Into the New

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*DI Managing Editor Michael LeFevre considers
radical innovation's sources*

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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: [1]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.

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

[1] *Etymology dictionary*

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.

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

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[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.

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."

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.

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> *"We shape our buildings, then our buildings shape us."*
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> *— Winston Churchill*

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 poche'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 design 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 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.

Author photos.
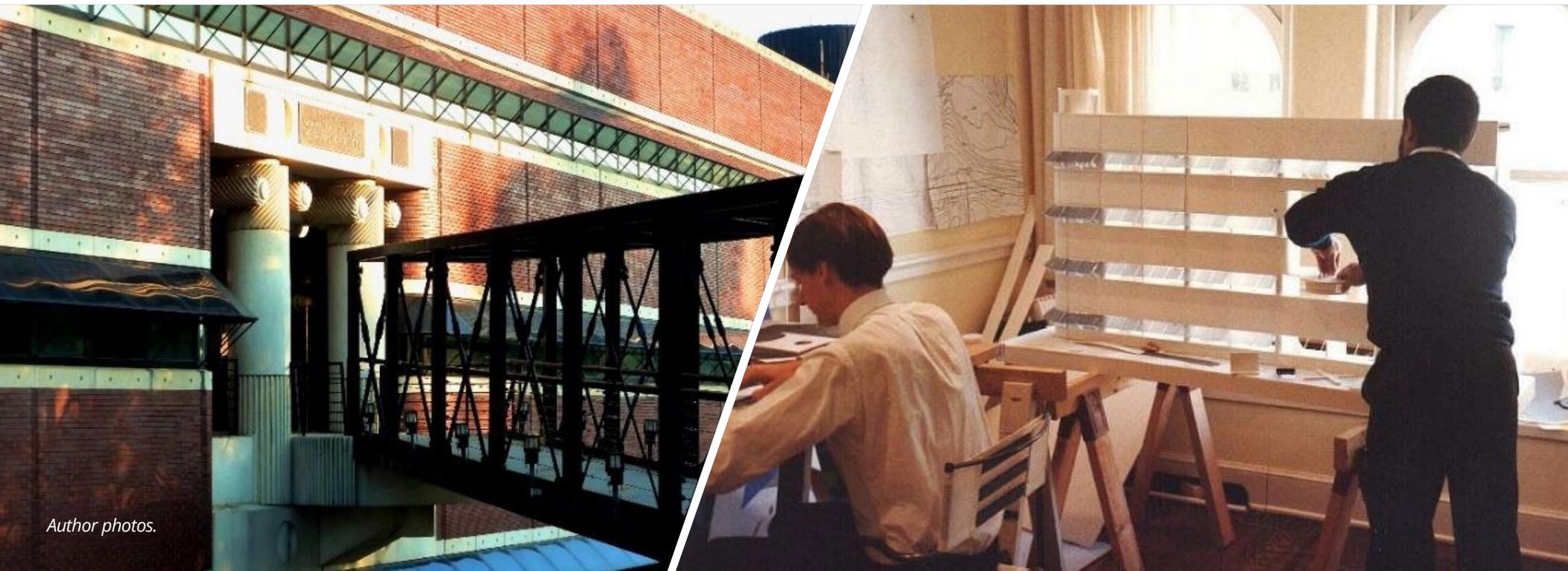
The building's leaf shape formed the context for a coiled, copper-clad metaphorical "snake" auditorium roof sitting atop the primary green roof. Innovation abounded on this pioneering project. Beyond its naturalistic geometry and locally sourced materials, its most significant innovation was in the delivery 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.

"I can tell you right now I can cut 40% out of the curtainwall 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

Top: Zoo ARC, Jonathan Hillyer photo
Middle: Flint RiverQuarium, Tim Hursley photo
Bottom: Mercedes-Benz Stadium, Atlanta, Georgia

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.

Michael LeFevre, FAIA Emeritus, is principal, DesignIntelligence Strategic Advisory; managing editor, DI Media Group; and the author of the Amazon best-selling new release: Managing Design: Conversations, Project Controls and Best Practices for Commercial Design and Construction Projects *(Wiley 2019).*