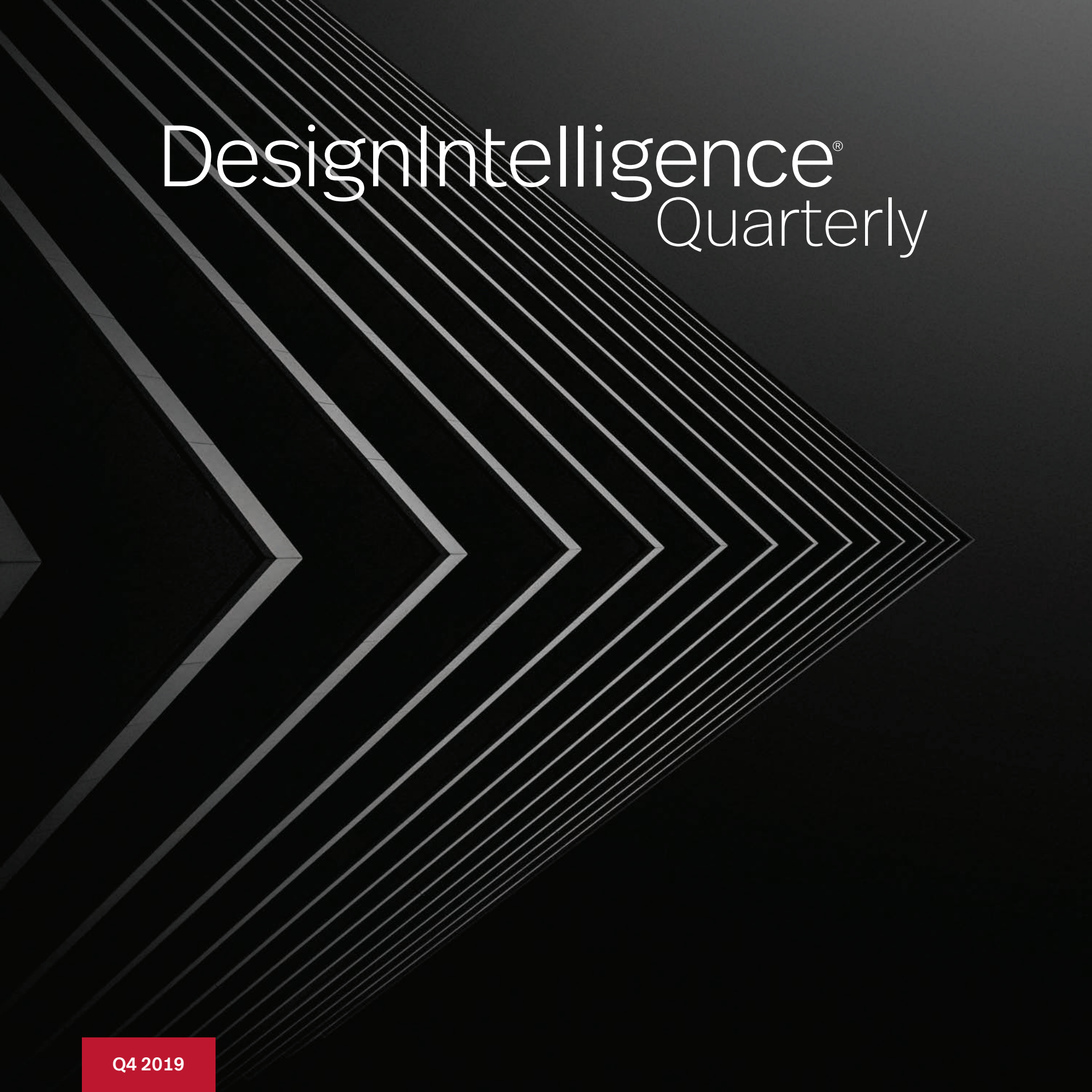
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From the Management and Editors

As we approach the end of the year, we want to pause for a moment to look back on 2019 and look forward into 2020. Looking back, what were the transformational forces at work, what were the big sweeping changes, and what are the implications for 2020 and beyond?

The power of the past is that it gives us context in which to understand the present as well as frame potential challenges and opportunities in the future.

In this edition, we look broadly at trends in the built environment, such as talent, economics, leadership, the environment, technology, and the future of the profession. Industry experts share with us what they see as they prepare for the future.

The Knowledge You Need for the Decisions That Matter

Whether your firm is looking to expand into new geographies, better understand the needs of your clients and markets, establish the right compensation packages to retain key leaders, or understand how to evolve the direction of the enterprise, having information can make the difference between an effective choice and missing the mark. Since 1994, DesignIntelligence has developed the expertise and extensive network of sources to help you find clarity regarding opportunities, risks and actions.

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ESSAYS

The Way of Authentic Leadership – Part 4

Celebrating Interdependence as a Cultural Differentiator

DAVE GILMORE

Authentic, effective leaders are front and center when it comes to functional collaboration. They lead from a collaborative posture, inviting multiple voices into the decisioning process. They welcome input, being postured as always approachable, always receptive.

Though we take great pride in the idea of independence, the positive dynamic of the entrepreneurial spirit, the celebration of individual success, the once popular principle of self-effort detached from hand-outs and governmental assistance . . . like anything lived-out in imbalance our greatest strength becomes our greatest weakness. Perhaps the most sustainable value factor of authentic American success is interdependence.

The U.S. economy, which has been the standard of wealth and success for over a hundred years, is based on the fundamental principle of interdependence. Business goods and services offered to the consuming public are impossible outside the context of interdependence. Business owners work within an ecosystem of interdependence:

- Banks
- Material Suppliers
- Infrastructure Providers (Electricity, Telephone, Internet, Water, Sewage, etc.)
- Security Services
- Insurers
- Staffing Firms
- Compliance Coaches
- Shipping & Freight Providers
- Suppliers in Various Sorts and Sizes.
- And more . . .

The poet John Donne captured the spirit of Interdependence over 400 years ago:

"No man is an island entire of itself; every man
is a piece of the continent, a part of the main;
if a clod be washed away by the sea, Europe
is the less, as well as if a promontory were, as
well as any manner of thy friends or of thine
own were; any man's death diminishes me,
because I am involved in mankind.
And therefore never send to know for whom the bell tolls;
it tolls for thee.."

For the American Industry to sustain, grow, and lead, it will have to sustain and embrace this fundamental principle of interdependence. Differentiation only occurs when interdependence expresses itself in new and creative models, new and creative win-win working relationships. Functional collaboration is the heart and soul of interdependence which acknowledges that we are better together than alone.

> "Every decision-making entity needs a framework to ensure focus, accountability, and a standard for progressive achievement.

Navigating Between Opportunity and Distraction

I suppose it's a matter of perspective. What one sees as an opportunity another might see as a distraction. An objective gauge to judge between the two is a defined strategic plan that articulates the boundaries for forward progress and targeted achievement. Without a "roadmap" to guide the business, the distinction between opportunities and distractions becomes blurred. In this ambiguous and foggy place, the business wastes time and resources chasing non-essentials while neglecting fundamentals.

Authentic, effective leaders own the responsibility of looking forward and planning well. Actually, they take it as essential to their stewardship of leading organizations, not allowing neglect or indifference to mar the firm.

Have you articulated the clear and navigable points of achievement you desire to take your business? Have you defined the boundaries of do's and don'ts to manage the energy and motivation of your teams? Have you formulated a decisioning process whereby you can properly judge between an opportunity and distraction?

> Perhaps the most sustainable value factor of authentic American success is interdependence.

Far too many firm leaders are making off-the-cuff, emotionally oriented, and subjective gut decisions about their businesses. I suppose that their experiences of success and failure have taught them the intuitive gut check methodology of decisioning and this, in its proper place, is essential to sustainable forward movement. But going by gut alone is a "roll of the dice", especially as a business grows and the stakes get higher.

Frankly, it's easier to navigate by how one feels. It's immediate, assuages a degree of anxiety, and requires little effort. And with a never-ending stream of decisions to make on a daily basis, expedience seems the best way to go. But it's unmeasurable, leaving it unmanageable. As the saying goes, "You can only manage what you can measure."

By the way, this goes for any genre of corporate entity; companywide, business unit, department, team, or individual contributor. Every decision-making entity needs a framework to ensure focus, accountability, and a standard for progressive achievement.

So, what's the plan? Can you point to it? Articulate it? Define its boundaries? Measure it? If you will take the time, make the investment to get it down on paper, and allow it to speak back to you, it might just save you, your firm, and your place in the wide marketplace.

Dave Gilmore is the president & CEO of DesignIntelligence.

The Economic Year in Review and What to Watch in 2020

For the real economy, 2019 was pretty good. In July 2019, the current U.S. economic expansion became the longest on record, posting 120 months of growth since the end of the Great Recession.

BOB HUGHES

The first quarter posted growth of 3.1% following a very weak 1.1% to close out 2018. The second and third quarters decelerated significantly, rising 2.0% and 1.9%, respectively. Throughout most of the year, the labor market stayed reasonably strong (though not as strong as in 2018), price increases were moderate, and debt levels grew at a modest pace (except for the federal government).

Key highlights include:

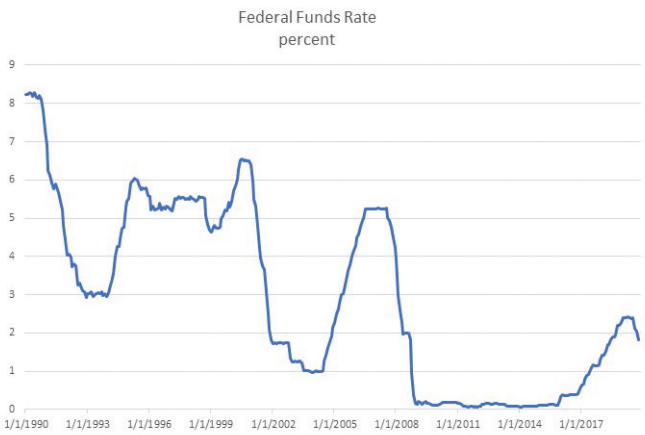
- Real gross domestic product growth of 2.3% for the first three quarters, right in line with the 8-year average of 2.3%.
- Real private domestic demand growth of 2.3% versus an 8-year average of 3.0%.
- Consumer prices were up 1.7% for the twelve months through September while core consumer prices which exclude volatile food and energy, were up 2.4%. Consumer prices have been rising around 2% since the mid-1990s.
- The unemployment rate was 3.6% in October, just slightly above the 3.5% low since 1969.
- An average of 152,000 new jobs were created each month through October, a total of almost 1.52 million.
- Household net worth hit a record high of $113.5 trillion while overall consumer debt service remained near all-time lows.
- Bank lending rose a moderate 5% for the 12 months through September and the loans to securities ratio, a measure of bank balance sheet safety, was well below average (a good result).
- Commercial construction expenditures were running at record pace for the first nine months of 2019.

By these important numbers, the U.S. economy is doing reasonably well. At this point in a typical business cycle, the attention would be focused on the tight labor market causing a sharp acceleration in wages and possibly accelerating inflation. Asset prices would be at risk for speculative bubbles, and bank lending might be getting too aggressive as lenders rely on strong economic conditions to justify lowering standards. The Federal Reserve would likely be leaning toward interest rate increases.

However, the numbers don't tell the whole story. Major policy shifts and general economic policy upheaval have had a negative impact on trade and confidence. Trade agreements have been abandoned, kicking off several rounds of tariffs and retaliatory actions. Trade volumes globally have declined, and consumer and business confidence have leveled off or fallen a bit. Though still at generally high levels, fading confidence has the potential to restrain consumer spending, leading to slower hiring and less capital investment. In short, disruptive and unpredictable policy has the potential to cause a confidence crisis and drive the economy into a recession.

Source: International Monetary Fund.

In response to this risk, the Federal Reserve did an abrupt reversal in monetary policy. While the Fed had begun the year with debates about when to cease a two-year effort to raise interest rates to a more historically normal level, by August, the Fed made its first rate cut since the financial crisis. The cut created confusion among many economists as monetary policymakers abandoned the long-held philosophy of being data driven, and instead justified the rate cut based on stories in the newspapers regarding escalating trade wars and the potential for slower trade to impact the real economy. Surveys of consumers show that the sudden reversal by the Fed actually hurt consumer confidence as people interpreted the move as a potential warning that the economy might be in trouble. Indeed, the move by the Fed could actually have the unintended consequence of pushing the economy toward recession as worried consumers cut back on spending.

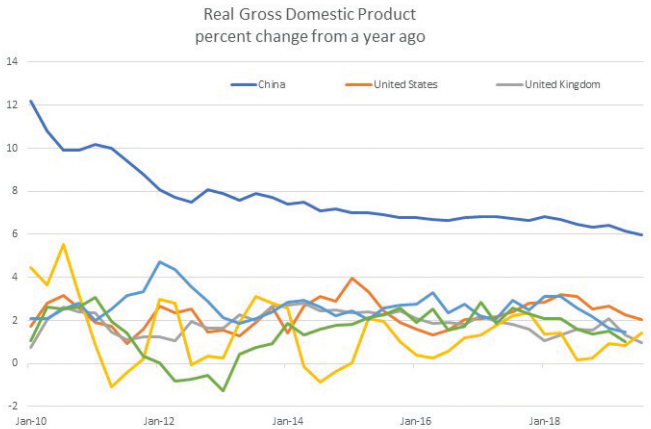


Source: Federal Reserve Board.

With monetary and trade policy creating uncertainty and confusion, the highly partisan atmosphere in Washington becomes even more dangerous. Constant accusation, counter accusation, investigation and counter-investigation only serve to reinforce a negative perception of American political leadership. Congressional approval stands around 20% while disapproval polls around 70%. Furthermore, Trump (-12), Pelosi (-11), Schumer (-14), and McConnell (-23) all have unfavorable polling results, and about 60% of people polled believe the country is headed in the wrong direction. Expanding impeachment proceedings and ramping up of the 2020 election cycle are likely to worsen the partisan environment. A lack of confidence in government leadership could contribute to an economic slowdown if businesses and consumers believe the government is incapable of addressing unfolding economic challenges.

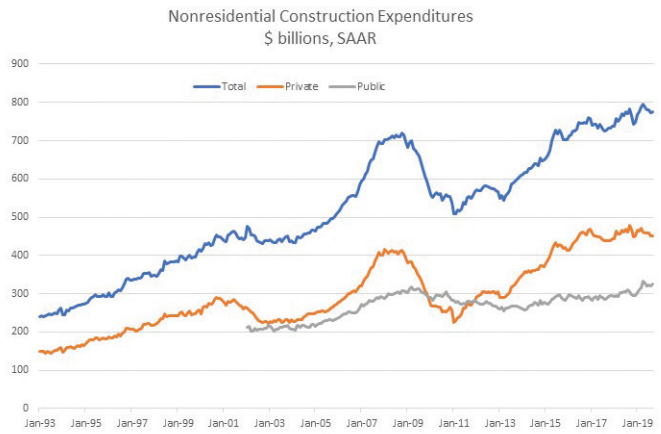
Around the world

Many of the world's major economies are already experiencing slow growth. Europe and Japan have been struggling with extremely slow growth for several years. Germany is on the brink of recession and the United Kingdom is consumed by Brexit drama. Meanwhile, China saw it's GDP growth fall to 6% in the latest reading. While 6% is high compared to other major economies, it is the slowest pace of growth for China in decades. In Australia, where economic expansion has been growing since 1991, growth has slowed to about 1.5%. Declining trade volumes due to escalating trade wars, and political tensions in general, exacerbate weakness around the globe.



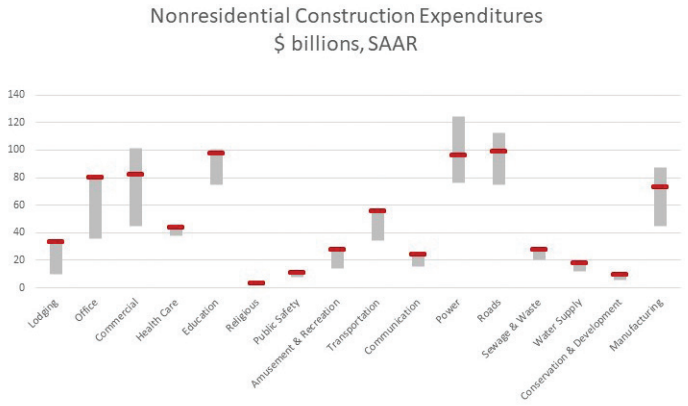
Source: National Bureau of Statistics of China, Bureau of Economic Analysis (US), Office of National Statistics (UK), Cabinet Office (Japan), Australian Bureau of Statistics, Eurostat.

For the A/E/C industries, activity levels remain near all-time highs.



Source: U.S. Census Bureau

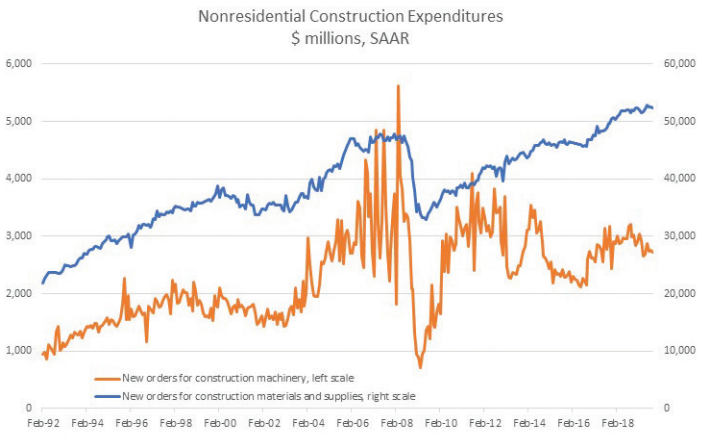
Though the levels of work vary by type of construction:



Note: Gray areas show range of monthly expenditures since 2012 and red line is the latest monthly expenditure.
Source: U.S. Census Bureau.

Like many industries, A/E/C is struggling to fill open jobs and wage pressures are building. Open jobs for all construction firms totaled 338,000 in September resulting in an opening rate of 4.3%, average hourly earnings are up about 2.4% over the 12 months through October, down from a recent peak of 3.8% for the 12 months through October 2018. The deceleration in average hourly earnings comes as the average workweek remains elevated at 39.3 hours.

Leading indicators for the construction industry suggest continued, albeit slow, growth in coming months. Orders for new construction supplies are close to an all-time high though the pace of growth has decelerated since mid-2018. Orders for new construction equipment have trended lower over the past year but are at a moderate level by historical comparison.



Source: U.S. Census Bureau

2020: What to watch

The harsh reality is no one can predict the future (and if someone claims they can, don't listen). The best business leaders can do is get a solid understanding of current conditions and trends, then prepare for likely contingencies.

The biggest risks to the outlook are the lack of clarity regarding policy and policy changes. Trade policy, monetary policy, fiscal policy, immigration policy and regulatory policy have all been in play under the current administration. Unfortunately, there has been very little discussion before actions on any of these policy areas (policy changes have usually been by executive order rather than by legislative action). Since taking office, President Trump has issued 111 executive orders or about 47.6 per year. That puts him on the fastest pace since Ronald Regan.

The lack of clarity increases uncertainty and makes business planning far more difficult. In those circumstances, business leaders and consumers tend to become more conservative. Consumers may restrain spending and business leaders may delay hiring and investment. If those behaviors become significant enough, a recession may develop.

The trade wars have already pushed the manufacturing sector into a mild decline. While manufacturing currently accounts for only about 15% of the economy, it can still be a bellwether for the broader economy. The consumer remains the dominate sector in the U.S. economy. The key to continued economic expansion is the virtuous cycle of consumer spending leading to more jobs and higher income leading to more spending. The key things to watch relate to that virtuous cycle.

Things to watch:

- Jobs, jobs, jobs — the monthly jobs report from the Bureau of Labor Statistics is the most comprehensive and timely economic report. Released the first Friday of each month, gains in jobs and average hourly earnings are critical.
- Consumer confidence — while jobs and income are the most important things to consumers, headlines can have an influence. This is where the poor leadership in Washington can cause real harm. Popular surveys of consumers come from The Conference Board and The University of Michigan Survey of Consumers.

- Business confidence — As with consumers, uncertainty over policy can change behavior, for the better and for the worse. Business confidence surveys include a small business survey from The National Federation of Independent Business and a CEO survey from The Conference Board.
- Corporate sales, profits and the stock market — if activity starts to slow, businesses will have no choice but to cut back. Corporate reporting season begins roughly the second week of a new quarter. For these, media coverage is extensive.

At this stage of a business cycle, there is very little pent up demand. Growth is more likely to be trending toward a long-term sustainable rate (often estimated as population growth plus worker productivity, currently 2.0% to 2.5% for the U.S.). Under more traditional circumstances, inflationary pressures, asset bubbles and/or excessive lending followed by monetary policy tightening would be the typical progression. These developments are still worth monitoring but seem less likely at the moment.

The real economy (real activity such as production, construction, spending and investment) is grinding along at a slow pace. The labor market is tight and price increases are moderate. Policy, leadership and partisanship are the key threats.

"How the tug-of-war between the real economy and the uncertainty created by policymakers plays out will determine whether the expansion continues, or a recession develops."

The final take-aways are:

- Caution is the dominant theme.
- Economic expansion is likely to continue but there is more downside risk than upside potential at this stage of an expansion.
- Policy and leadership appear to be the most significant unknowns.
- A partisan, dysfunctional government is a risk for everyone.

How the tug-of-war between the real economy and the uncertainty created by policymakers plays out will determine whether the expansion continues, or a recession develops.

For those with the time and interest, an ocean of detailed economic data paints an even more granular picture. But few business leaders have the time to devote to detailed economic analysis. For those leaders who don't have the time, we at DesignIntelligence will do our best to provide useful economic analysis and commentary in order for you to understand current economic conditions and plan for contingencies.

Bob Hughes has more than 25 years in economic and financial markets research. He was formerly the head of Global Equity Strategy for Brown Brothers Harriman, where he developed equity investment strategy combining top-down macro analysis with bottom-up fundamentals. Prior to BBH, Bob was a senior equity strategist for State Street Global Markets, senior economic strategist with Prudential Equity Group, and senior economist and financial markets analyst for Citicorp Investment Services. Bob has a M.A. in Economics from Fordham University and a B.S. in Business from Lehigh University.

A Backwards Look Ahead

The last few years have seen a tremendous boom in construction of all sorts, including corporate/commercial, higher education, science and technology, medical, and hospitality projects. Architects, engineers and construction firms are busier than ever, and qualified labor is in short supply, which means that prices have surged. Yet with interest rates still historically low and with persistent strong demand for new space, owners continue to build. Is this boom sustainable? Is the current robust market a blip or could it become a new normal?

SCOTT SIMPSON

Those who remember the painful lessons of the 2008 recession will caution that overbuilding inevitably leads to price bubbles followed by market corrections. Others will argue that a rapidly evolving economy will continue to require new and different kinds of space, and that as the world continues to industrialize, this will generate strong demand. On top of that, many existing building types (such as airports and museums) are undergoing significant renovation and expansion, and the effect of e-commerce means that millions of square feet of retail space will need to be repurposed.

Investment in real estate is a long-term bet that requires substantial up-front capital. It takes several years to plan, permit and construct a new project before it can be put in service and the revenue begins to flow, and during that time market conditions can change significantly. Savvy clients are increasingly leasing rather than owning their facilities. This is true not only for generic functions such as offices, but also for highly customized and technical spaces such as biotechnology research labs. Senior management has run the numbers and concluded that their capital is better allocated to their core businesses rather than real estate, and this in turn means that more and more buildings are being designed in anticipation of multiple functions over the life of the project, rather than being customized for specific users. Some might call this design for flexibility; others might call it a movement toward generic design.

> “Who will step up and provide the basic organizing framework for a new way of doing business?

Another key trend is the “socialization” of space. Open work stations rather than private offices have become the established norm. Hotel lobbies are designed to resemble clubs or living rooms, and even research laboratories come standard with café-like gathering spaces that dispense free food and espresso. Airports have morphed into shopping malls that happen to have planes attached, and just about every new museum project devotes significant space to a restaurant and a gift shop. Interiors have become more theatrical in nature, like stage sets. Open planning is ubiquitous; everyone and everything is on display.

“Branded architecture” has become a thing, particularly in high-end residential real estate markets such as New York and Miami. Ads for pricey condominiums frequently contain

"designed by" labels, not unlike major clothing lines. Residential developers have discovered that name brand architecture can command premium prices, and this also extends to commercial projects. For example, Bjarke Ingels has signed on to oversee the design branding for all the WeWork office spaces, and it's no secret that the work of Jonny Ive – the head of corporate design for Apple – was a major factor in that firm's historic success. The market is finally beginning to understand that good design is good business.

Concerns about climate change are becoming more acute, and while some may still debate the specifics of cause-and-effect, more and more owners are factoring the need for resiliency into their projects, particularly in coastal cities which will need to contend with rising sea levels over the coming decades. This means that major mechanical equipment and emergency generators are no longer relegated to the basement where they could be vulnerable to flooding, and that ground floor spaces are generally reserved for retail and restaurant functions, which are not critical to building operations. Many major cities, from Miami to Boston, are starting to formulate design guidelines for resiliency. This will add capital cost up front but presumably offer protection from catastrophic damage, saving money down the road.

As construction costs continue to mount, it puts additional pressure on owners. The construction industry is responding by incorporating more technology; including off-site prefabrication, sophisticated logistics planning, and even the use of drones to monitor progress on site. One firm, Suffolk Construction in Boston, has created a "Smart Lab" that can monitor construction activities at any of its hundreds of project sites remotely and in real time, with monitors that track deliveries, budgets, safety protocols, quality control, and schedules as needed. This begs the question: will future buildings be regarded primarily as manufactured products to be assembled entirely by robots, like smart phones or candy bars? The prospect is not so farfetched.

30%

OF PROJECTS DO NOT MEET BUDGET OR SCHEDULE

It seems inevitable that both design and construction will become ever more automated. The A/E/C industry is the last major segment of the economy to enthusiastically embrace technology, and it's long past time that the inherent inefficiencies are boiled out of the system. Historically, 30% of projects do not meet budget or schedule, which in effect places a very high tax on the industry. Technology can speed up both design and construction processes, but this will require a sea change in how the A/E/C industry is organized. As the Baby Boomers enter retirement, a new generation of tech-savvy design professionals is emerging, so the time is ripe for truly transformative change. The question is one of leadership: who will step up and provide the basic organizing framework for a new way of doing business? Changing from a competitive business model to one that's based on true collaboration would unlock big value for all the players at the table.

With all this new stuff going on, what's missing? The pressures of high cost and ever-accelerating schedules have resulted in more generic design that lacks a strong sense of place. For example, in Boston there's been tremendous expansion in both the Seaport and the Fenway districts, which are located at opposite ends of the city, but the two areas have become almost indistinguishable from a design standpoint. Indeed, many of the new projects in Atlanta, Chicago, or Denver could just as easily have been sited in Portland, Minneapolis, or St. Louis. It's getting more and more difficult to tell cities apart because they are beginning to look more and more alike.

Where will these new trends take us? Which ones are fads, and which will have staying power? Start with the premise that clients will always seek value. They need to deploy their capital where it will do the most good, and hence they

build buildings to make money, not spend money. They are beginning to understand that design is not only aesthetic, it is also strategic. Innovative hotels with higher levels of amenities will attract more and better-paying customers. Innovative offices and laboratories will boost productivity. Compelling new exhibit spaces in museums will entice more patrons to visit and contribute. Add to this the prospect that climate change will certainly have an impact on where we build, why we build, and how we build. Regardless of how the long-term political debate plays out, owners will be taking steps to protect their investments.

In the years to come, great design will be in great demand.

Finally, the potential for technology to disrupt the entire industry is very real. With sophisticated software and the right algorithms, schematic design can be accomplished in a matter of minutes rather than months. Design documentation, which normally accounts for 40% of the conventional fee, can be largely automated. Optimists will cheer these new developments, as they could free up more time and fees for truly creative thinking. The pessimists will say that technology will turn design into a commodity business, based solely on speed and price, and that the role of the architect will diminish proportionately.

The future of the A/E/C industry is fraught with both promise and uncertainty. One thing is clear: the world's population will continue to grow, and the trend toward urbanization is likely to be unstoppable. People will need to be fed, clothed, and educated, and they will need housing, schools, and places to work. No one can predict the future, but we can anticipate it. Some may fear that mankind is ruining the planet irrevocably, but history shows that human beings are remarkably resilient and creative problem solvers. Promise and uncertainty are watchwords of the day. The good news is that these are the very conditions under which designers work best. In the years to come, great design will be in great demand.

Scott Simpson, FAIA, LEED AP is an award-winning architect and consultant based in Boston. He is Editor-at Large of Design Intelligence, a Richard Upjohn Fellow of the AIA, Senior Fellow of the Design Futures Council, and co-author of "How Firms Succeed" as well as "The Next Architect–A New Twist on the Future of Design and Lessons from the Future". He teaches at the Advanced Management Development Program at Harvard University and provides strategic consulting services to leading firms.

Broad Technical Trends and AEC

Recent and near future

BLAINE WISHART

It is nearly the end of 2019 — a good time to review the past few years and to look to the future. This short article is the first of several that will look at broad developments in technology and some ways in which they manifest within the Architectural, Engineering, and Construction (AEC) industry. In this first article, we will look at 5G, Cloud Computing (CC), and Machine Learning (ML). We will look at Building Information Modeling (BIM) within the context of ongoing technological changes. In particular, we will discuss the new context for BIM due to the emergence of ML, 5G, and CC. Fifty years ago, an intuitive understanding of 'the built environment' was pretty easy. Houses, hospitals, stadiums, bridges, etc. were built and constituted an environment for personal and social life. Today, however, the characteristics of those structures, of the built environment, can change dynamically and unexpectedly because of wireless communication and its intersection with the Internet of Things (IoT), which is the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data (Wikipedia).

BIM, Revit, and Models

Often in casual conversation BIM is equated with Revit or perhaps 3D modeling in general. Many firms are happy with that level of BIM. For others, BIM has not lived up to its full promise largely because data are not preserved accurately as they move up the value chain from design to construction, facilities management, etc. In many cases data does not flow at all. Instead different stakeholders start from scratch to create a model that works for them using Revit, spreadsheets, etc.

Models

In broader technical discussions, the term 'model' often refers to a 3D visual representation. A look at the third definition of model in the Merriam Webster dictionary reveals something deeper:

: a system of postulates, data, and inferences presented as a mathematical description of an entity or state of affairs

also
: a computer simulation based on such a system such as a climate model

In these articles we are looking at the term 'model' in this broader view which is well aligned with the term as it is used in 'climate modeling', 'groundwater modeling', etc. From this perspective, Revit models can be one component of a more encompassing model of a building. We still have BIM, but it is composed of a rich, multi-dimensional conceptual model as well as a 3D drawing and associated take-offs, BOMs, and visualizations.

5G

The term 5G refers to a new generation of high-speed wireless communication structured as a set of cells. Speeds will range from ~50 Mbit/s to over a gigabit — typically more than 10 times as fast as common technology in use today. As with IoT, the specifications are useful, but loose. As a result, 5G will not always interoperate correctly across vendors or between countries.

For the purpose of these articles, greatly increased wireless speed, increased density of radio waves, and the extensive introduction of new hardware, are 5G's most significant characteristics. Though the increased speed is attractive to a designer, many concerns have been raised:

- Interference – 5G will interfere with existing wireless protocols and very likely with existing electric, electronic, and electromagnetic devices
- Surveillance – the combination of increased speed and widespread use heightens the possibility of both legal and illegal surveillance.
- Health – the sheer quantity of electromagnetic radiation will increase. Even if current levels of radio signals are not a problem, problems may emerge — or become more serious
- Security — the 'attack surface' for existing forms of network disruption will increase. Wikipedia explains: "the attack surface of a software environment is the sum of the different points (the 'attack vectors') where an unauthorized user (the 'attacker') can try to enter data to or extract data from an environment." This definition is useful, but inadequate, because the combination of 5G and IoT means that billions of additional devices will be introduced, and all of those devices will be designed for communication. We are dealing with the intersection of software and new hardware. There are currently no significant standards to guarantee the security of IoT devices.

5G also presents great opportunities. As 5G becomes part of buildings and civic infrastructure, we will be able to learn a great deal about real-time performance, environmental conditions for people, etc. Especially in combination with the Internet of Things (IoT) and Machine Learning (ML), 5G offers the possibility of verifying that a building performs as designed. Because BIM, with our expanded definition of a model, specifies both the performance goals of the designers and the operational characteristics of the occupied building, the model can now report on discrepancies between the design goals and the behavior of the implementation.

Machine Learning and Data

Machine Learning (ML) is a branch of Artificial Intelligence that automatically examines data and then builds an analytical model, which can facilitate decisions including the identification of objects (e.g. is that a person or a fire hydrant?), identification of people (Is that the person whose car was speeding 30 minutes ago?).

We can break down the term like this:

- By 'machine' we mean a computer program which automates the examination of data.
- By 'learning' we mean the program categorizes things (this is a photo of a cat), draws inferences (a cat is also a mammal), draws conclusions based on measurements (statistics) of the data (since the animal weighs more than 100 lbs., it is not a house cat and probably not a pet).

To illustrate getting meaning from data we can examine the origin of Geographic Information Systems (or GIS). In 1957, the Russians launched Sputnik — the earth's first artificial satellite. That little device, visible with binoculars, zoomed around the Earth emitting a sound periodically. "Beep, beep, beep." That's all it did 24/7/365. The Russians got the first satellite in space, but it didn't do anything except beep.

Soon, William Guier and George Wiefenbach at Johns Hopkins began recording these beeps and calculating the time between them. They found that the gaps were not consistent. Recording both the time of a beep and the delay from the prior beep and their known position at Johns Hopkins, Guier and Wiefenbach had data rich enough to calculate the sputnik's position through well-established physics.

BIM has not lived up to its full promise largely because data are not preserved accurately as they move up the value chain from design to construction, facilities management, etc.

They then realized if they could do that, they could go backwards, listen to the beeps, and figure out their specific location on Earth. That is the foundation of our GIS.

Let's breakdown what they did. They took simple data, performed calculations, generated statistics (measurements of data), and then related the combined information to the physical world. Likewise, we can perform calculations on the data we can collect from the built environment. When we relate the new, richer data to the physical world and to the original projections of the building's performance, our projections can be more accurate, and we can improve our models as well.

Remember, a few beeps inspired GIS.

As we look at the way data flows, or should flow, between different stakeholders in a building's life cycle, we will see that ML is relevant at every stage of a structure's life.

Cloud Computing

Some believe cloud computing is just using someone else's computer. It can be that, but there is more. Here are a few examples:

- Worldwide Content Delivery Networks (CDN) developed for massive streaming make fast HTML pages over much of the world cheap for all players — big and small.
- CDNs intersect with other technology such as server-side rendering (SSR), lambdas, and DevOps. The dramatic result will be the subject of a future article
- Machine Learning (ML) are getting a big boost from cloud computing because of:
  - Access to massive data sets
  - Crowdsourcing labeling of data sets
  - On demand access to massive grids of CPUs, whether it is for a minute or for days
- Legacy data stored in CRM, ERP, and similar systems can get new life by leveraging the sophisticated infrastructure available for rent in cloud-based systems. For example, the DevOps support on cloud systems can be used to apply ML algorithms to legacy data without extensive custom programming.

The security implications of cloud computing, especially those that arise in conjunction with ML and 5G will be the focus of one article in this series.

2023 BIM: A Sketch

The technology discussed in this article (5G, ML, IoT, and Cloud computing) is only a small part of emerging technology which relates to topics in future articles in this series will also consider RFID, evolution of programming languages, blockchain, robotics and autonomous systems, and AI. Looking ahead, we can think of BIM as it may exist in 2023 within the context of a 30-storey office building.

> Machine Learning (ML) is relevant at every stage of a structure's life.

The building needs windows. The designers specify the required thermal characteristics, which are made available to potential suppliers through supply chain consortiums organized by Amazon and Alibaba. As in current practice, a Revit model of the building provides an accurate count of the windows. However, using cloud-based services, bids and delivery dates are available to the general contractor and owner for consideration, such that the costs of construction loans and material costs can be optimized. The model is sophisticated enough so that costs are measured in many ways: Dollar cost. Carbon transport cost. Cost of on-site vs off site component assembly, etc. ML applied to past project schedules allows useful estimates of the probability of hitting various targets. When an unusual typhoon in Southern China disrupts shipping for several weeks, alternative supplies are automatically provided to the builders because cloud services support persistent queries using GraphQL and other advances in software.

Two years after occupation, a sudden cold snap at the office reveals that while the windows perform as designed when

the temperature ranges between 20 F and 120 F, heating costs jump up unexpectedly at 5 F. Designers update their energy model appropriately and the owner works with a consultant to estimate the tradeoff between replacing the windows and paying increased energy costs by using a variety of climate models from the US Weather service and private model vendors.

How do IoT, evolving programming languages, RFID, block-chain, robotics, autonomous systems, and AI fit into this type of scenario? We hope to answer this and other questions in the next series of articles. Additional questions from readers are welcome.

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Transforming Design Education for the Modern Age

Today, we are seeing an evolution in the way that students engage in the creation of the built environment. The roles that they prepare to someday occupy are changing in fundamental ways. DesignIntelligence spoke with Barbara Bryson, associate dean for research and director of the Drachman Institute at the College of Architecture Planning and Landscape Architecture at the University of Arizona, to better understand these transformations and how they will impact future generations of the A/E/C industry.

BARBARA BRYSON

DesignIntelligence (DI): How is professional practice changing, and how will its evolution impact future A/E/C students?

Barbara Bryson (BB): My architecture education experience began in the 1970s when I went to Georgia Tech. At the time, the traditional expectation at Georgia Tech — and at architecture schools around the country — was that most students would not complete the program. They told us, "Look to the right, look to the left. That person won't be there when you graduate." The fact was that out of a class of about 450, only some 50 graduated, and that was not unusual for architecture at the time.

Even now, in our own program at the University of Arizona, we have a significant drop of students in the first year because many who come to the architecture school have no notion what a studio-based design program is or what architecture is about. By and large, as a profession, we have not communicated well to students enrolling in higher education what architecture is and what is expected in architecture education. In many ways, the two often feel disconnected.

Part of the reason for that disconnect is because the profession of architecture is very different than what it is experienced in the college studio. Even in the 1970s, once you emerged from the traditional studio education — where you spent almost all of your time being a lone designer, attacking each project from whole cloth — you became part of an office, working on teams with other architects and with structural, civil, mechanical and electrical engineers. Often, you were not even the designer, there was only one designer, perhaps two, in the entire office, even in fairly large offices. Everyone else was tasked to do other things; they were drafting, coordinating drawings, managing projects, or doing some other aspect of project development.

“By and large, as a profession, we have not communicated well to students enrolling in higher education what architecture is and what is expected in architecture education. In many ways, the two often feel disconnected.

Today, that has been further exacerbated. Technology has had a lot to do with it, because of building information modeling, because of all the new demands on drawing communication, and because of the complexity of buildings. The more that technology has grown, the more we begin to realize the need for humans to help us translate, operate and manage the technology. There are many new roles in architecture or in the built environment for professionals who are not necessarily architects but who can work at the edge of technology.

In today's offices, we have people who are managing the technology: the hardware, the software, the vocabulary, or the library of the information. There are archivists. Of course, there are people who are actually creating the models and the 2D drawings that come out of the models. There are professionals who are coordinating the models. Then, we have all the others who are dealing with the legal, management and budgetary concerns, the 4D output and the deliverables…and we have not even mentioned research yet.

“Clients' expectations are different than they were 40 years ago. The technology has changed, as has our own sophistication regarding the potential tools.

In addition — something that was not on the radar screen when I was a young person — there are the communication and branding aspects of the built environment that are so important today. How do you communicate effectively with the community about a project? With your team members? How do you present reporting material in a way that enhances the key relationships or is simply informative and effective for decision-making? How do you brand yourself as an organization? How do you build a website that isn't just ostentatious, but that actually benefits your organization in a positive way? So, the ability to communicate with your clients, potential future clients and with other team members has become more important. Yet that is not something that is ordinarily taught in architecture school.

Then there is project and team management. The fact is, today's professionals have to be good at collaboration, yet we spend little time teaching this valuable skillset. I am sometimes invited into studios to teach collaboration skills to our students, an opportunity I appreciate. It's so important. I wrote about the need to be trained in collaborative skills in the article “The Future of Architects: Extinction or Irrelevance.”

DI: Are these changes happening because teams have become more diverse, and technology has created more opportunities, and therefore we have more to sort through?

BB: It's all of that. It's also that the business environment has changed. Clients' expectations are different than they were 40 years ago. The technology has changed, as has our own sophistication regarding the potential tools.

This brings me to what is happening in higher education. Many students today are deeply interested in the built environment because of the sustainability, resiliency and adaptation issues; others are interested because of social and cultural issues. What are they doing and what are the options for them? Are these options growing?

So, at the University of Arizona, we have a partnership with the College of Humanities leading to a Bachelor of Arts in applied humanities with an emphasis in design thinking and spatial organization. Students who decide that a studio environment is not what they are looking for, but who are still deeply interested in built environment, they will often transfer to this degree. It allows them to build a skillset in the built environment, but also in humanities, which can help them work with communities and professionals, work with designers to work with communities, or to work with designers on communication. They could become space programmers themselves because they have the ability to understand communities and spatial organization.

We also have a Bachelor of Science degree in sustainable built environments, a four-year program that allows students to explore how they can be sustainability professionals on campuses, in industry, in product manufacturing, the list goes on and on. They can specialize in heritage conservation, real estate or city planning. They can accelerate that degree into a Master of Science in architecture, a research degree with several different focus opportunities, such as health in the built environment or energy. We're finding that students who earn these degrees have opportunities to work in architecture firms because firms are looking more and more for master's-educated students who can bring research experience to their firm.

DI: So, as you are developing these new programs at the university, are they reflections of the changes that are taking place in the world of professional practice? Or is the university looking forward and providing graduates with the skills to make those needed changes?

BB: Of course, we have to know that a program is going to be successful, so we have to know that there is a market for the programs that we have developed. But also, we are moved by our mission, so we are certainly developing programs that we believe will serve these students effectively in the future.

Some program graduates are going to work for architects and engineers, and some are going to work for new positions that are being created specifically because the need is out there. I recently heard about one of our students from the Sustainable Built Environments program who is now brokering renewable energy for a small town in Arizona. That job didn't exist a decade ago, but is a real job today, and it's a job that she found her way to through this program.

DI: What is the trajectory for all of these changes, and what are the implications for our industry?

BB: Randy Deutsch wrote a book called "Superusers," an excellent book about the trajectory of talent. He frames technology talent as superusers. But if you look at what he calls "the superpowers" or the characteristics that these superusers have to have to navigate the future, they are going to have to be collaborators, to be curious, to be communicators, to be coders, to be all of these different characteristics in order to truly be successful, because the demands of this industry are changing rapidly.

We are facing what I call the 20 freight trains of disruption, which include the fact that our profession of architecture is changing, the relative dynamics between the building professions are changing, even the way that we make our money is changing. Are there other ways of thinking about the business of architecture? Should we be thinking about sustainability as part of the business plan in some way? All of those conversations are on the table.

“They are going to have to be collaborators, to be curious, to be communicators, to be coders, to be all of these different characteristics in order to truly be successful, because the demands of this industry are changing rapidly.

As for implications, the first thing to know is this: if you're in the process of changing and moving towards a nimbler, more collaborative, more culturally informed environment in your firm or company, you are probably not going fast enough. So, go faster. Second, engage. If you love hiring from a particular university or organization, engage in a conversation with them to make sure that students are exhibiting the characteristics that will help you reach your goals. That probably means that students need to be learning about collaborative skills and they need to get research experience. They need to learn about leadership.

DI: When you look at all of these changes that are taking place, what are the positives and negatives that we can anticipate in the future?

BB: The negatives are that, to a large extent, higher education is not very good at being nimble. I worry about the inertia of higher education and the systems that support it. I believe NAAB has tried recently to be responsive and to allow more flexibility but the results are being hotly debated. Regardless of the accreditation debate, we may find that our overall higher education structure is not as nimble as it needs to be in order to prepare our students for the future.

> If you're in the process of changing and moving towards a nimbler, more collaborative, more culturally informed environment in your firm or company, you are probably not going fast enough. So, go faster.

However, the positive is that when you get a chance to anticipate change, you have the opportunity to lean in and take more responsibility. I also wrote in the "Future of Architects" article that architects have been leaning out for very long time, that they have been stepping away from potential opportunities and responsibilities because they have been worried about risk. This is a great time to lean in, to understand that it's not about risk avoidance or risk management, it's about understanding that you can reduce risk through collaboration and through enhancing communication.

I believe that as we teach our students to work in teams effectively, as we provide our students better tools to manage the future, and as we inspire them to be curious about the potential of technology and research, they are going to innovate and solve problems in ways that we cannot even imagine right now. The next 10 years in our industry will be perhaps the most exciting of our time, so I'm going to sit back, watch and enjoy, because I believe our young professionals have an opportunity to surprise us and themselves.

Associate Dean for Research and Director Drachman Institute, College of Architecture Planning and Landscape Architecture, University of Arizona Principal, Design Intelligence Strategic Advisors

After practicing architecture for nearly two decades leading large corporate and public projects, Dr. Bryson turned to higher education in 1996 leading design and planning at the University of Miami. Then, as associate vice president of facilities engineering and planning at Rice University, she successfully completed more than $1.4 billion in construction on time and within budget over 14 years. In 2008, Dr. Bryson was elevated to the College of Fellows of the AIA for her integrated planning work and, in 2010, she was named a Senior Fellow of the Design Futures Council. Barbara is a co-writer of "The Owners Dilemma: Driving Success and Innovation in the Design and Construction Industry" along with Canan Yetmen a book that has changed the industry's view of the owners' role in leading collaborative processes. Today, Barbara continues to influence the design and construction industry through her writing on the future of the industry and her work at DI Strategic Advisors. She also supports the creation of foundational knowledge for the built environment as associate dean for research and director of the Drachman Institute at the College of Architecture, Planning, and Landscape Architecture at the University of Arizona. Dr. Bryson's New Book, "Creating a Culture of Predictable Outcomes" will be released in fall 2020.

Destination Design: World Architecture Festival Unites A Global Industry

I am the program director and acting chair of the World Architecture Festival (WAF), which originally launched in Barcelona in 2008. In my role I am responsible for all the editorial content of the event, which includes the presentations, speakers and judging process. Looking back at the origin of this event and how far its innovations have come makes me excited for the future of the architecture industry.

PAUL FINCH

Because my company published the Architectural Review International monthly title, we attended real estate events around the world with architects who were there to get work from real estate developers. We wondered why there wasn't a big global event where architects are the main players. We researched it, and although there are some huge annual events such as the American Institute of Architects, there was not something truly global and inclusive. The events that come closest are not annual, such as the International Union of Architects that occurs every three or four years. So we asked ourselves, if we launched an annual event, would architects support it? What would it include? Since we had a large database of global architects from our architecture review activities, we were able to do extensive research. We came to the conclusion there was a strong enough case for us to go to our publishing bosses with the idea for a festival, which would be more than a conference; it would also include awards and trade show elements.

> "This festival highlights how different architects in different countries, climates and cultures address similar issues but in completely different ways.

Then we began to explore how to make the awards distinctive in a way that would gather people together in one place. It would not be possible for any jury to visit all the contestants in multiple categories, so we decided the architects would present their projects to international juries in front of audiences. This meant good architects presenting good projects from all around the world in a quick-fire format, which would never be boring. If you had a specific interest in a building type, location or architect's work you admired, you could be catered to, because you would know who would present in advance. This became the World Architecture Festival, and it hasn't fundamentally changed since we launched in Barcelona in 2008.

In our first year we only looked at completed buildings, and we've expanded it since then. Now we also look at future projects, interiors, and we also have special prizes for best use of color, concrete, glass or steel. Architects present in 20-minute sessions, and anyone can watch them perform. For the first two days of the festival, there are 18 rooms where these presentations take place. Then there are nearly 40 category winners across all different sectors. On the third

day, all the category winners present again to slightly more high-powered juries in public, and that gives us our "Best in Show" awards which are announced at the gala dinner.

We've now given many hundreds of awards, and it's an opportunity for people to pick up on what other architects regard as really good work. The outcomes have been very unpredictable. Over the years, we've had architects that might be well-known in their own country but not outside it, gain exposure. Once an almost completely unknown Vietnamese architect won for a community center and café which doubled as a wedding chapel in Ho Chi Minh City.

> Whether you're designing against heat in the Gulf or cold in Scandinavia, the sophistication and architectural thinking is exactly the same; they will always find things in common to talk about.

We wanted everything under one ceiling rather than a really quiet trade show with everyone in crit rooms until they come out for lunch. We run a thematic conference on the main stage for two days, and we have a secondary stage where we do presentations from some of the special prize winners. We have a book club. The Architect's Review run their emerging architecture awards for younger architects, and then there are our sponsors and exhibitors with their stands. We have constant movement of people between the crit rooms, which are all inflatables. At one moment, there are probably four or five different things you could be doing depending on your tastes and appetites, and we get about 2,000 people total at the event. It took us three or four years to get this formula right.

Originally we spent four years in Barcelona, and then four years in Singapore. We've moved on to two-year cycles now because it means we can get around the world more quickly. We did two years in Berlin, and now this is our second year in Amsterdam. For the next two years, we'll be in Lisbon, so we have a nice geographical spread.

We've tried to be open to ideas about how architecture is represented or made and keep things fresh. This year we've introduced the visualization award, because architects spend a lot of time and money doing visualizations, which is not terribly well-recognized internationally. Three years ago we created, along with an architectural practice in London and the John Soane museum, the architectural drawing prize; that has attracted a different sort of entry. For many years we have also hosted the Architectural Photography Awards launched by one of the photographic agencies in London.

We are also interested in exploring the trends we see in respect to issues that are going to affect us all in the future one way or another such as aging and health, building technology, and climate, energy and carbon. One trend we've seen in the awards which seems to be growing is bioclimatic architecture, which tries to bridge the gap between the manmade and the natural world with "living walls" of plants and trees growing inside buildings or on their facades. Our big completed building winner last year was in Singapore, which has the perfect climate for that sort of project. It was a mixture of nature and the manmade, but it was also a hybrid building where part of it was for seniors, another part was connected to the subway station, and another was retail. I think that trend of people using nature as part and parcel of a building process will continue over the next few years, so there will be a greater interest in landscape, not just around the building but actually in or on the building with elements such as roof gardens. We've seen some delightful work like this in other Southeast Asian countries, but it can be done anywhere.

Our conference theme this year is flow, and a lot of that has to do with the smart city flows of people, water, energy and power — both political power and energy power. Cultural identities become a very big issue for a lot of the projects, as well as ethics and values. What value does architecture bring to society, clients or institutions? What are the values that architecture itself is based on? What are the architectural responses to power and justice?

This festival highlights how different architects in different countries, climates and cultures address similar issues but in completely different ways. For example, in many Asian cultures, it's not uncommon to have three generations of people under one roof. How do you design for that? In Europe that isn't a tradition, but proximity, where people can live quite closely together, has produced some interesting ideas. They are exploring creating housing complexes with different sorts of accommodation that people can move around in over the span of their lives without having to go miles away.

One reason I believe we have been able to make WAF work is architects have a lot in common, which is cross-cultural. They tend to have the same education system wherever they study architecture; a mixture of history, theoretical training and science, as well as elements of practical training and construction. Whether you're designing against heat in the Gulf or cold in Scandinavia, the sophistication and architectural thinking is exactly the same; they will always find things in common to talk about. Since they use a visual language set apart from verbal language, we have not had a problem doing the festival in English. The better the quality is with photos and drawings, the fewer words you need.

The overall spirit of WAF is an event where architects go to remind themselves why they fell in love with architecture in the first place. They can forget about all the problems in their daily office life. They can just be inspired by seeing great people presenting great work and go back, we hope, architecturally refreshed. As designs trend more toward sustainability and the incorporation of the natural world into the built environment rather than the destruction of it, I believe architects will play a key role in preserving the future of our world.

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The overall spirit of WAF is an event where architects go to remind themselves why they fell in love with architecture in the first place.

Paul Finch is Programme Director of the World Architecture Festival (WAF) and Editorial Director of The Architectural Review/Architects' Journal. He started professional life as a journalist in the early 1970s. He became Deputy Editor of Estates Times (now Property Week), and subsequently edited Building Design, Architects' Journal and Architectural Review, where he launched WAFin 2008. He has been co-editor of Planning in London since 1994. He was a founder commissioner at CABE (Commission for Architecture & the Built Environment) in 1999, chaired its design review and regional panels, subsequently chairing its London Olympics design panel from 2005 to 2012. He became chair in 2010, overseeing its merger in 2011 with the Design Council, where he was deputy chair for three years. He holds an honorary doctorate from the University of Westminster and honorary fellowships from University College London and the Royal Institute of British Architects. He was awarded an OBE for services to architecture in 2002.

The Shift in Sustainability

During this time of extreme income inequality and a growing political divide in the country, support for sustainability is challenged by what Alex Schafran refers to as an "Incomplete Coalition" – we have been focusing on sustainability now for a long time, and if it was a complete idea, if it was sufficiently inclusive, we would have the widespread support that is needed to solve the problem by now. People living in urban, suburban and rural areas, home owners and renters, rich and poor, all need healthy neighborhoods to live in, but instead, we have promoted idealized technical solutions and turned a blind eye to the racialized economic drivers that determine where people can live – it is an incomplete approach. Today's push for sustainability must place an increased emphasis on the design of our communities to address climate change, public health, and the relationship of the environment and social inequality.

SANDY MENDLER

Community input was essential for the Resilient by Design proposal developed for North Richmond. This image illustrates commercial and retail space for local business, and civic gathering space with sidewalk markers commemorating beloved community leaders. Image courtesy of Mithun.

I started my focus on sustainability back in the early 1990s, working with HOK and in Washington, D.C. It was a very interesting time because the federal government was exploring — through the greening of the White House and a series of executive orders — how to support the idea of sustainability in architecture and the larger built environment. I was also heavily involved in the early days of the U.S. Green Building Council and on the original committee for the development of the LEED green building rating system.

The main issue we were looking at was efficiency: how could we, through design, "do well by doing good," as Ray Anderson, CEO of Interface Carpets, used to say. Where could we be more efficient — and resource-efficient — and get the pollutants out of the production process? It was a focus on finding those win-win design solutions that would be both better ecologically and also produce a better economic return.

The U.S. Green Building Council was also very much focused on market transformation — this idea that the market would reward this focus on providing a social benefit at the same time as an economic benefit. In the LEED system, it was a conscious decision to measure energy efficiency in terms of the cost of energy rather than in terms of energy itself, underscoring that this was both an environmental and an economic savings.

The Changing Movement

All of that is important to understanding where this movement started, but also the limitations of it. Now, there is a sense that looking only at the issues of efficiency — though there have been some great successes — is not going to be sufficient to address the disconnect in terms of who benefits when we reduce carbon emissions and protect ecological resources. In the evolution of this movement, people are looking more than ever at issues of equity — is the green building movement seen as a luxury for people that can afford to invest in green buildings, or is it having a much more widespread impact?

We are also seeing greater urgency in the movement as the effects of climate change are becoming more apparent — sea-level rise, increasingly powerful storms and flooding, and wildfires are costly. We also need to ask how environmental impacts affect human health and well-being, both in the present as well as looking toward the future. And then, how are those impacts distributed? We are seeing evidence that the people at the low end of the income spectrum are also exposed to the most environmental challenges in terms of health. Bay Area Regional Health Inequities Initiative, also known as BARHII, published a report in 2015 describing what they call a "social gradient," with people in low-income neighborhoods systematically having lower life expectancy than people in higher income neighborhoods. For example, in the San Francisco Bay Area, people in West Oakland live on average 10 years less than people who live in the Berkeley Hills, and people living in Bay View Hunters Point live on average 14 years less than people who live in the Russian Hill neighborhood.

Win-wins become apparent when carbon reduction goals are aligned with public health goals. A 2014 study showed that investments in emissions reductions have real financial benefits — and can actually pay for themselves in terms of avoided costs for health care — as each dollar spent on air quality improvements can yielded between 26 cents and $10.50 in savings associated with health costs[1]. In fact, we are seeing public hospitals invest in housing and other community improvements as a strategy to reduce the cost of services. This is one of the innovations of the Affordable Care Act, as it provides for shared savings to the hospital when the population it serves has improved health outcomes.

Instead of thinking about incremental improvement, we can work toward design that addresses whole communities to improve health, create jobs, and build resilience with green infrastructure while meeting carbon reduction goals. This is the bigger question: how do we transform our cities and our economy to produce an environment that we will all be able to live with for a long time? So, in this sense, design is needed more than ever for the new models that will be fundamentally more sustainable over time, while addressing health and climate challenges.

Sustainability and the Community

Today, the challenge is to bring these issues down to the community scale, because it is at that scale where the benefits of sustainability truly become evident. For example, we can look at shoreline areas that are at risk from sea-level rise, many of which are degraded industrial areas that have been long neglected. When those areas are restored as part of a natural living system, it protects the shoreline. Our team at Mithun has been working with a task force group in West Contra Costa county to develop a "living levee" solution similar to an earlier pilot developed for Ora Loma. The living levee involves an expanded marsh built on a slope to accommodate sea-level rise over time, providing a beautiful natural amenity that sequesters carbon, a great alternative to building a sea wall.

When we provide an environmental asset, parkland, or open space, we can connect it to restorative efforts in the adjacent communities. Those are places where we get the most sustainability multiplier effects. For example, North Richmond is a fenceline community in West Contra Costa county that has struggled with the legacy of racism, through red lining in the

past and pollution and disinvestment in the present. While the proposed living levee will provide protection, we have also been supporting community-driven efforts to increase affordable housing, community gathering space and local business opportunities together with tree planting to filter air pollution and manage stormwater. The combination of protective measures with affordable housing and community health investments will be transformative.

A living levee buffers the North Richmond community from the shoreline, and trees along the edge of the parkway mitigate diesel pollution – providing access to natural areas and mitigating poor air quality, while providing local jobs and educational opportunities. Infill housing on abandoned single family home lots promotes greater density and home ownership healthy and affordable by design – integrated with community 'water hubs', open space, trees and bioretention areas providing air and water filtration. Images courtesy of Mithun.

The World Health Organization (WHO) has defined "social determinants of health" as the environmental conditions in which people are born, grow, live, work and age. Research shows that 80–90% of the impact on long-term health outcomes is related to these social determinants, with health access and health treatment only impacting approximately 10–20% of a person's health. So, designers can have a strong influence, creating healthier communities that are more walkable with more access to green space, and addressing air quality impacts. The design community must make the case for how the decisions around the built environment have a tangible impact on peoples' lives.

Of course, it is important to have policy at the federal and state levels to address the issues that drive decisions around fuel sources and energy; but in addition, architects, planners, and designers need to communicate to the public that the way we design communities is fundamental to creating sustainable solutions. It is possible that if we do this right in a very transparent and inclusive manner, some of the social divides could be addressed at the same time. Communities with strong local economies and local services are inherently more sustainable and resilient and provide greater access to opportunity.

Changing the Investment Value

We also need to shift the way we think about sustainability from one of, "How much will it cost to address this terrible problem?" to "What are the potential gains and the benefits of providing this necessary investment?" It goes from the cost column to the investment column. Instead of addressing our decisions around communities solely in terms of an economic metric, we can look at value in a much more multifaceted way. In addition to the economic return, we can also look at how we build social capital, how we build community connections, how we build health, and impact opportunity, access to jobs, access to transportation, and all those other aspects that provide a community with a higher quality of life. We can look at the value of that investment and work with communities to make sure it reflects their values.

Ultimately, the conversation around climate is happening at the national level, it is happening at the international level, and it does feel abstract. It does feel like the decisions that any

individual or any community make will be a drop in the bucket. But if we can shift practices and find the new models that produce less carbon emissions while addressing all the other human needs, then we provide a systemic solution that will have a chance of having a widespread impact.

Equity and Sustainable Design

The issues of inequity and inequality are not new at all to the people that are experiencing them. There has been a consistent effort in the marginalized communities to address these challenges. It would be wrong to think of this as a new movement, but it does seem that a tipping point has been reached, where the corrosive effect of inequality is becoming more evident to our society as whole. The environmental justice community has been working for a long time to bring attention to the impacts to under-invested and marginalized communities, but we are seeing a greater recognition now of how essential it is to address environmental justice as an integral part of a larger sustainable design agenda with equity at the core.

> “Looking ahead, there is an opportunity to replace unsustainable extractive growth with healthy, sustainable and inclusive growth.

In California, which was revolutionary in creating a Cap-and-Trade program to address its climate goals, there has been tension between those advocating for a primary focus on carbon reduction and environmental justice advocates calling for an approach that benefits impacted communities. In fact, environmental justice activists in California initially fought against the reauthorization of Cap-and-Trade because the program was actually making localized health impacts worse in communities of color[ii]. Capital tends to flow to the places that have the highest return, so the projects that were reducing carbon emissions were all occurring in the higher income areas or out of state, and many lower income areas and communities of color were actually experiencing greater emissions. So, the market-based system was not only not helping those under-invested communities, it was making the situation worse.

In the end, two additional laws were passed as a compromise to win support for reauthorization, changing the direction of the Cap-and-Trade program to require a portion of the investments in carbon emission reductions to be made in those neighborhoods that are most impacted. This also led to the creation of the Transformative Climate Communities program, which funds the development of neighborhood-level community plans providing local economic, environmental and health benefits to disadvantaged communities. In the end, climate advocates realized they could not abstractly look for the most economically efficient place to reduce carbon emissions — they had to look at the human side as well.

We are at a level of income inequality that we have not seen nationally since the 1920s, and the current economic dynamic — concentrating wealth and concentrating poverty — is not only unjust, but it is also going to limit the ability of the economy to continue to grow. Looking ahead, there is an opportunity to replace unsustainable extractive growth with healthy, sustainable and inclusive growth.

A Year, Reviewed

Looking back at 2019, Greta Thunberg has been an amazing advocate. She has not only spoken to youth in this country in a way that has grabbed their attention, but also to the parents of young people. Her message that we cannot be complacent about the future and that our kids need us to act with urgency has been very powerful.

We are also seeing the mounting evidence of the impacts of climate change, and that the impacts are greater than what was predicted. We are seeing a trendline that is going in the wrong direction.

Considering the Green New Deal, which is an exciting idea in general, it is very important the design industry finds a way to provide our input to this thinking. Should the Green New Deal go forward, the focus needs to include an understanding

of the opportunity to make transformative change through development in local communities. That application in real places by real communities is going to be fundamental to the success and to the realization of public benefit.

Into the Future

I tend to be reflexively optimistic, but it is harder these days. We are at a serious inflection point, to borrow a term, and the decisions that are made in the coming decade will be very important. In California, there is an estimated housing deficit of 3.5 million units, and the governor has stated that he is committed to getting those built between now and 2025. So, it really matters where those housing units are built, how they are built, and how they align with a set of equitable sustainability goals and land-use priorities. This is a hugely important time for designers and people in the design community to step up and help set that direction.

The design community can provide fresh thinking through design challenges. Two recent examples are the recent Resilient by Design and Rebuild by Design projects. Rebuild by Design was a collaborative design exercise with both local designers and people from all over the world to look at how to rebuild New York City after Hurricane Sandy. They created innovative models that would address both climate adaption needs and sustainability goals. The Resilient by Design project was modeled after Rebuild by Design and developed as an exercise to plan in advance of a crisis, rather than after it. It was also was done in advance of funding to build the prototypes. Nine design concepts were developed, together with community partners, to address the challenges of climate adaptation with new sustainable models that also addressed the social equity needs in the community. This is a good model of bringing a cross-section of talent from local, national, and international groups to invest in real solutions within real communities.

There are always leading clients who are interested in making something unique as well. Some of the places where we have had great success working with innovative clients have been in the university realm. We had the opportunity to work with Chatham University to create their new Eden Hall campus, an innovative net-zero energy, net-zero water, net-zero waste campus from the ground up as a living-learning environment for sustainability. As it has been built out, they are learning how important the project is, but also how it challenges the way they interact with students, develop new governance structures, and create new ways of engaging in collaborative learning on-campus.

On the city side, we see desire for innovation to address growing affordable housing challenges, as the market will not solve this problem on its own. But the problem is often that public funds seem to be siloed. We can make the case for how design will produce what we call “avoided costs” — a reduction in spending for health and public safety with a healthier, better built environment. But it is still hard to allocate dollars across one silo to the other.

There has been some success with community-benefit agreements, essentially a tax on new development that is targeted to the desires of the local community. Yet, a community-benefit agreement is a more difficult approach to take, particularly if the community does not have a strong market and does not have the ability to attract the kind of development that can afford to pay the premium. In those communities, mitigation funds become really important.

The Sun Valley Healthy Living Initiative focuses on the elements that make a healthy community – including active play and nature play areas, gardens producing healthy food, bike share, shade trees and space for social connections and local business startups. Image courtesy of Mithun.

One program that has been effective in building the partnerships needed to create innovative new development models is EcoDistricts, a nonprofit formed to guide the collaborative community development process, engaging public, private and civic participation. Sun Valley in Denver, Colorado, is an example where Mithun worked to establish healthy development goals for a community where 70% of the residents currently live below the poverty line. It is being redeveloped as an EcoDistrict, to transform existing low-density public housing into an inclusive, mixed-income community with access to healthy food and family-friendly places, while offering all existing residents subsidized housing in the new development. The development includes renewables, green infrastructure, community gardens and a walkable community with ample services — an exciting model of community revitalization without displacement.

> On the city side, we see desire for innovation to address growing affordable housing challenges, as the market will not solve this problem on its own. But the problem is often that public funds seem to be siloed.

In the end, it is crucial that we, as architects, develop strong partnerships to look holistically at solutions. It is not possible to effectively address the challenges of climate change, adaptation, and social equity just at the building scale, or at the large landscape scale, or independently in land-use planning. It requires a larger collaborative effort to develop the brilliant climate positive solutions that address challenges comprehensively, creating virtuous cycles of investment that build health and wealth in communities. At the same time, community voice is fundamental. Gathering all of the expertise and supporting community leaders to develop solutions collaboratively — that is the largest shift.

A principal with Mithun, Sandy is a nationally recognized design leader, author and advocate focused on creating inspiring, healthy places for sustainable living. A pioneering member of the USGBC and AIA Committee on the Environment, Sandy was national Chair of AIA COTE in 2000 and 2001, and served twice on the USGBC national board contributing to the early development of the LEED green building rating system. She is currently involved with EcoDistricts and has contributed to development of their standard. Lead author of the seminal book, "The HOK Guidebook to Sustainable Design," Sandy teaches, lectures and serves on numerous peer review and expert panels. Her current research and writing focuses on sustainability, resilience and equity at the neighborhood scale.

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[i] *"In a study of emissions reductions in the USA, researchers estimated that the monetised human health benefits associated with air quality improvements have the potential to offset between26% and 1050% of the cost of various carbon policies. In other words, each dollar spent on air quality improvements can yield between 26 cents and$10.50 in savings associated with health costs" (Mendez 2015; citing Thompson et al. 2014).*

[ii] *In a report developed by researchers at UC Berkeley, USC, UCLA, and Occidental College, researchers found that large GHG-emitting facilities, particularly those producing a public health concern from PM10 pollution, are located in neighborhoods with higher proportions of residents of color and residents living in poverty. They also found that those large pollution sources actually increased during the time that cap-and-trade was in effect, and that many emissions reductions associated with the program were linked to offset projects located outside of California. (Cushing et al. 2015, p. 10)*

Design Futures Council

2020 Leadership Summit Events

Each year, the Design Futures Council gathers together around a series of essential themes ruddering the A/E/C industry. The gatherings are always titled as leadership summits or forums. Each gathering is attended by leaders from property development, architecture, design, engineering, construction, finance, banking, building product manufacturing, academia and more. The overarching goals for these exchanges are:

- Relational connectedness among attendees.
- Challenging the status quo of design and delivery.
- Presentation of thought-leading content that alters perspectives.
- Staging the questions every industry leader should be asking.
- And more.

The schedule of DFC events for 2020 is:

DFC Leadership Summit on Technology & Applied Innovation
January 15-16, 2020 (La Valencia Hotel, La Jolla, California – USA): Perhaps the most significant such gathering of design thinking since the La Jolla gatherings began in 2004. Comprehensive interactive design, cognitive science framework, and new approaches and tools for design.

An Evening with DesignIntelligence
March 19, 2020 (Terminus, Atlanta, Georgia – USA)

DFC Leadership Summit on the Future of Environmental Responsibility
September 2020 (Dates and Location TBD): Leaders from the Built Environment Industry gather to share thoughts and ideas, and challenge what is understood and believed about sustainability and how it is inculcated in all areas of design.

DFC International Leadership Summit
October 6-9, 2020 (Rome and Venice Italy)

DFC Leadership Summit on the Business of Design
November 9-10, 2020 (Charles Hotel, Boston, MA – USA): Gathering of C-Suite executives from across the Built Environment Industry to explore and discuss risks, challenges, and opportunities to driving quality profitability and running a better business.

AUSTRALIA | Action Forum: Deep Dive into Global Trends
February 07, 2020 (Sydney, AU), | February 13, 2020 (Melbourne, AU): Today's businesses, government and individuals are responding to shifts that would have seemed unimaginable even a few years ago. These are large, transformative trends that define the present and shape the future by their impact on businesses, economies, industries, societies and individual lives – with 'global reach, broad scope, and a fundamental and dramatic impact'.

Notable Quotes

Jean Nouvel

“Space, space: architects always talk about space! But creating a space is not automatically doing architecture. With the same space, you can make a masterpiece or cause a disaster.”

“I like to play with architecture! It’s my favorite game.”

“It is not possible to design always the same. How to be different in each different place–that is the most important work and duty of the architect to find out.”

“Each new situation requires a new architecture.”

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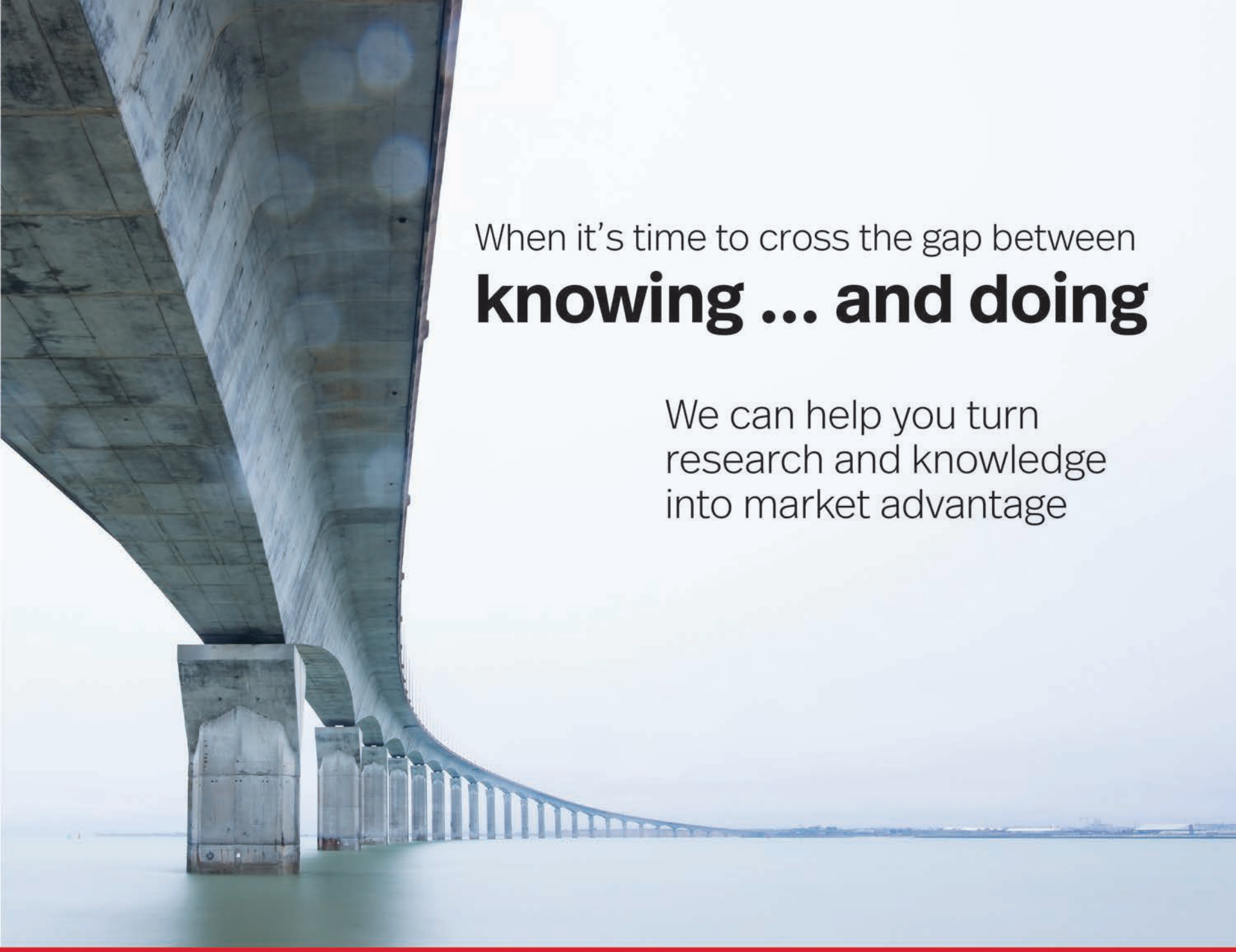

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