pandemic, the same companies that implemented estimating and scheduling software knew almost nothing about the specific individual workers on their construction sites — when they arrived, when they left, whether they were authorized to be on the site, were properly certified for the work performed, had passed site specific and/or required OSHA or local safety training requirements, had a COVID vaccination or required COVID testing — the list goes on.

The construction industry is addressing this challenge by incorporating new technologies and systems to work in conjunction with their project management systems to fundamentally understand not just the project overall — but each individual who steps foot on their projects. Ironically, in the New York City's highly unionized market, the need to incorporate these individual worker solutions has been exponentially advanced by the building trade unions through successfully advocating for the recently enacted Wage Theft Law. The new law, which takes effect January 4, 2022, holds prime and general contractors jointly and severally liable for unpaid wages, benefits and supplements owed by a subcontractor at any tier to the subcontractor's employees. In addition, the general contractor may be liable for liquidated damages (100% of the unpaid wages or treble damages for a willful violation), attorney's fees, interest and penalties for statutory claims. In other words, if any lower-tier subcontractor fails to pay an employee, the general contractor is liable to pay all the previously mentioned costs.

Not surprisingly, the technology exists to help the industry with both enhanced labor efficiency as well as complying and policing new laws like the Wage Theft Law. Specifically, this technology captures and analyzes all the necessary project data — not just for the overall project labor force — but for each individual worker. The Building Trades Employers Association (BTEA), a trade organization representing 26 construction trade organizations and 1,200 construction managers, general contractors and subcontractors who put in place \$65 billion in construction revenue and led by this author with Field Control Analytics (FCA) and its CEO, Reid Rubinstein, is in the process of establishing a historic strategic agreement that will help all BTEA member contractors finally implement the technology they need to solve these labor data analytics challenges.

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The industry has been ignoring one of the largest construction cost drivers: labor. ... [It] is addressing this challenge by incorporating new technologies and systems to work in conjunction with their project management systems to fundamentally understand not just the project overall — but each individual who steps foot on their projects.

FCA has become the market leader in labor data analytics for the construction industry by harnessing technology to deliver actionable and automated workforce intelligence. Through 20 years of experience, FCA has established itself as a partner to over 15,000 contractors. This initiative will allow BTEA contractors to know and verify who is on the jobsite, when they arrive and how long they stay, if the worker is qualified for the task they are performing, and whether the worker has performed on that company's projects safely in the past. Here are some sample data points illustrating what this strategic alliance with FCA will bring to BTEA contractors' project sites:

- Ensure only those authorized to enter the site can do so and prohibit unauthorized access.
- Limit site access to workers with facial confirmation.
- Ensure all workers have taken required site safety training.
- Require workers to complete COVID attestation and log vaccination information.
- Verify on-site worker presence and hours billed against time and material contracts and change orders.
- Verify work hours and avoid labor payment fraud.
- Save money and increase construction contingency by controlling labor costs.

This strategic alliance with new technology is just one example of the kind of synergy possible between data, technology and the ever-present, all-important human workforce. Such convergent thinking can pave the way for increased industry productivity while adding visibility and value.

Transparency and accountability are two of the most important aspects of construction in the view of owners — public and private. In a post-COVID future, providing open access to the costs of and data about the workers performing labor on construction sites is a timely, important element in the construction industry. Adopting this and other, similar data-rich technologies to enable our labor force will accelerate industry productivity and build trust.

Louis Coletti has served as president and CEO of the New York Building Trades Employers' Association for 23 years. He has over 33 years of experience in the New York City construction industry. At BTEA, the largest union contractor organization in the nation representing 27 industry trade associations and 2,000 construction managers, general contractors and specialty trade subcontractors doing business in New York City and state, he is responsible for government relations, public relations, construction safety, workforce development and labor relations coordination and administration. Previously, he was a senior vice president for construction management firm Lehr McGovern Bovis, responsible for business development and marketing, public affairs and public relations, specializing in the public sector market. He has worked on the renovation of Grand Central Station, the Historic Preservation of the Los Angeles City Hall, the U.S. Olympics in Atlanta, New York Giants Stadium Luxury Box Renovation, Bronx Criminal Courthouse, Brooklyn Federal Courthouse and Queens Criminal Courthouse.

Coletti holds a master's degree in public administration from New York University, Robert Wagner School of Public Administration, a Bachelor of Arts from Rutgers University New Brunswick Campus, and is a graduate of the NYC Partnership David Rockefeller Fellows Program.

Reid Rubinstein was responsible for spearheading the acquisition of Field Control Analytics out of bankruptcy and joined the organization as CEO in 2020 to lead the turnaround effort. Over the course of a 15-year career, he has focused on investment banking and private equity for publicly traded and privately held middle-market companies, in addition to co-founding an investment bank. A graduate of New York University, he holds a B.A. in economics with a minor in business.



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MetalWorks™ Linear – Synchro



Turf Design



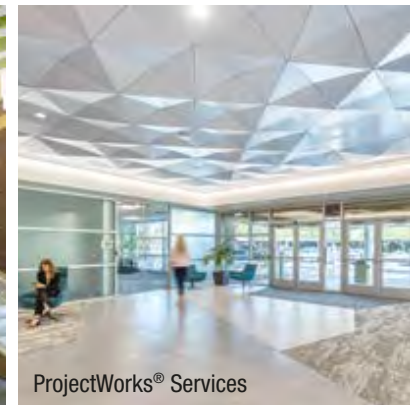
Wall Reveals



Tectum® Create! panels



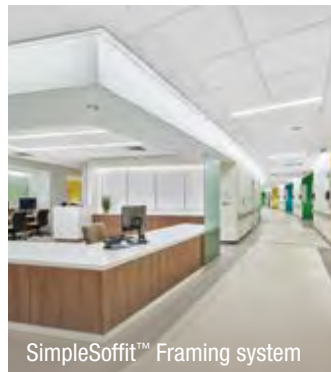
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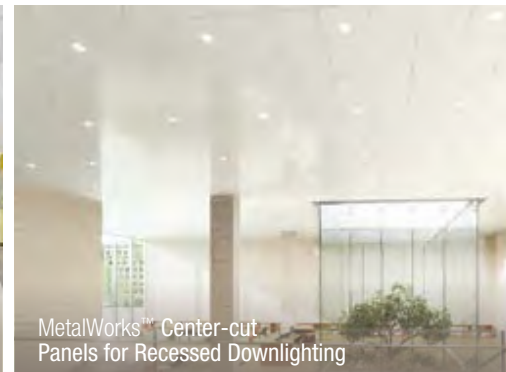
ProjectWorks® Services



Móz Designs



SimpleSoffit™ Framing system



MetalWorks™ Center-cut
Panels for Recessed Downlighting



Armstrong Living Lab

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INTEGRATED LIGHTING

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