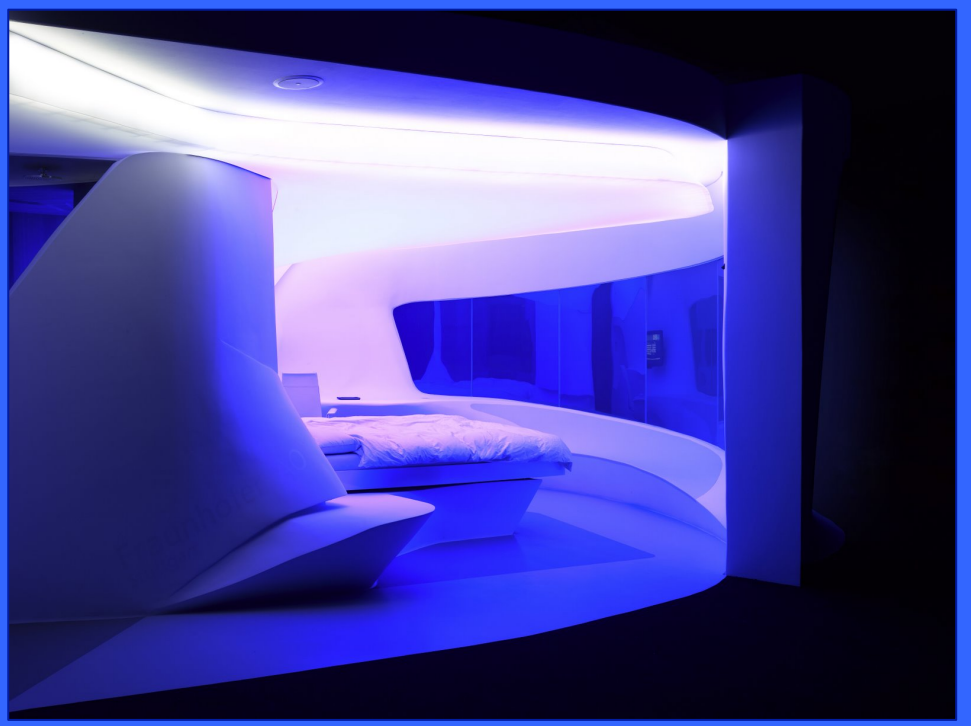
FUTURE SCAN 2017



Council for Interior Design Accreditation

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Future Scan 2017

COUNCIL FOR INTERIOR DESIGN ACCREDITATION

OVERVIEW

This year's CIDA *Future Scan* is more of a supplement to last year's *Scan* than a wholly fresh and comprehensive scan of all the topic areas of interest to CIDA's leadership. And with good reason. In terms of new or emerging trends likely to impact interior design education, the practice of interior design, and/or the interior design industry, little has changed since last year's scan. This is not surprising since, given the nature, size and scope of the industry, change for the most part tends to be gradual and incremental. This is true for the construction industry as a whole, and for higher education, as well.

One might have expected more turbulence in macro areas such as the economy, social and regional trends with the change in administration in Washington, DC and its nationalist and pro-business agenda, Brexit, refugee migration, and international tensions among superpowers. However, the rate of change diminished rapidly, due to continued opposition and legislative gridlock in Washington and London, as well as diplomatic efforts to diffuse much of the political rhetoric. Overall, the global and U.S. economy are improving, if modestly; the amount of global conflict has diminished somewhat, as surprising as that may seem; and the world seems to be gradually adjusting to the "new normal," whether people like it or not.

Technology innovation and acceleration continue to dominate the headlines in the built environment industry. From changing how products are made, buildings are constructed, designs are developed, businesses are run, and people interact with built spaces, technology is changing almost every aspect of construction and design. And the rate of change is staggering. Already the impact of fields like robotics, virtual and artificial reality, and artificial intelligence are being felt, and their roles will vastly increase in the next decade.

As for interior design, it is standing at a crossroads between the practice of the past and the practice of the future. On the one hand, technology in some areas is supplanting the need for the design professional. On the other hand, the major trend in the built environment industry at present is the focus on occupant wellbeing and the human experience of built environments. Technology, changing work and life patterns and behaviors, concern for health and wellness, and ever-escalating expectations of consumers and clients will challenge designers to become more innovative, creative, responsive, forward-looking, and research- and technology-savvy in the future. The challenge for interior design educators will be to prepare students for the unknown and the not-as-yet invented future in which they will have to design and compete. For both designers and educators, they are challenges both demanding and exciting, with the potential to provide rich, rewarding careers.

ECONOMY

THE BIG PICTURE

- Global and US economies improving
- China seeking to become the world's top economic power
- US employment up but wages stagnant
- US manufacturing makes a comeback, retail under threat

GLOBAL ECONOMY

Global economic picture improving. In advance of the release of the International Monetary Fund's annual world economy forecast, IMF chief economist Maury Obstfeld stated in a recent interview with CNBC that the organization sees a broad-based global recovery. "The importance is that it's really broad-based in a way that it hasn't been in a decade," Obstfeld said. In July, the IMF forecast global economic growth of 3.5% for 2017 and 2.5% for 2018. While positive, such tepid growth brings with it longer-term risks, said Obstfeld, such as political tensions and protectionism, which most economists agree thwarts growth. Major economies around the globe improved on the whole by the end of the second quarter. An article in *Business Day* highlighting recent advances quotes Paul Mortimer-Lee, chief market economist at BNP Paribas, "Global momentum has turned out to be solid in the first half of 2017 and looks favourable going forward. Generally, we see more reasons for growth optimism than we did three months ago." In July, the IMF had downgraded its economic growth forecast for both the United Kingdom (from 2% to 1.7%) and the U.S. (from 2.3% to 2.1%) after slower-than-expected growth in the first quarter.

Growing influence of China. While the U.S. president has been advocating a nationalist, protectionist, isolationist position on trade and international relations, Chinese president Xi Jiping has been aggressively reaching out to other nations around the globe, seeking to advance China's position as the world's leading economy and economic influencer. In 2015, the government established the Asian Infrastructure Bank to rival the International Monetary Fund. It now includes 57 member countries and 27 prospective members, including most of the world's major economies, aside from the U.S. and Japan. In May, the government announced an ambitious $1 trillion initiative, called "One Belt, One Road," to fund hundreds of infrastructure projects in more than 60 countries across Asia, Africa and Europe. It also has been actively courting Central and South American governments to strengthen relations and increase trade and is looking to increase its already substantial holdings in the U.S., directly or indirectly, including a bid by one Chinese company to assume ownership of the Chicago Stock Exchange. At the time of writing, China just finished hosting the ninth annual BRICs Summit, bringing together leaders from Brazil, Russia, India, China, and South Africa, as well as Mexico, Egypt, Thailand, Guinea and Tajikistan, which it hopes to bring into the fold. In response to what it deems "a surge in protectionism in some Western countries," the BRICs block seeks to promote an agenda of "inclusive growth and globalization." During his keynote speech at the opening ceremony of the Business Forum, Xi noted, "A large number of emerging markets and developing countries have come to the fore, playing an ever greater role in

international affairs," and stated that in contrast to the West's "zero-sum game" approach, the BRICs collectively expressed their "aspiration for peace, development and win-win cooperation."

Worry over the well being of future generations. A Pew Research Center study of 32 countries conducted earlier this year found that the publics in about half (46%) of these countries (including the U.S., Europe, Russia, Japan and India, as well as Australia and some parts of Africa and South America) feel more positive about their nation's economy than they did a year ago. At the same time, the study found, many are concerned about the future. A median of just 41% believe that a child in their country today will grow up to be better off financially than their parents. The most pessimistic about prospects for the next generation are the French, Japanese and Greeks, whereas respondents in emerging and developing countries were more likely (54%) to say their children will be better off by the time they reach adulthood compared to their own present situation. One particularly interesting finding is that people who were aligned with the political party currently in power were more likely to feel positive about the current and future economic outlook for their country than were those who were not.

Industrial manufacturing and global trade sluggish. Analysis by consulting firm PwC finds industrial manufacturers facing a number of challenges globally. According to an article on the PwC website, foreign trade is at historically low levels, and nationalist policies are threatening to further undermine the free flow of goods, creating more uncertainty and constraints upon manufacturing growth. The IMF projects industry manufacturing output to increase just 3.1% in 2016 and 3.4% in 2017. Yet, a PwC survey conducted in January found that only about a third of manufacturers were planning to make improvements in the next 12 months that could benefit their companies, such as investments in information technology, facilities expansion, new talent, and marketing and sales promotion. As a result, says PwC, many companies will continue to fall behind as competition globally increases.

US ECONOMY

Economic growth gains speed—a bit. Following modest moderate growth in the first quarter of 2017, growth in the second quarter reached its fastest pace in two years, according to U.S. Commerce Department revised data. Gross domestic product rose 3% over the previous quarter, and consumer spending increased by 3.3%. Bloomberg News reports a strong job market, contained inflation and low borrowing costs are helping to boost consumer confidence and spending. However, says Bloomberg, analysts do not expect the economy will maintain this rate of growth, especially in the aftermath of Hurricanes Harvey and Irma. At present, growth is anticipated to stay at around 2.1% for the year, more or less in keeping with the growth rate since the beginning of the recovery from the last recession.

Job growth slower but steady. Although the U.S. economy added fewer new jobs in August than analysts had predicted, and overall job growth is at only 0.1%, that is not unexpected, contends *New York Times* correspondent Neil Irwin, given the more rapid rate of growth last year and the economy approaching full employment. Job numbers can fluctuate from month-to-month for a number of reasons, notes Irwin. The economy has been adding on average 170,000 jobs a month since February, and the unemployment rate is at 4.4% instead of the 4.9% in the middle of last year. "The good news," says Irwin, "is that a slow and steady expansion means that most Americans who want a job can now get one, and wages are growing faster than (low) inflation."

Wage growth stagnant. The big question looming over the economy at the moment is why, with the country near full employment, wages are not going up faster than they are. *The National Review* reports that after adjusting for inflation, hourly wages in the private sector grew 0.4% between April of last year and April of this year. The four-fifths of these workers who labor in "production and nonsupervisory" roles saw growth of just 0.1%. That's well below the very low inflation rate of about 1.5%, and more or less nil compared to rising costs of housing and healthcare. Most gains in household income have been because of increased employment, not from wage increases. There have been many theories put forth as to why this is happening, from executives hoarding all the cash to high wage baby boomers retiring and being replaced with younger employees earning lower salaries to start. Whatever the reason, some analysts predict wages will start to increase next year as employers face a smaller pool of available candidates to choose from, providing those already employed more leverage to demand a raise. As discussed in the section on **Social Trends**, below, some city and state governments have sought legislation to increase the minimum wage to help correct the situation, especially among lower-paid service workers, with mixed success.

Manufacturing jobs making a comeback. Much was made during last year's presidential campaign of the loss in manufacturing jobs in the U.S. and the impact on middle class incomes and quality of life in particular. The situation may be turning around. *The New York Times* reports, "The latest payroll data underscores the striking rebound at American factories, which lost more than two million jobs in the recession, but have clawed their way back and recovered more than one million positions since 2010." The article states, "Manufacturers have indeed stepped up the pace of hiring this year. A closely watched private survey released [recently] showed factory activity at a six-year high."

Stock markets going strong. U.S. stock markets have hit record levels several times this year. Markets ended up near record levels at the end of August. Several factors may determine how well stocks continue to perform for the remainder of the year, including the impact on the economy of Hurricanes Harvey and Irma, whether the Federal Reserve decides to increase interest rates (unlikely at this time), the escalating tensions between the U.S. and North Korea, and whether Congress makes headway on raising the debt ceiling, passing a budget for next year, and enacting tax reform. The latter may be a possible boon for interior designers if the Trump plan to drastically cut taxes on businesses and on the wealthy, thus freeing up capital for improvements of various sorts, gains favor with enough legislators.

A future for brick-and-mortar retail? Brick-and-mortar retail chains from major department stores to niche boutiques have been dropping like flies this year. Shopping malls are becoming ghost towns. Consumers increasingly are choosing to do their shopping online. Results of a Pew Research Study released last December showed roughly eight-in-ten Americans are now online shoppers: 79% have made an online purchase of any type, while 51% have bought something using a cellphone and 15% have made purchases by following a link from social media sites. Nielsen reports that through the first three quarters of last year, e-commerce represented an average of 8.1% of total U.S. retail sales and is growing. Not all is lost for brick-and-mortar retail yet, however. The Pew study found overall 64% of Americans indicate that, all things being equal, they prefer buying from physical stores to buying online. (Although, the authors point out, often things are not equal—especially in regards to price and availability, which is why more consumers are shopping online.) Amazon is experimenting with brick-and-mortar stores to sell books and other items and recently purchased Whole Foods to enter the grocery store market. The decline of brick-and-mortar retail and increased reliance on automation (Amazon's

book store requires few staff) will likely mean large layoffs for lower-paid, lower-skilled employees, who will have difficulty finding jobs to replace the ones they've lost.

SOCIAL/DEMOGRAPHIC TRENDS

THE BIG PICTURE

- Widening income inequality globally and in U.S. eroding social bonds
- Fourth Industrial Revolution will impact many jobs
- Demographic shifts creating social upheaval

SOCIAL TRENDS

Widening income inequality. Both in the U.S. and globally, the disparity between the haves and the have-nots continues to grow, with more and more people falling into the have-not category. The repercussions of income inequality go well beyond basic standard of living, affecting the have-nots' access to healthcare, education, employment opportunities, and housing. Most of these individuals and families are just barely getting by and have little or no savings to buffer the loss that could arise from an illness, accident, job loss or catastrophic event. As a result of poorer work and living environments, stress, lower standard of health care, diet and other consequences of low income, studies show, income inequality impacts a broad range of quality-of-life factors, including health (mental and physical), longevity and life expectancy, employment and employability, and work performance. A literature review of research on income inequality published in the journal *Social Science & Medicine* concludes that relative deprivation from income inequality correlates with higher rates of morbidity and mortality, obesity, teenage birth rates, mental illness, homicide, low trust, low social capital, hostility, racism, poor educational performance among school children, the proportion of the population imprisoned, drug overdose mortality, and low social mobility.

Within a number of countries, including the U.S. and China, differences in lifestyles, education, travel, and access to technology and consumer goods have created two societies with very different values and worldviews. In its annual risks report for 2017, the World Economic Forum ranks rising income and wealth disparity, and increasing polarization of sectors of society as the first and third most critical underlying trends that will determine the shape of the world in the next decade. In the past year, for example, we have seen manifestations of the cumulative effect of years of financial strain and degradation of quality of life in the growing support for isolationist, segregationist, xenophobic, and radical fundamentalist ideologies that promote exclusion as the path to renewed prosperity.

The factors contributing to income inequality are many and complex. They include globalization and its accompanying access to cheap goods, labor and raw materials that benefit more affluent consumer societies; a scarcity of quality, good-paying, stable jobs for lower and middle class workers; tax and social services policies that favor the wealthy; changes in corporate practice, including excessive executive compensation [analysis by the Economic Policy Institute in 2015 found executive pay had grown by 997% between 1978 and 2014, while the average compensation for a private-sector production and nonsupervisory worker increased by just 10.9%] and cash accumulation rather than investment or higher worker salaries; the growth of the tech and service sectors; automation; and racial and gender discrimination. None of these factors is likely to change soon, if at all, in the coming decade.

The idea to help alleviate income inequality by providing a basic, baseline or "universal" income for all citizens received some notoriety earlier this year when Facebook founder and CEO Mark Zuckerberg announced his support in principle. However, it has not gained much traction with economists and policy experts, partly because it is largely untested and depends on a number of assumptions that may not hold in all or many cases. A recent study by the Roosevelt Institute, using macroeconomic modeling to investigate three different federal monthly payment scenarios, concludes, "The economy can not only withstand large increases in federal spending, but could also grow thanks to the stimulative effects of cash transfers on the economy." On the other hand, an article discussing the study in the *MIT Technology Review* points out that the model assumes such a large cash infusion into the economy would stimulate substantial growth and employment—a scenario many economists disagree with. It also assumes recipients would not work less, but there is no guarantee of that. An article in the *Boston Review* in May by Anke Hassel, a German professor of public policy, claims "basic income is dead" and argues that guaranteed basic income would do little or nothing to help the struggling middle class and would deepen the divide between the poor and the wealthy.

Another alternative that has gained some popularity is raising the minimum wage to compensate for years of stagnant wage growth. Some economists and policy experts point out that while this may provide some short-term relief, in the long run the effect is likely to be net or worse, as employers will pass the increased cost on to consumers, thus raising prices, increasing inflation and interest rates, and eroding the buying power of the higher wage. Furthermore, employers may also seek ways to increase the use of automation or other labor-saving strategies to cut costs, thus eliminating jobs for lower-paid workers.

A more productive alternative would seem to be for national, state and local governments to implement policies that would foster a more balanced distribution of wealth, incentivize companies to invest more in their employees and communities, and increase basic social services to improve the standard of living for those who are poor or less well off. Encouraging rather than discouraging immigration would also help to stimulate the economy and create jobs.

Realigning human capital in the digital age. In conjunction with the widening income inequality gap is the growing disjunction between increasingly tech-oriented societies and economies and those that still depend largely on manual or lower-skilled labor, such as factory and service workers. Developing countries in Asia (including China and India), Africa, and Central and South America are undergoing seismic population shifts from rural to urban areas, creating large segments of the population that are ill-equipped to thrive in city environments. Similarly, Western Europe in the past two years has experienced a huge influx of immigrant refugees fleeing war and other forms of violence, repression, dire poverty, and famine, many of whom lack the skills needed to succeed in more industrially advanced economies. In developed countries, middle class workers are struggling as globalization and the rapid rate of technological change make their jobs and skills obsolete. All of these trends are putting huge pressure on businesses and governments to find ways to assist workers and citizens to adapt and make a place for themselves in today's changing economies and workplaces.

Dubbed the Fourth Industrial Revolution, current technologies such as robotics, artificial intelligence (AI), mobile platforms, social connection platforms, sensors, and nanotechnologies threaten to dislocate not only certain types of jobs (including some administrative, middle management and paraprofessional jobs) but entire labor-intensive industries, such as transportation, shipping and delivery, manufacturing, and retail, that have been the staple of middle-class affluence since the 1950s. Not only will these technologies

reduce the number of workers needed to operate many businesses, but they also will require new types of technical and analytical skills for the positions that are available. Observes human resource consulting firm Deloitte in its *2017 Global Human Capital Trends* report, in an age of disruption, "The problem is not simply one of 'reskilling' or planning new and better careers." Rather, "companies should focus more heavily on career strategies, talent mobility, and organizational ecosystems and networks to facilitate both individual and organizational reinvention."

Multiple studies have documented that massive numbers of jobs are at risk as programmed devices – many of them smart, autonomous systems – continue their march into workplaces, according to the Pew Research Center. In a survey of 1,408 technologists, scholars, practitioners, strategic thinkers and education leaders conducted by the Pew in the summer of 2016, 70% of respondents agreed that within the next 10 years there will emerge new education and training programs that will successfully train large numbers of workers in the skills they will need to perform jobs in the future. Central to this effort, said the experts, will be technology-based self-directed learning platforms and focusing on nurturing unique human skills that artificial intelligence (AI) and machines seem unable to replicate. They also foresee new credentialing systems that will arise as self-directed learning expands. Among the respondents who believe this future will not come to pass, major concerns were that governments and businesses will not provide adequate funding at the scale that will be needed to counteract the massive loss of jobs that will ensue; many who lack the skills needed will also lack the skills or interest to pursue self-directed learning opportunities; and continued population growth will mean millions of more people competing for millions of fewer jobs.

Most Americans spending more time alone. According to data collected by the American Time Use Survey, between 2003 and 2015, Americans on a daily basis increasingly have spent less time with friends, parents, siblings and other family members, co-workers, children, and their partner. The only measure to increase was time spent alone, which went from roughly 2.5 hours to nearly 8 hours a day. Presumably, this includes time spent alone with one's devices, and thus engaged in some form of digital social activity, at least part of the time.

Inclusion/Exclusion come to the forefront of the social agenda. As mentioned above, one consequence of the widening gap in income inequality has been the rise of groups promoting isolationist and exclusionist ideologies. A number of highly publicized shootings of African Americans by police officers around the U.S. have reignited accusations of institutionalized racism and bigotry. Growing acceptance of diversity not only in race, ethnicity and religion, but also gender identity and sexual orientation has generated backlash from conservative, ultra-conservative and fundamentalist groups. In addition, several high profile incidents of gender bias, sexual assault and harassment, and a rise in violence against women, have brought these issues to the national and international attention. Business leaders as well as governments and nonprofit organizations are working to reverse these trends. In June, 150 chief executives from some of the top U.S. corporations signed on to an initiative called "C.E.O. Action for Diversity and Inclusion" to foster more open discussion about race and gender in the workplace. The group is sponsoring a website, ceoaction.com, which has more than 70 examples of the most effective efforts developed by companies, including flexible work practices and gender equality programs.

Consumer consumption rebounds. Gallup reports that U.S. consumer consumption reached a nine-year high in July. Americans' spending levels are back to where they were before the global financial crisis in 2008, and the latest figure is the second-highest average in nearly a decade of Gallup's tracking. The elevated spending levels are stable among both higher- and lower-earning Americans. Adults in

households whose annual income is $90,000 or more reported a spending average of $178 per day throughout July. Spending among Americans in households earning less than $90,000 annually averaged $80.

The rise of The Aspirational Class. With "the democratization" of consumer goods luxury brands and experiences like world travel, the rich are looking for other ways to distinguish themselves from the less affluent. According to Elizabeth Currid-Halkett, professor at the University of Southern California and author of *The Sum of Small Things: A Theory of the Aspirational Class*, there is new class elite emerging who have started using different, less conspicuous displays of wealth. As reported in the *Herman Trend Alert*, this trend is being driven by "a well-to-do, educated elite" that Currid-Halkett calls the "Aspirational Class." The Aspirational Class values "knowledge and building cultural capital," plus their spending habits are different as well from the traditional wealthy consumer. These folks prefer to spend on services, education, health and wellness, retirement, and other types of investments in themselves, rather than "purely material goods." The author calls these new status behaviors "inconspicuous consumption." Education accounts for a significant portion of these expenditures (almost 6% of the top One Percent's household expenditures, compared with just over 1% of middle-income spending). In fact, since 1996, spending of the top One Percent on education has increased 3.5 times.

Masculinity under threat. Recent trends are creating a crisis in male identity and traditional views of masculinity. Reports futurist Richard Watson, as a move toward gender equality and respect, men's work and home lives have been health and safety checked, sanitized and most recently, "feminized." Daily rituals and physical places where men used to socialize with other men have been knocked down or renovated to become female friendly. Men have been targets of certain behavioral memes such as "mansplaining" and "manspreading." In addition, in recent years men have been hardest hit by high levels of unemployment, homelessness, incarceration, infertility, and incidence of certain types of illness, including heart disease and prostate cancer. As a result, says Watson, many men are struggling to find a role or purpose. One possible remediation, suggests Watson, would be to have men get out of the office and away from screens to spend time engaged in some physical activity or learning a physical skill that could be put to use benefitting the local community. Engaging in competitive sports, rather than watching them, and spending more time in nature would help as well.

DEMOGRAPHIC TRENDS

In advance of the annual meeting of the Population Association of America in April, the Pew Research Center prepared a list of **10 demographic trends shaping the U.S. and the world in 2017**. In brief, they are:

1. **Millennials are now the largest living generation in the U.S.** In 2016, there were an estimated 79.8 million Millennials (ages 18 to 35 in that year) compared with 74.1 million Baby Boomers (ages 52 to 70). The Millennial population is expected to continue growing until 2036 as a result of immigration. To date, Millennials have been slow to adopt many of the traditional markers of adulthood, including leaving their parents' home, moving for better employment prospects, getting married, having children, and purchasing a home.

2. **American's lives at home are changing.** Fewer adults are married and more are cohabiting (especially among those age 50 and older, whose divorce rates have doubled), and record numbers are living in multigenerational households.
3. **Women may never make up half of the U.S. labor force.** Although women comprised a much larger share of the labor force in 2015 than in 1950 (29.6%), the Bureau of Labor Statistics projected the share of women in the workforce will peak at 47.1% in 2025 before tapering off.
4. **Immigrants are driving overall growth in the U.S. workforce.** Without immigrants, there would be an estimated 18 million fewer working-age adults in the country by 2035 because of Baby Boomer retirements and a dearth of U.S.-born children with U.S.-born parents. However, immigrants do not form a majority of workers in any industry or occupational group.
5. **The U.S. unauthorized immigrant population fell in 2015 to below recession levels**, and the share of Mexicans within this population declined. As the number of unauthorized Mexicans has decreased, the number of unauthorized immigrants from other parts of the world, primarily Asia, has increased.
6. **The share of births outside of marriage declined for immigrant women from 2008 to 2014, but held steady for U.S.-born women.** Between 1970 and 2014, the increase in the annual number of U.S. births was driven entirely by immigrant women, while births to U.S.-born women fell.
7. **Globally, babies born to Muslim mothers will outnumber babies born to Christian mothers by 2035** – largely driven by different fertility rates. Between 2010 and 2050, the global Muslim population is projected to grow 73%, while the Christian population will grow just 35%. People who do not identify with a religion ("nones") account for 16% of the world's population, but only 10% of the babies born between 2010 and 2015, meaning that their projected share of the world's population will decline.
8. **The shares of adults living in middle-income households fell in several countries in Western Europe and the U.S. between 1991and 2010, although they increased in others.** Each of the Western European countries studied had a larger share of adults in middle-income households than the U.S. (59%).
9. **European countries received a near-record 1.2 million first-time asylum applications in 2016.** Syria, Afghanistan and Iraq were the most common countries of origin for first-time asylum applications in 2015 and 2016, together accounting for over half of the total.
10. **The U.S. admitted 84,995 refugees in fiscal year 2016, the most since 1999.** More than half resettled in one of just 10 states, with the largest numbers going to California and Texas. And almost half (46%) of the fiscal 2016 refugees were Muslim.

US fertility rate hits a record low. The Centers for Disease Control announced in June that after years of consistent decline, the US fertility rate hit a record low. *Business Insider* reports some experts worry this could signal a "demographic time bomb," creating a vicious cycle of low fertility and economic downturn, such as Japan is now experiencing, that could hit the country in 20 years if unchecked.

US white population approaches zero growth, while minority populations increase. Following the release in June of the U.S. Census Bureau's most recent population estimates by race, age, and sex, for 2016, real estate website Trulia identified several noteworthy trends:

- Nationally, the population of non-Hispanic whites only made up 0.2% of all population growth between 2015 and 2016, the smallest portion in the Census' population estimates history. By contrast, Hispanics made up 50.7% of the growth, Asians 23.4%, blacks 15.8%, and those identifying as two or more races 8.6%.
- Not a single metro area saw an increase in the proportion of people under the age 20 between 2015 and 2016, only five saw an increase or had an unchanged proportion of 25 to 64 year olds. All saw an increase in the share of their population 65 years of age or more, and nationally, that share went from 14.9% to 15.2%.
- Between 2015 and 2016 Asians were the fastest growing racial group in the U.S., increasing by 3%. Among the largest 100 metro areas, not a single one saw a decline in their Asian populations.

Average life expectancy is set to increase in many industrialized countries by 2030. A study, led by scientists from Imperial College London in collaboration with the World Health Organization, analyzed long-term data on mortality and longevity trends to predict how life expectancy will change in 35 industrialized countries by 2030. The study included both high-end economies and developing countries. It found life expectancy will increase in all the countries studied, with South Korea likely to have the longest life expectancy by 2030 (a baby girl at birth could expect to live to age 90.8 and a baby boy to age 84.1). The results also revealed that the USA is likely to have the lowest life expectancy at birth in 2030 among high-income countries, and would be more like the rate in Mexico or Croatia. The research team says this may be due to a number of factors, including a lack of universal healthcare, as well as the highest child and maternal mortality rate, homicide rate and obesity among high-income countries.

REGIONAL TRENDS

THE BIG PICTURE

- Future of regional trade at risk
- Income disparity affecting all three regional countries
- Changing patterns of immigration and aging populations

ECONOMIC TRENDS

NAFTA or nada? At the time of writing, the second round of negotiations to revise the National Free Trade Agreement (NAFTA) have just concluded, with the third round to take place shortly. What eventually emerges from those renegotiations may have considerable impact on the economies of all three countries, including ability to export/import goods, jobs, and prices. Currently, about 80% of Mexico's exports go to the U.S., and Canada's exports to the U.S., the country's largest trading partner, hit a record high earlier this year. An article in the *New York Times* at the start of the negotiations examined how trade relationships among the three countries, as well as China, have changed since 1994 when NAFTA went into effect, showing how the interdependencies have benefitted some sectors and hurt others. During the first round, the U.S. representative indicated that the current administration had little interest in maintaining the agreement, claiming it disadvantages the United States unfairly. Mexico and Canada have argued that the agreement has benefitted all parties overall and is not the cause of the U.S. trade deficit, which the current administration vows it will remedy. More recently, however, there has been talk of reaching some sort of agreement by the end of the year, ahead of mid-year elections in the U.S. and the national presidential election in Mexico in 2018. Nonetheless, both Mexico and Canada are already reaching out to renew or establish new trade agreements with other countries to find other markets for their exports should the U.S. decide to pull out of NAFTA completely. All three countries' economies are doing relatively well at present, with steady but modest growth projected for the near term. A disruption in trade would severely impact growth. Auto manufacturing, clothing manufacturing and retail, agricultural products and lumber are among the industries in all three countries that would be hardest hit if NAFTA were to be dissolved.

Trade and tariffs. One way the current U.S. administration is attempting to "rebalance" trade is by imposing tariffs on imported goods it claims are underpriced because they are subsidized by the exporters' government. One of those governments is Canada. Earlier this year, the U.S. Department of Commerce announced it would impose a 20% import tariff, on average, on softwood lumber coming from Canada, after both sides failed to reach agreement either to extend or renegotiate the temporary agreement that expired last November, despite heavy lobbying against the move by home builder associations and protest by Canadian officials. In June, the Commerce Department said it was imposing additional duties to penalize Canada for what it called "dumping" softwood lumber and thus driving down the price of U.S. lumber. As reported by *Construction Dive*, so far the new duties have driven up the cost of softwood lumber to its highest price since the recession while reducing the supply, creating problems for builders. This is putting a further strain on new home construction, which is already lagging behind in production and at risk of hitting a price point too high for most prospective buyers. The

administration is considering a similar approach to auto parts manufactured in Mexico and imported into the U.S., which likely would have a similar impact on the auto industry.

Income volatility. As mentioned in the section on **Social Trends**, above, one of the factors contributing to income inequality is a lack of quality, full-time, stable jobs. Writing in *Huffington Post Canada*, Elizabeth Mulholland, chief executive officer of the national charity Prosper Canada and a member of Canada's National Steering Committee on Financial Literacy, commenting on a recent national survey concerning the country's growing "struggling" middle class, states, "Community organizations have been aware for some time of profound changes in the financial lives of Canadians – more people cobbling together an income from multiple part-time and temporary jobs, more families working hard but having to borrow for food and rent, and more predatory fringe financial services proliferating in neighbourhoods." The survey found almost 40% of adult Canadians (over 10 million people) experienced moderate to high levels of income volatility over the past year. Approximately 3.3 million of these Canadians actually saw their monthly income fluctuate by 25% or more. Income volatility, along with income inequality and income poverty, notes Mulholland, is a key determinant of household and financial health. "The federal government should start working immediately with key stakeholders to develop national measures and longitudinal research, as well as more targeted studies, to investigate this problem," says Mulholland, "because we need to get very serious, quickly, about finding solutions."

Income poverty. Mexico has long had a huge gap in income inequality, in large part due to high levels of income poverty, corruption, and the concentration of wealth among a relatively small group of elite. Although one of the wealthier nations in Latin America, the World Bank recently ranked it 8th out of 18 Latin American countries in income inequality. According to a study by the country's National Statistical Institute, released last December, more than half of the nation's workforce (58%) works in the "informal" economy, including categories such as unregistered vendors, artisans, day laborers, and domestic workers, all of whom receive very little remuneration. For that reason, despite its size, the informal sector generated only about 23.6% of the nation's GDP in 2015, down from about 27.2% in 2003. A just-released study from Coneval, a government board established to evaluate public policy and social development initiatives, finds that more than 46% of the population lives in or near poverty, with many households subsisting on between 25 to100 pesos, or about US $1.50 to $5.50, a day. Upper income households expend 550 pesos a day or more. In part to try to raise additional tax revenues, the government has been encouraging small business development by offering loans and other assistance. While of some benefit to middle class Mexicans, it does little to help the largely rural and inner-city poor, who make up the largest portion of the country's impoverished.

SOCIAL & DEMOGRAPHIC TRENDS

Changing patterns of immigration. Contrary to public perception and last year's campaign rhetoric, immigration to the U.S. from Mexico, both legal and unauthorized, has been declining since 2013, according to the U.S. Census Bureau's American Community Survey, a result of economic and demographic changes in both countries, as well as tighter border controls. Meanwhile, the number of unauthorized immigrants from nations other than Mexico has grown between 2009 and 2015, mostly from Asia and Central America. India and China now account for the largest portion of all new immigrants—each increased six-fold between 2003 and 2013. However, because of previous inflows, Mexicans remain by far the largest group of U.S. immigrants, at 27% in 2015. Canada hit a record high

in immigration in 2016, reports Statistics Canada, which the Liberal government attributes to improvements in processing applications and a more open policy, including welcoming Syrian refugees. Canada's Minister of Immigration, John McCallum, has said it is the government's intention to "substantially increase" the number of new immigrants to Canada in order to fill labor shortages and confront the demographic challenges of an aging population." Mexico, on the other hand, is struggling to deal with the flow of migrants escaping poverty, violence and repression from Central America and the Caribbean, many of whom hope to enter the United States but are turned away and are stranded in Mexico. The U.N. estimates more than 22,000 migrants will seek asylum in Mexico this year, up from less than 800 in 2011, and probably twice that many pass through the country annually. The government has pledged to do what it can to help these immigrants, even as it faces many problems trying to provide jobs and assistance for its own citizens.

Aging nations. As is the case in many industrialized nations whose economies flourished in the aftermath of the Second World War, the aging of the post-war or baby boom population—the largest in history until recently—presents huge challenges for employers and social services. A series of articles in the *Globe and Mail* examining how the aging of the boomers could affect the country in the next 15 years lays out the following scenario: "The dramatic greying of Canada's demography . . . has serious implications for the national economy, government policy and the well-being of its citizens. Without significant adjustments, we could be headed for decades of anemic economic growth, shrinking per capita incomes and eroding wealth. Governments could face skyrocketing deficits and tough choices about what kinds of health care and social supports we can afford, as a smaller pool of taxpayers must fund the rising costs of the growing numbers of seniors. The gaps between the wealthy and poor may widen into gaping social wounds, as the adequacy of pensions and private savings are tested to their limits." A report released last year by the U.S. Census Bureau projects that the U.S. population will age at slower rate than many other developed nations, largely because of immigration. Nonetheless, an article published in *The Atlantic* last October observes, "Of the many significant forces shaping the U.S. economy—including globalization, automation, and housing supply—none is so inevitable and invisible as the sheer march of time for today's adults. The greying of America will touch every station of economic and political life: the size of the labor force, the jobs the economy will require, the ethnic makeup of the country, and the productivity of the workforce." According to an article published this past spring in the journal *The Gerontologist*, "Although Mexico's population is relatively young, with a median age of 27.9 in 2015, it will age rapidly in coming years, increasing to 42 years by 2050. The rapid median age in the nation also reflects the growing proportion of people 65 or older, and is expected to triple to 20.2% by 2050." Many of these elderly will be poor, having no pensions or social insurance, with little available financial or healthcare assistance from the government.

Rising violence and human rights violations. Violence has increased notably in both the U.S. and Mexico in the past year, for different reasons. In this year's Global Peace Index, compiled annually by the Institute of Economics and Peace, the U.S declined 11 places in the global rankings to 114th out of 163 surveyed nations, due to an increase in violence, racism, income inequality, and high crime rates. Mexico was ranked the lowest among 12 countries in Central America and at 142 out of 163 globally, partly due to threats from the Trump administration but also because of increased violence and political terrorism (including attacks on civilians by police and military personnel and on journalists by governments and narco traffickers). Mexico has also experienced a substantial increase in violence against women, including murder, and against indigenous populations. Both countries are struggling with finding a balance between protecting citizens and controlling law enforcement agencies, which more frequently

have become the perpetrators of violent acts. In contrast, Canada (ranked 8th in the world) became slightly more peaceful, largely driven by improvements in its external indicators (i.e., fewer threats from outside the country), although domestically the crime rate and risk of terrorism rose somewhat.

EMERGING TECHNOLOGIES

THE BIG PICTURE

- Robots becoming more ubiquitous
- Data gathering and mining permeating all aspects of life
- Artificial intelligence combining with robotics, virtual reality and artificial reality to create autonomous "learning" and "thinking" systems

Attack of the robots. Industry insiders say robotics technologies are advancing rapidly and that robots will soon permeate most areas of our lives, from the workplace to our homes. Robotics is being taught in schools in many countries, and a number hold national or international competitions to encourage young people's interest in the field. Engineers are combining robotics with artificial intelligence (AI), virtual reality (VR) and sensor technology to create more "intelligent" and responsive machines. *Archite*ct magazine in May reported on a San Francisco-based company, OpenAI, that is using virtual reality to teach robots actions and tasks much faster than using previous methods. The day is not far off when robots will be teaching and learning from other robots with no direct human intervention other than perhaps someone monitoring the system to be sure it's working properly. It is scenarios like that that are keeping visionaries like physicist Stephen Hawking and inventor Elon Musk up at night. Closer to home, experts are predicting integration of more robots into the workplace could displace millions of workers. Futurist Richard Watson relates, "A recent Bank of England Study has said that 15 million of the UKs 30 million jobs could be at risk from automation over the coming years. Meanwhile, a US PEW study [mentioned under **Social Trends**, above] found that two-thirds of Americans believe that in 50 years time, robots and computers will 'probably' or 'definitely' be performing most of the work currently done by humans." Watson cautions against forming too dire a picture of the future: "No robot is about to steal your job, especially if it's a skilled or professional job that's people-centric." On the other hand, the picture is less rosy for low-skilled, low-paid workers: "If your job is rigidly rule based, repetitive or depends upon the application of knowledge based upon fixed conventions, then it's ripe for digital disruption." That would include low-level data entry jobs, as well as many administrative, clerical and production jobs.

Big Data, Big Brother. Data collection of nearly every conceivable type has become commonplace in the digital, mobile-connected, "smart" communication age in which we live. Despite concerns about privacy, hacking and identity theft, we are surrendering all kinds of information about ourselves through our use of smartphone and smart watch apps, GPS devices, "smart" products for the home, credit cards, supermarket and retail store bonus cards, Internet usage, social media usage, and increasingly through sensors embedded in built environments. The *Telegraph* recently ran an article on a growing number of companies implanting rice-sized microchips in their employees' hands to gather data on their movements and biometrics, as well as to replace other forms of security protections, such as ID cards or passkeys.

What happens to all this data? Two real estate brokers wrote in the *Alaskan Dispatch* about two presentations they attended by companies touting their Big Data capabilities to the real estate industry. What they learned is sobering, indeed, and worth quoting at some length:

> One company's presentation promoted its customer relationship management service that was more than just keeping track of work activity and contact information of new and prospective clients. This CRM service integrated specific cellphone numbers with their software to automatically log client phone calls and data.
>
> The amount of data collection was surprising. With a single call or text from a client, the client's phone number is used to cross-reference an enormous number of data points and obtain such information as name, address, email, carrier, line type, secondary phone, age, gender, household income, marital status, presence of children, homeowner status, home market value, length of residence, net worth, occupation, education level — even social media profiles and followers.
>
> The second company combined publicly obtained information with more data purchased from a variety of other sources to obtain what they considered "law enforcement quality grade" information. Using different algorithms and analytical computations, they could rate the likelihood of an occupant selling or buying a home within the next six, 12, 18 and 24 months. That same information could be used to identify other possible marketing scenarios for a multitude of products.

Businesses of all kinds, healthcare systems, law enforcement, and educational and government institutions are using this type of technology not only to identify customers and elicit sales but for screening, tracking and other purposes. Big data use is becoming integral to construction, architecture and interior design projects as a way of gathering and analyzing information about the environment, intended building performance, and the needs and wants of clients and future occupants.

The potential for misuse, misunderstanding or misapplication of data is a growing concern. Speaking at the Data Science for an Open Government Conference in May, Steve Macfeely, head of statistics and information at United Nations Conference on Trade and Development, supported the idea of a worldwide “open data” policy but told attendees: “The increasing availability and use of more ‘linkable’ data will inevitably bring greater risks of data disclosure. So we are faced with a trade-off between the positive benefits of using data versus the downside risks of data disclosure and abuse. It's not an easy issue to solve.” Asked about the major challenges for open data use in the future, Macfeely responded:

> What has been described as the "Data Deluge" — the explosion of data arising from our ubiquitous use of technology presents a range of new opportunities and challenges. If these data can be accessed and harnessed, then new types of statistics might be derived. There would appear to be real potential here — to measure our environment, our culture or wellbeing in ways that were not possible in the past. But this will take time and resources — there are a lot of hidden pitfalls in the “big data” world.
>
> But there are real challenges ahead, too. Many of these new data are proprietary and so access may not be universal. In a data driven world, unequal access to data may introduce a new element of inequality. The proliferation of so called statistics from websites and social media may

undermine the purpose of information, by overloading and confusing citizens. It may also allow "alternative facts," disguised as official data, to go unchallenged.

Technological syncretism. As interactive technologies like artificial intelligence (AI), alternative reality (AR), and virtual reality (VR) develop, they are being combined with each other and with data mining and robotics to perform all sorts of tasks that previously were not possible. *The Herman Trend* alert reported on a project conducted by three researchers at Cornell University who employed big data, machine learning, computer vision, and automated analysis algorithms to analyze 100 million Instagram photos in order to track global clothing patterns and derive insights into their development and wearers. Ryan Tracey, an e-learning manager in the financial services industry who blogs on corporate learning and development topics, believes the time is not far off when AR and VR will be employed widely as tools for visioning, prototyping, self-directed learning, and training. Dave Hodgson, president of 3-D Solutions, a visual modeling company, foresees combining VR and AI, supported with visuals from drones, to create extraordinary virtual customer experiences.

Impact of technology changes on the workplace and workers. The so-called Fourth Industrial Revolution is altering how people work, where people work, and what work they do. And that, in turn, is altering the physical environment in which they work. An article on the website for commercial real estate firm JLL relates insights from experts on how technology is disrupting the status quo in the workplace. Trends they identify include a greater shift toward co-working environments, workplaces that seamlessly support connectivity and collaboration as workers move about from place to place, customizable work spaces that can be adapted to changing work needs, smart buildings built with advanced sensors and extreme mobile device connectivity that will effortlessly adjust to meet the needs and preferences of the people within them, and eventually the fully automated office incorporating robot receptionists and cognitive computing. A white paper produced by furniture manufacturer Herman Miller entitled *New Technologies, New Behaviors*, states, "Smart devices, unified communications channels, and natural forms of interface [i.e., interacting with a computer via gesture, voice or touch as opposed to a keyboard or mouse] are creating new behaviors in the workplace." Two notable recommendations in the white paper are (1) that "offices should be designed for work patterns that assume both virtual and face-to-face interaction" in any location, not just a conference room, and (2) "because of these new [interface] technologies and the behaviors they engender, it's important to think about what a workstation or team area might look like when people are interacting with devices through speech, touch, and gesture, as well as talking to each other."

Interactive products. Going beyond "smart," interactive products incorporate sensing technologies that allow the product to be activated and respond in different ways by human contact. Researchers at Carnegie Mellon have developed a sensor that plugs into an ordinary electrical outlet and works as a hub to track all ambient environmental data from other sensors in the space. The hub can then be programmed to perform household routines. For example, turning on a kitchen faucet with a sensor signals the hub to activate the nearby paper towel dispenser. And when the dispenser is running low, it signals the hub to add paper towels to the home's digital shopping list. *Architect* magazine reports fabricator UM Project and wallpaper-designer Flavor Paper are developing an interactive product that combines conductive wallpaper and electronic devices. Instead of being built into a wall, the building's electrical wiring and circuitry is embedded in the wallpaper, which then integrates low-tech/high-touch 2D and 3D elements. The wallpaper runs lines of conductive ink across each panel, and the panels are

linked by short strips of metal. The panels and the wiring end at the electronic device they are powering. The wallpaper relies on human touch to operate, which creates an interactive experience.

Wireless future. Builders are now starting to integrate wireless technology directly into the building during construction, with the aim of providing uninterrupted wireless service anywhere, anytime. New iOS and Android smartphone models will be entirely cordless, relying on inductive charging technology to recharge their batteries. The technology uses an electromagnetic field to transfer energy between two objects through electromagnetic induction, and is already being incorporated in charging stations built into countertops, tabletops, desktops and the like.

HIGHER EDUCATION

THE BIG PICTURE

- Enrollments continue to decline
- Technology altering methods of teaching and learning, campus life
- Student safety a growing concern

Enrollments continue to decline. Data released by the Public Agenda in September 2016 found that the percentage of Americans who responded "yes" to the question "Is college necessary?" declined from 55% to 42% between 2009 and 2016 after rising from 31% in 2000. Forty-six percent said that college was a questionable investment because of loan debt and limited job opportunities. The National Student Clearinghouse Research Center, which tracks 97% of students at federal aid-eligible institutions, found an overall national decline of 1.5% for the 2017 spring semester compared to a year ago. Website Inside Higher Ed states that enrollments have been declining since 2013. For-profit colleges were hit the hardest, with a 10.1% decline, following a dip of 9.3% last year, as were small non-profits and community colleges. Four-year public colleges and large privates maintained more or less the same enrollment levels as last year. Undergraduate enrollments were down by roughly 300,000 students, the center found, with graduate and professional student enrollments up by 27,000. The biggest drop in undergraduates was among older students at for-profit and community colleges.

Technology driving change. Without question technological innovation and adoption is the biggest driver of change in higher education on a variety of fronts. Today's tech-savvy and tech-dependent students approach learning and the acquisition of knowledge in different ways than previous generations. They have more tools to rely on and vastly greater access to research resources and expertise. Teachers, too, have more tools at their disposal to convey concepts and information to students, particularly visually. Administrators can draw on database and big data technology to screen applicants and track student progress.

A report produced earlier this year by the New Media Consortium to "chart the landscape of emerging technologies" in learning and education, states, "When it comes to higher education, the future trends seem to highlight the importance of embracing a more open digital culture." As summarized on the website MoodleNews, the report identified three key digital trends: 1) within two years, blended and collaborative learning will become part of the standard practice and offering in higher ed; 2) quantitative approaches, along with a better embrace of measurement and analytics, is predicted to take longer for a broad implementation; and 3) new ideas about the architecture and design of physical learning places are forecasted to reach a similar height, set to join the mainstream conversations in 2019 or later. The report also states that these changes will require institutions of higher learning to alter their organizational cultures to include more innovative, creative and entrepreneurial thinking. It foresees entrepreneurship as a critical component of an innovative campus culture that advances technology adoption over the long term.

Richard DeMillo, Distinguished Professor of Computer Science and Management and director of the Center for 21st Century Universities at Georgia Tech, in an article on the accelerating pace of change in higher education, observes: "Judging from recent books, articles, and editorials, higher education is poised for a cataclysmic collapse. There is a considerable body of opinion that systemic problems such as runaway tuition, student debt, low graduation rates and pervasive elitism are so wired into the collective culture of college faculty and administrators that only drastic and disruptive measures can break through institutional logjams. In fact, this list barely scratches the surface." He goes on to argue that technology changes will require the academy to respond more quickly to these and other issues. In a similar vein, an article on tech website SingularityHub predicts tech will rescue the current broken, outdated higher education system. It lists five major global tech trends changing the way we will educate and learn in the future: the digital classroom (both online learning, or Massive Open On-line Courses (MOOCS), and in-classroom streaming); global online collaboration; the future of work (which will be ever-changing, requiring lifelong learning); virtual and augmented reality; and big data and artificial intelligence.

Protecting student safety. Student safety is a major issue in higher education administration and building maintenance. Increased on-campus violence and sexual assault are making headlines, putting pressure on administrators to ensure students' safety and well being. The Ohio Department of Higher Education, for example, was allocated $2 million in the state's 2015 budget to develop model best practices for preventing and responding to campus sexual assault. Among the more common forms of violence identified by the Center for College Health and Safety are hate and bias crimes, hazing, rape and sexual assault, stalking and vandalism. The National Center for Education Statistics reports that in 2014 [its most recent data], there were 27,000 criminal incidents against persons and property on campus at public and private 2-year and 4-year postsecondary institutions that were reported to police and security agencies. However, many violent acts on campus, especially those involving sexual violence, go unreported. By some accounts, as many as 1in 5 or more women are sexually assaulted while in college. However, the results of an investigation conducted by two professors posted to the website of the National Education Association found that, in fact, campus areas are considerably safer places for young adults than non-campus areas, although certain campus populations do suffer high rates of violence. The authors are quick to point out they are not discounting the need to address violence on campus, only that an evidence-based analysis, not an emotional response, is needed to understand the causes and arrive at effective means of prevention and intervention.

Costs a barrier to access. Another major concern is the continuing escalation in the cost of higher education, which is saddling many students with increasing levels of debt, straining schools' financial resources, and deterring potential applicants. A report issued in spring this year by the Institute for Higher Education Policy, featured in *The Atlantic*, shows that as many as 95% of colleges are completely unaffordable—and thus unavailable—for huge swaths of Americans. The article states, "Of the more than 2,000 colleges analyzed, IHEP found that almost half were affordable only for students from families making more than $160,000." The reasons are many and complex. The Center on Budget and Policy Priorities points out, "Years of cuts in state funding for public colleges and universities have driven up tuition and harmed students' educational experiences by forcing faculty reductions, fewer course offerings, and campus closings. These choices have made college less affordable and less accessible for students who need degrees to succeed in today's economy." As a result, more students are taking out loans and more colleges are using financial aid as a way of discounting the cost of education for lower-income students. The most recent student debt statistics show 44.2 million borrowers with a total debt at $1.31 trillion, or an average $37,172 per student in 2016.

Colleges and universities are taking steps to address the problem. According to an article in the *Washington Post*, the National Association of Independent Colleges and Universities has submitted a proposal that would exempt colleges and universities from federal antitrust laws that ban consultation about prices and discounts among competitors in any industry, thus allowing them to talk with one another and discuss ways to lower tuition costs. An article on the website for the James G. Martin Center for Academic Renewal relates, "In an effort to reverse the trend of falling enrollment and attract new students, some colleges are cutting their tuition significantly. More than 50 public universities have reduced their tuition rates—particularly for out-of-state students—by more than 10 percent in recent years. Dozens of private universities have made similar cuts." After detailing some of the ways that colleges are finding other sources of revenue aside from tuition, the article concludes, "University finances today are marked by several positive, though often unheralded, changes. Competition and other factors are lowering tuition, spurring efficiency, and giving the public a more transparent picture of college costs."

Community colleges remain important pipeline for 4-year institutions. A policy paper issued by the American Association of Community Colleges as the new administration took office in January states, "Community colleges are probably better understood and valued than at any other time in their history." As the cost of tuition soars and levels of student debt continue to rise, community colleges continue to provide a viable alternative for first- and second-year students, especially for lower-income, first-time and minority students. According to the Community College Research Center, among all students who completed a degree at a four-year college in 2015–16, 49% had enrolled at a two-year college in the previous 10 years. Data show 44% of low-income students (those with family incomes of less than $25,000 per year) attend community colleges as their first college after high school. In contrast, only 15% of high-income students enroll in community colleges initially. Similarly, 38% of students whose parents did not graduate from college choose community colleges as their first institution, compared with 20% of students whose parents graduated from college. Among college students who first enrolled in fall 2010, 48.5% of black students and 50.8% of Hispanic students started at a two-year public college, compared to 35.6% of white students and 37.8% of Asian students. The Public Agenda data, cited above, finds that Americans with growing reservations about the value of college are concentrated among whites, while Latino and African-American populations place greater value on attaining higher education. A 2009 article written for *Public Purpose*, the magazine of the American Association of State Colleges described a number of collaborations and partnerships underway between community and 4-year colleges, including scholarship programs, recruitment, shared faculty, and special degree offerings in order to encourage transfer of community college graduates to 4-year institutions.

Campus of the future. What might higher education look like in 2050? The Not-for-Profit and Higher Education Practices arm of accounting firm Grant Thornton offers its scenario in its *State of Higher Education in 2017* report. It envisions a completely personalized and customized educational experience for each student, without traditional schedules or class periods. Universities will be part of a global, interconnected virtual network, exchanging knowledge resources and faculty, with online classes and in-class streaming the norm for content delivery. Most students will telecommute, eliminating the need for on-campus housing. Libraries will be completely digital, serving as communal learning and collaboration spaces, complete with AR and VR learning technologies, 3D printers, and hologram conferencing rooms. The cost of education will be offset in part by students' ability to work doing online research for non-profit and for-profit organizations. Students will receive "life credit" toward their degrees for their

major-related work, volunteer experience and internships. Gamification will be employed as a way to test students' knowledge and skills by their institutions and future employers.

WELLNESS & HEALTH / ENVIRONMENT

THE BIG PICTURE

- Access to care and costs major challenges to health care and wellness in U.S.
- Growing awareness of social and economic impacts on health and wellness
- Wellness has become a lifestyle for the affluent
- Builders and engineers looking beyond sustainability to reduce environmental impact of buildings

HEALTH

Key U.S. health challenges. According to the Mayo clinic, the top 10 health challenges in the U.S. today are:

- **Heart Disease.** For both men and women, heart disease kills the largest number of Americans per year. According to the American Heart Association, heart disease, which causes heart attacks and strokes, kills more people than all forms of cancer combined.
- **Cancer.** Lung cancer is the cancer responsible for the most deaths in both men and women. Women are also affected greatly by breast and colorectal cancers
- **Stroke.** Stroke is the number three cause of death in women, and the number four cause of death in men.
- **Respiratory Diseases.** Respiratory diseases such as bronchitis and emphysema belong to a class of diseases called COPD, or chronic obstructive pulmonary disease. About 5% of the U.S. adult population develops COPD, primarily as a result of smoking.
- **Injuries.** The Centers for Disease Control states that the leading cause of fatal injuries in both men and women ages 18 to 54 is motor vehicle accidents. Other causes of fatal accidents include poisoning and falls (a leading cause of death among the elderly).
- **Diabetes.** Type 2 diabetes can cause kidney damage, heart disease and blindness. It is also a leading cause of death in both men and women.
- **Alzheimer's Disease.** Alzheimer's disease is the fifth-leading cause of death in women, and the tenth in men.
- **Influenza and Pneumonia.** In some people, influenza may cause complications such as pneumonia, which are potentially fatal.
- **Kidney Disease.** Kidney disease is the ninth-leading cause of death for both male and female Americans. It can be caused by high blood pressure or diabetes.

- **Septicemia.** Septicemia, or blood poisoning is the tenth-leading cause of death among women. It is usually a complication of a bacterial infection such as a lung or urinary tract infection

In addition, the Centers for Disease Control in its list of emerging public health challenges includes:

- **Obesity.** More than 72 million adults and 12 million children in the U.S. are obese.
- **Food safety.** Foodborne diseases sicken 1 out of 6 Americans each year.
- **Healthcare-associated infections.** 1 out of 25 hospitalized patients contract a healthcare-associated infection.
- **Teen pregnancy.** The U.S. has one of the highest rates of teen pregnancy in the world.
- **HIV.** More than 1 million people in the U.S. live with HIV.

US health advances. The 2016 America's Health Rankings report, produced annually by the United Health Foundation, finds that the United States has made notable long-term improvements across key indicators of health, including smoking (down 41% since 1990), preventable hospitalizations (down 35% since 2006), and health insurance coverage (number of uninsured has decreased 35% in the past five years). On the other hand, the report finds rates of cardiovascular and drug deaths increased nationally from the previous year, and the prevalence of obesity remained high.

U.S. ranks low globally on many health and health care indicators. The U.S. spends more on health care per capita than any other country ($9,024 in 2105) but has a poor record on a number of key health and health care outcomes. For example, the U.S. ranks last among 30 leading developed or developing nations in life expectancy. It ranks last in health care coverage. It came in 35th in a ranking of preventing deaths that could be avoided by applying known medical interventions. It ranks 29 out of 35 in preventing infant mortality. A study of 11 leading developed countries by the Commonwealth Fund concludes, "In comparison to adults in the other 10 countries, adults in the U.S. are sicker and more economically disadvantaged. The resulting challenge to the U.S. health system is compounded by higher health care costs, greater income disparities, and relatively low levels of spending on social services." Adults in the U.S. are more likely than those in the 10 other countries to go without needed health care because of costs. The study found that Americans utilize health care services less than people in the other 10 countries but pay more for their health care, health care services, health insurance, and health care products.

More Americans now have access to mental health services, but many do not receive treatment. Mental Health America (formerly, the National Mental Health Association) reports that access to insurance and treatment for mental health issues have increased (at roughly 80%), as healthcare reform has reduced the rates of uninsured adults. However, because of a shortage of mental health workers and cultural stigma, 56% of American adults with a mental illness did not receive treatment last year. Their 2017 survey report also finds: 1 in 5 adults (about 40 million) have a mental health condition; and youth mental health is worsening (rates of youth depression increased from 8.5% in 2011 to 11.1% in 2014).

Suicide a major public health issue. Suicide in the United States has surged to the highest levels in nearly 30 years last year, according to federal data. The rise was particularly steep for women. It was also substantial among middle-aged Americans. Still, men are more likely to commit suicide, and it is the

eighth most common health problem for men. A new analysis by the Centers for Disease Control finds the suicide rate among teenage girls reached a 40-year high in 2015. From 2007 to 2015 alone, suicide rates doubled among teen girls and by more than 30 percent among teen boys.

U.S. facing opioid use epidemic. A study commissioned by the Trump administration to investigate the growing use of opioids and resulting increase in related addiction and deaths urges the president to address what it deems "a federal state of emergency" in opioid abuse, which exists in all 50 states. Among its findings, based on data from the Centers for Disease Control, the report relates that every day 142 Americans die of a drug overdose (more than car crashes and gun violence combined), and that the quantity of opioid prescriptions from medical doctors has quadrupled since 1999.

Digital health revolution. Access to healthcare remains a challenge for many Americans, and costs make care prohibitive or financially ruinous for some. *Fortune* magazine recently reported on 21 companies aiming to change the healthcare paradigm through high-tech solutions in five categories: telemedicine, algorithmic medicine (i.e., big data), next-generation drug delivery, genomic revolution, and new pharma. The article concludes, "From tech incubators to world-class research facilities, from tweaks to biological machinery to computers that can unlock its secrets, and from research conducted on our pale blue dot to the cosmos themselves, the health care revolution is within our grasp."

Growing awareness of how social and economic factors impact health and wellness. In recent years, a number of studies, under the rubric of social epidemiology, have demonstrated the impact of both income inequality and social inequality on the health and wellness of affected populations, including exposure to higher levels of pollution and toxins, poorer air and water quality, food contamination, and negative impact on a range of health indicators, as well as less access to health services. As reviewed in the journal *Nature*, a book published earlier this year, *The Death Gap: How Inequality Kills*, by David Ansell, a Chicago-based physician and social epidemiologist, "presents a powerful case for social inequality as a cause of disease and disparities in health." An article on the website of the Henry J. Kaiser Family Foundation states, "While increasing access to health care and transforming the health care delivery system are important, research demonstrates that improving population health and achieving health equity also will require broader approaches that address social, economic, and environmental factors that influence health." It cites data showing that 20% of premature deaths can be linked to social and environmental factors: "Based on a meta-analysis of nearly 50 studies, researchers found that social factors, including education, racial segregation, social supports, and poverty accounted for over a third of total deaths in the United States in a year." Similarly, the CBC News in Canada reports, "Most [Canadians] would be surprised to find that 25 of the 30 added years in life expectancy since the early 1900s are not a result of medicines, but thanks to public health measures . . . by addressing factors that create illness in the first place: social, economic and physical environments, personal health practices and access to health services." These so-called social determinants of health are large systemic problems that will require the cooperation and collaboration of many disciplines, government and private enterprise to address.

Increasing death rates for middle-class white Americans. The effects of social determinants of health have been documented to account for the unprecedented increase in death rates among middle-class white Americans in recent years. Since 1998, the death rates for middle-aged white Americans began to rise on average by 0.5 percent per year. Speaking at a panel on "Mortality and Morbidity in the 21st Century" at the University of Southern California in April, Nobel laureate and USC Presidential Professor

Sir Angus Deaton and his colleague Anne Case, an economics and international affairs professor at Princeton University, told the audience the death rate was driven by an increase in suicides and drug overdoses and alcohol-related liver disease. The death rates were highest among those who had a high school degree or less. Case and Deaton said people who have no college degree are at a "cumulative disadvantage" in society. The labor market is only one challenge they face. The middle-aged whites without degrees also have reported feeling worse health-wise than other age groups. More middle-aged whites report chronic pain, mental distress and difficulty with daily living. They seem to be doing worse than the very old and the very young.

WELLNESS

Wellness as a lifestyle. Nielsen reports, "In recent years, health and wellness has elevated in importance for countless consumers, largely due to a convergence of factors, including rising health care costs and an aging population. Consumer health risks are also evolving. As Americans are living longer, chronic diseases are also on the rise, meaning consumers are looking to new, affordable and convenient formats to address their ailments, such as in-store retail clinics." As a result, for many Americans wellness has become a way of life, affecting not only their health behaviors and fitness routines, but also diet, use of transportation, and choices of recreation. In addition, consumers now have access to an array of tools to monitor their health and wellness indicators, allowing them to monitor and improve their health on their own, without waiting for an annual physical checkup. Website Women's Marketing states, "Wellness . . . is now a status symbol among consumers, who prioritize maintaining their well-balanced physical and mental health. We are experiencing a phenomenon where health is creeping into all aspects of consumer life and experience." Marketing analysts predict the wellness market will soon exceed $1 trillion per year, including technology, healthy foods and food-preparation appliances, and expenditures on fitness, such as classes, clothing, shoes, etc.

Wellness reconfiguring the workplace. *The Architects Newspaper* featured an article in May on how the growing awareness of the importance of occupant health and wellness is impacting workplace architecture and design. It states, "The concept of wellness in many ways is an extension of the environmental movement, as it expands the ideals of building performance to the human experience. There are several programs that fall under these formulas, such as Fitwel, developed by the General Services Administration (GSA) and Center for Active Design (CfAD), and the Living Building Challenge by the International Living Future Institute." Among the factors examined in designing for wellness in several recent projects examined in the article are air quality, water quality, environmental comfort (thermal, visual, acoustic, ergonomic, and accessibility), quality nourishment offerings, and fitness (including design to encourage movement).

Wellness requirements in home design. *Kitchen and Bath Design News* reports increased demand for health and wellness products in the home, such as composting containers integrated into a waste basket cabinet or sink base and cabinets that easily accommodate small appliances like juicers and blenders. The article cites a study conducted by the Joint Center for Housing Studies at Harvard University and the Farnsworth Group that revealed the top health-related concerns homeowners have. These include mold, residual smoking odors, dampness and toxic materials. According to the same report, the three most popular healthy home projects and products installed by remodeling contractors were nontoxic paints/finishes/adhesives (by far the largest at 67%); non-toxic building materials, including cabinets

and flooring (26%), and water filtration systems (21%). Lighting enhancements and whole-house air filtration systems also showed up on the list. "We're seeing an equal level of interest in health and wellness products from both boomers and millennials," states Kate Bailey, director of showrooms for Ferguson Enterprises, in the article.

ENVIRONMENT

Beyond sustainability. A recent symposium held at the University of Minnesota entitled "Sustainability Is Dead: Architecture as (Re)Generator" brought together architects, academics and experts to discuss how architects, builders and designers can move past the idea of "sustainability" to a more positive and effective approach to building to help protect the planet's ecological future. Panelists advocated the pursuit of regenerative design as a more effective means of doing more ecologically. There is a growing movement to make all new building net-zero energy consumers. Panelists also spoke of the need for next-generation green building rating systems that would draw on real-time data provided by suppliers of energy, water, waste management, etc., rather than current LEED documentation procedures.

Builders responding to states' net-zero goals. With energy codes becoming more stringent in many states, a growing group of regional and national production builders are building highly efficient, zero-energy-ready homes, reports *Builder* magazine. California has a stated goal of adding a net-zero homes requirement to its building codes by 2020, and Massachusetts and Florida have been adding on to their requirements as well. "We're pretty confident that by 2020, you're going to see a significant number of states moving in that direction," says Sam Rashkin, creator of the EPA's Energy Star for Homes benchmark, and current chief architect in the building technologies office at DOE, where he heads the Zero Energy Ready Home program. "By 2025, the national code pretty much looks like what we're doing now with zero energy ready (ZER) or better." Website Eco-Business reports Australia has set a target for all new buildings to be emissions-neutral by 2030 and all existing buildings by 2050.

Business to play a bigger role in combating causes and effects of climate change. Aron Cramer, president and CEO of Business for Social Responsibility, writes in Green Biz that global agreements to address climate change and environmental degradation will require businesses to do more: "Meeting the climate challenge means reductions in emissions, yes. But it also means fully embracing resilience strategies; understanding the intersection of climate and women's empowerment; and unleashing new products, business models and technologies that not only shift the world toward a low-carbon economy but also create new jobs, new businesses and lasting solutions to poverty reduction." In addition, he says, "It's time for companies to take a fresh look at how they report, engage with stakeholders and manage supply chains."

USER BEHAVIOR / INTERACTION WITH INTERIOR ENVIRONMENTS

THE BIG PICTURE

- Focus on occupants and human experience over building performance
- Using big data to predict how occupants will respond to design choices
- Evidence-based tools for evaluating impact of interior environment on occupants

Using neuroscience to enhance the human experience in the built environment. Established in 2003, and funded in part by the American Institute of Architects, the Academy for Neuroscience for Architecture (ANFA) seeks to promote and advance knowledge that links neuroscience research to a growing understanding of human responses to the built environment. The Academy sponsors conferences and events, conducts and funds research, and has developed a Neuroscience Certificate Program in conjunction with the New School in San Diego. It currently has two research projects underway, a pre- and post-occupancy study of an office setting and a study on wayfinding. In an article for the International Society of Biourbanism entitled "Applying Neuroscience to Architecture," the Academy's founding president John Eberhard cites two cases studies of how neuroscience has helped to improve design, one involving neuroscience on infant development and the design standards for neonatal intensive care units, and one on how our understanding of certain brain functions helps to explain the sense of awe one experiences in certain religious spaces. Eberhard also describes ANFAs early efforts to identify areas for investigation:

> During [the first] two years, a number of workshops were held to identify hypotheses derived from the functional requirements of healthcare facilities, elementary schools, correctional facilities, sacred places, facilities for the aging, and neuroscience laboratories. The workshops included architects with experience in designing the kind of facility under discussion, neuroscientists, behavioral scientists, and ANFA Board members. Some 70 to 80 hypotheses resulting from these workshops now await research efforts by doctoral and postdoctoral students.
> The five areas studied in brain systems are:
> • Sensation and Perception (how do we see, hear, smell, taste, etc.?)
> • Learning and Memory (how do we store and recall our sensory experiences?)
> • Decision making (how do we evaluate the potential consequences of our actions?)
> • Emotion and affect (how do we become fearful or excited? Or what makes us feel happy or sad?)
> • Movement (how do we interact with our environment and navigate through it?)

Much of that research is still in its early stages. A report in *Architect* magazine on ANFA's biennial conference last October states that papers at the conference came from research teams that included both architects and neuroscientists, working in both academic and professional settings. And many of the conclusions of this research challenge some of the widely held assumptions of the architectural community. Topics included creating environmentally rich environments for older persons with cognitive impairments, wayfinding, designing residential environments to support victims of stroke recovering at home, and creating environments to reduce adolescent risk behaviors.

Environmental psychology and affective design. There is a longstanding relationship between environmental psychology and interior design. For the most part, however, the relationship has been rather lopsided, with designers drawing on environmental psychology research to inform their designs but not contributing much in the way of research. Most of the research designers cite in their articles, blogs and presentations relates to how certain aspects of the interior environment affect occupants' mood and sense of well-being, such as color, lighting and daylighting, nature and nature views, and visual arrangement. Wayfinding is another frequently cited topic in commercial design. More recently, there has been growing interest in the healthcare field in the application of this research to create healing environments and in office design to improve health and wellness conditions for workers. But there has been little advancement in the field from designers themselves, and more research is needed to document what are now mostly assumptions or observations about how certain design and human factors decisions affect occupants in a space.

Multisensory, or empathy-based, design. Taking the notion of affective, user-centered design a step further, multisensory design, also referred to as empathy-based design, begins with the premise that humans experience space in many ways, such as sounds, smells, temperature, humidity, textures, and flavors, as well as visual stimuli. It also acknowledges that different people respond to these stimuli in different ways. At a conference last year, Melissa Marsh, founder and CEO of workplace and real estate strategy firm PLASTARC discussed how multisensory design can improve the workplace environment. "Employees face a lot of cognitive demands in the workplace. Paying attention to the multisensory aspects of design can make it a less stressful place and increase productivity, as well as physical and mental well-being," says Marsh. "For example, sound masking in open offices can improve productivity and reduce stress, while signature scents can help create a unified brand experience in the workplace."

Designing for human experience. "We believe human experience is the future of design," announces Gensler in its 2017 design forecast. "People are the one constant in this era of dramatic technological change, demographic shifts, global volatility and climate change. This historic confluence of change means that, as designers, we must re-think and re-invent how people experience every aspect of their lives and the places and spaces that they live in. More than ever before, there is an opportunity to create a better world through people-centered design." The report explains, "The best experiences anticipate people's needs, tap into their emotions and engage the senses. People are looking for these kinds of experiences to connect them to their communities, with interactive spaces creating something called the third place."

One of the trends related to this focus on human experience is the blending of addressing people's physical needs and their social needs. An article on the website Sourceable refers to a Jones Lang LaSalle survey of 200 workers that found they placed a high value on face-to-face interaction. To respond to this demand, JLL foresees by 2030 at least 50% of total space will be allocated to co-working while many fitouts would be constructed in a modular fashion so as to enable adaptability. Interactive walls would replace individual screens so as to enable greater immersion while working labs would act as incubators for innovation, and 4D telepresence would enable immersive experiences for those who were not physically present. Also mentioned in the study was workers' desire for on-site childcare and spaces where children could come to the office after school to do their homework. Similarly in retail, companies are integrating digital with in-person human interaction to create fully

immersive experiences for shoppers. Using a multisensory approach, designers are looking to appeal to all the senses to engage occupants' bodies and minds in whatever activity they are performing.

Tools for evaluating occupant-centered environments. The growing use of evidence-based design methods has led to the development of assessment tools that can be used to evaluate how well specific environments support the needs of users. A study published in the June 2017 issue of the *Journal of Environmental Psychology* describes the creation and testing of a survey tool, the Psychiatric Staff Environmental Design, designed to gather input from staff in mental and behavioral health environments in order to evaluate the importance and effectiveness of specific environmental qualities and features. The Center for Health Design has developed a number of such tools, as well.

Using big data to predict the impact of the built environment on occupants. As noted in the section on **Emerging Technologies**, above, the use of big data and algorithmic analysis is permeating many areas of the built environment industry. A&D firm Woods Bagot offers a service it calls SuperSpace, which, it says, "combines computational analysis and design that both predicts human behavior and maps social and physical trends within organizations and cities. . . . We develop proprietary data models and platforms to understand and predict user behavior through computational design and analysis, allowing data-backed decisions to inform our design." Firms are also partnering with tech specialists to create apps to gather input from clients, occupants and sometimes stakeholders as well in order to determine their needs and preferences pre-design.

Impact of technology on occupants. Numerous studies and surveys have been conducted on how technological advances are changing performance and the way people are using spaces. Likewise, there is considerable research on ergonomics and human interaction with technological devices. However, there is little or no research on how occupants are affected by technologically intense environments. This seems like an area ripe for exploration, especially since the trend is toward embedding even more technology in all sorts of interior environments in the future.

BUILT ENVIRONMENT & RELATED DISCIPLINES

THE BIG PICTURE

- Responsible building is the new value-add
- Tech skills will be part of future designers' toolkit
- Technology integrating with all aspects of the built environment

Construction activity sluggish. U.S. construction spending unexpectedly fell in July, hitting a nine-month low brought about in part by a steep decline in investment in private structures, according to the most recent U.S. Department of Commerce data. Investment on public sector projects also fell. It was the lowest level since October 2016 and followed a downwardly revised 1.4% tumble in June. The Dodge Momentum Index for August also slipped, for the second month in a row, largely do to a slowdown in commercial activity. New home construction starts have declined five out of the first seven months of the year, most recently in July, and requests for new permits also fell in July. Hoped for relief from the new administration in Washington in the way of decreased regulation, tax reform, and spending on infrastructure has yet to materialize. Meanwhile, increased costs in materials and labor, a shortage of skilled labor, and rising interest rates are driving up the cost of building.

Responsible building is the new value-add. As reported in last year's *Future Scan*, the big sea change in construction, architecture and design in the past decade or so has been toward an occupant-centered focus. It is not surprising, therefore, that more and more firms are positioning themselves as providing value in creating buildings and interiors that improve the quality of the experience for occupants. For example, A&D firm Perkins Eastman lists 10 Core Beliefs on the Design Approach page of its website, the first of which is "The built environment impacts the quality of life and the ability of our clients to achieve their mission." In its mission statement, HOK declares, "We use design to enrich people's lives and help organizations succeed. . . . HOK's mission is to deliver exceptional design ideas and solutions for our clients through the creative blending of human need, environmental stewardship, value creation, science and art."

In addition to caring for occupants, builders, architects and urban planners are focusing more on the impact of the built environment on the quality of communities. Earlier this year, the American Institute of Architects (AIA) launched a PR campaign called "Blueprint for the Better" to "shine a light on the powerful impact architects and their work has on their communities and society." An article posted in April on the AIA website entitled "Before you design, listen: it could save lives," begins by quoting Victor Rubin, vice president for research at PolicyLink, "Something like 80 percent of the reasons people are healthy or unhealthy are not the direct result of medical care. They are the results of the lives we live and the communities in which we live."

Similar areas of focus are construction and engineering to make buildings safer, more resilient and more environmentally responsible, as well as construction and design to improve health and wellness.

The big take away from all this is the trend to send a message to potential clients that these disciplines and firms will deliver not only a well-constructed, high performing building but also one that is both humanly and socially responsible.

We do design, too. Residential interior designers have been accustomed for years to furniture dealers and other retailers offering customers in-house design services. Providers of commercial products to the A&D industry are in some cases now also offering design or design management-related services directly to the client as a way of increasing their value proposition. Furniture manufacturer Steelcase, for example, offers clients "a portfolio of workplace services" (unspecified) to help them "create and maintain a sustainable, interconnected workplace." Herman Miller has a library of AutoCAD, Revit and SketchUp files called "Living Office Design Solutions" which clients can download to create "naturally human workspaces." California supplier Golden State Office Furniture offers client design services and CAD drawings, stating, "All we may need from you are doorway and room measurements and to know if the application is residential or commercial" to design a "perfect" office space. In part, this trend is a result of reduced budgets following the last recession and the proliferation of start-up companies needing cheap office space, as well as overworked designers offloading some tasks like layout to their vendors' design teams. It does not as yet seem to have made a major impact on commercial design business activity, but does eat away at business for smaller firms doing smaller projects and design fees.

Tech skills a must for new architects and designers. For some time now, it was a given that new architects and designers would have computer design and drawing skills, as well as office software skills, if they wanted to compete for the best jobs. Now, however, employers are looking for candidates with a much broader array of tech skills, according to recruitment firm Hays. Its April-June quarterly report states, "Architects now need to not only use a broad range of digital devices and tools to practice their job, but to enhance their ability to design creatively. They also need to be aware of emerging new technologies and learn how to use them to their advantage; GPS positioning, 3D printing and VR are current tools of focus." Also in demand, according to Hays, are candidates with good problem solving and creative thinking skills.

Big data-enhanced digital design. In recent years, product designers have been combining computer drawing and design programs with 3D printing capabilities to create new designs and products. Taking that model a step further, Los Angeles–based Synthesis Design + Architecture recently partnered with IBM Watson Analytics to employ big data practices in the design of an installation for the IBM Watson Experience Center in San Francisco. As reported by C*ontract* magazine, Synthesis employed data analytics, parametric modeling, and digital fabrication to create Data Moiré, an expansive CNC-milled aluminum wall installation. Watson's own statistical analysis dictated the data-driven patterns that adorn the surfaces of the wall.

Built-environment technology comes of age. Integrating technology of all sorts into the built environment has become so routine that it has given rise to a new international organization, the Built Environment Technology Association (BETA). Recent advances listed by BETA include smart buildings, building automation systems, artificial intelligence and augmented reality, design, material and construction technologies, blockchain, cyber security, the Internet of Things (IoT), the cloud, mobility and analytics, integrated workplace management solutions (IWMS), building information modeling, 3D/4D/5D printing, drones, and more. "Keeping informed of the variety of technological fields can be

challenging," says BETA's informational materials. "Relevant technological frontiers are constantly evolving, merging, splitting and changing." The association seeks to "foster collaborative relationships with companies, vendors and trade organizations, develop a real-time communication portal, commission research and produce educational and training products for these transformational technologies."

Expanding the design team. With tech specialists becoming such an integral part of many building and design projects, it has been suggested that firms add specialists to their own staff, rather than partnering with a tech firm or outsourcing to freelance specialists. Similarly, an article on the website C*onstruction Dive* makes the case for including medical staff at construction companies. The article states, "some [are] setting up temporary clinics at their job sites or hiring healthcare providers to address the range of injuries common among workers in the industry." In addition, having medical personnel on site allows them to experience first-hand what are the most common injuries and recommend to project managers information and on-site training to help prevent injuries in the future.

INTERIOR DESIGN

THE BIG PICTURE

- Increasing competition from non-ID services
- AI and big data a potential threat to future need for some design services
- Technology advances driving product innovation

Employment up for interior designers. The U.S. Bureau of Labor Statistics (BLS) reports the number of employed interior designers in 2016 was 53,160, an increase of 2,110 positions, or 4 percent, from 2015, which saw the highest increase since the start of the last recession. (BLS data does not include self-employed designers, who make up between one-fourth and one-third of all practicing designers. The American Society of Interior Designers (ASID) *2016-2017 Outlook and State of the Industry* report estimates there were approximately17,000 self-employed interior designers in 2016.)

What designers earn. The BLS reports the mean annual salary for an employed interior designer in 2016 was $56,220, up about 1.3% from the previous year. Those working in architectural firms earned more than those working in interior design specialty firms ($62,590 vs. $56,710, respectively). Employment website Salary.com lists the following average annual base salaries for interior designers at different career levels: as of September 2017:

Interior Designer I	$43,797
Interior Designer II	$51,248
Interior Designer III	$57,315
Interior Designer IV	$65,638
Interior Designer V	$78,156

The most common employers for interior designers in 2016 were interior design specialty firms (15%), architectural firms (1%), furniture stores (2%), residential construction firms (0.3%), and home wholesale suppliers (2%).

Because many firms are multidisciplinary, there are no data on what designers earn by specialty area. States with the highest salaries in 2016 were New York, California, Texas, Illinois and Florida.

Interior design firms. According to the ASID *2016-2017 Outlook and State of the Industry* report, there were 12,642 interior design specialty firms in the U.S. in 2016. Revenues for design firms vary widely, with some sole practitioners earning less than $50,000 a year and large A&D firms earning tens of millions or more. Data from *Interior Design* magazine's Top 100 Giants for 2017 show the biggest segments for larger firms remain office projects (39 percent of revenue), hospitality (14 percent), health care (13 percent), and government and retail (7 percent each). Again, data on revenues by specialty

area are not available. Total interior design industry revenues topped $9 billion in 2016 and are projected to reach $12 billion by 2020.

Designer demographics. In general, demographic information on the interior design profession is very poor. The federal government collects only limited data, as do the professional associations. For instance, a 2016 Industry Roundtable Report produced by the International Interior Design Association (IIDA) entitled *Design & Diversity* relies on data from mainly outside the interior design profession. According to the website datausa, the median age for an interior designer in 2015 was 40.7. Nearly 9 in 10 interior designers are female. Whites make up the vast majority of interior designers, followed by Hispanics and Latinos. To give some relative numbers for the sake of perspective, BLS data shows that in ALL design fields (interior design, graphic design, fashion design, etc.) in 2016, 5,100 were African-American, 8,400 were Asian, and 10,600 were Hispanic or Latino. A study on diversity in architecture conducted by the AIA in 2015 found that, in 2014, less than 22% of AIA members were women and less than 2% were African-American. A survey conducted by the AIGA last year of graphic designers found 73% were white, 7% were Hispanic, 8% were Asian, and 3% were African-American. The 2016 IIDA Industry Roundtable report mentioned above states that minority percentages—calculating the amount of Asian, Hispanic, and black students—of the 10,000 individuals enrolled in NASAD-accredited interior design and interior architecture programs have all doubled over the last 15 years, but does not provide specific data.

Design innovation primarily in product. While there is no question that technology has had a profound effect on the design process and the design firm business model, the fact remains that design practice has changed minimally in the past decade compared to the technological advances in design products and the use of technology in the built environment. The biggest contributor to growing the design knowledge base has been evidence-based design. However, as mentioned in the section on **User Behavior** above, designers themselves have contributed very little to evidence-based design; instead, they have been largely dependent on research in related fields, such as environmental psychology, ergonomics, gerontology, health and medicine, etc. As an industry and a profession, on the whole interior design, while highly creative, tends to react to innovation rather than innovate. Indeed, an article on the website for *Inc*. magazine asserts, "Traditional interior design companies have operated successfully for a while but have declined to deliver meaningful innovation or undergo digital transformation. Aware of a space that lacks innovation, several platform businesses have emerged with solutions for disrupting this staid industry." Most of the innovation in the industry in the moment is coming from manufacturers and artisans responding to designers' requests for products and materials to meet the changing needs of their clients. This is true in a wide range of fields, not just technology but also textiles, surfaces, lighting, office furniture, healthcare FF&E, etc. But, as mentioned in the *Inc*. article, developers of digital tools (i.e., apps), virtual reality applications, smart products, and e-commerce (think Amazon partnering with IKEA) are nibbling away at residential interior designers' market.

Devaluation of design. Interior design projects are composed of many components: ideation and design, programming and research, purchasing, project management, installation, etc. In recent years, demand has been declining for design services provided by professional interior designers. A review of recent industry surveys shows that within the past several years, demand for remodeling and renovation work has risen to its highest level since before the housing bubble burst in 2008. Yet, demand for interior design services has been dropping (although it did improve somewhat in the second quarter of this year), while contractors, design/build firms, and K+B specialists have experienced a notable uptick in demand.

Technology, such as design apps or online programs, has decreased the need for design services. Retailers offer more design services and more pre-fab design bundles of products. Online design services have undercut fees for designers offering a more complete menu of design services. On the commercial side, architecture firms, design/build firms, outsourced designers and planners, and some vendors now compete with independent designers, offering concepts, plans, designs, layouts, renderings, etc., as well as consulting services. In addition, as more consolidation occurs in the industry, the likelihood that interior design firms will end up merging with other providers, such as A&D and design build firms, to offer clients one-stop shopping is increasing.

Artificial intelligence to reshape the future of interior design. More than other types of technology, artificial intelligence (AI) looms as the biggest threat to interior design services as currently practiced. Providers of computer- and cloud-based interior design software and apps are already incorporating AI to create the next generation of do-it-yourself design products. The makers of Planner 5D, for example, claim that, once programmed with basic design principles, their software has already demonstrated the ability to "learn" how to apply them to properly arrange furniture in a space, such as not placing a television set in front of a window to avoid glare or how to balance larger and smaller pieces of furniture in a room. In an article in *Furniture Today*, co-founder Alexey Sheremetyev is quoted, "Our vision is to empower everyone to become interior designers with an app that combines artificial intelligence with virtual reality. When we connect interior design techniques with AI, we hope to surpass an average interior designer who works using 'cookie cutter' design methods. Later on, we might even win some interior design contests." A more sanguine examination posted to the blog for *Kitchen + Bath Business* observes, "If a designer is working on creative projects, AI can hardly help. But if a designer is creating various similar-looking projects by using one template that only needs to be adjusted and modified, then this is a job for AI." The opportunity for AI and ID to co-exist is great, but designers need to get out in front of this development to reassert the value of their contributions to the design process and mark their territory or risk being left behind.