Future Scan 2016

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FOREWORD

Many exciting developments are happening in interior design that may significantly change the way practitioners design and what they design in the not-too-distant future. At the same time, the industry, the profession, and the world at large face a number of challenges that could hamper the demand for professional interior design services. The following report highlights these trends—the good, the bad and the ugly—as they are occurring in various spheres of activity.

As these spheres interact with and influence each other, some overlap among categories was unavoidable. By the same token, there are several **meta-trends** that cut across a number of categories and that are having or will have a profound affect on the built environment. They are, in no particular order of degree or importance,

- **Focus on occupants**. Within all types of physical environments, builders, architects, designers, owners and others are paying more attention to the impact of the built environment on occupants—their health, safety, wellness, performance, productivity, creativity, satisfaction, mood, etc.

- **Focus on health and wellness.** Not only within the built environment but generally and globally there is considerable energy and investment going toward shifting the paradigm in health care from cure and treatment to wellness and prevention.

- **Mobile devices and smart technology.** Globally, we are increasingly becoming digital dependent. These technologies are transforming every area of human endeavor and, at the same time, creating a whole new set of problems and challenges that will need to be resolved or managed.

- **Techno-beings**. Advancements in robotics, artificial intelligence, haptic technologies, augmented reality and virtual reality technologies are bringing us closer to realizing the creation of androids, whether physical or virtual, that will be able to "think" or make decisions independently and react "emotionally" to our moods and body language. While these techno-beings will have many practical uses, they also will introduce new issues regarding rights, ethics, accountability, and what it means to be human.

- **Imbalance.** The world is becoming more and more imbalanced—in population density, availability of resources, economic well-being and wealth, climate change and susceptibility to natural disasters, political and personal freedom, power and influence, and mobility.

While there are no guarantees with forecasts, one thing seems certain. Tomorrow's designers will need to be well versed in human behavior and the latest technological innovations in order to keep pace in a rapidly changing world.

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GLOBAL INFLUENCES

THE BIG PICTURE

- Concern about effects of climate change and long-term sustainability of the planet
- Impact of mass migrations resulting from prolonged warfare, civil and criminal violence, and natural disasters
- Increased urbanization and population density
- Competition for resources (energy, water, arable land) and technological innovation
- Threat to democracy and personal freedom; breakdown of traditional institutions
- Expanded connectivity creating new opportunities and threats for global communication, finance, business and cultural exchange

According to trend watchers Global Trends, the following are current and developing trends affecting commerce, government and society globally:

- **Energy in transition**. Oil is in decline and new technologies are on the rise. Against a backdrop of shifting energy sources the notion of peak oil is disappearing, being replaced by talk of stranded assets – no longer are oil reserves more valuable in the ground in anticipation of future price rises. The race is on to capitalize on existing reserves as soon as possible. Major energy incumbents will need to rethink long-term strategies and short-term investments, as consumers become more informed about climate change and empowered by technology to play a more active role in energy production – and as new technologies promise to further shake up the energy mix. But given the corporate clout they wield, expect

some spirited defense of the status quo. This will create a shift in global power and economics, creating hardships for some countries and opportunities for others.

- **Concern for more environmental and socially responsible behavior.** The effects of climate change and civil discord have made people all over the world more aware of the need to protect the environment and work toward collective solutions requiring both personal and institutional commitment to work toward the common good. The world's weather is getting more unpredictable. Temperatures are reaching record highs, as are sea levels. Water is increasingly becoming a scarce resource, while the fight to own and control many resources rumbles on. Global waste has increased ten-fold in the last century. Yet, despite tough climate negotiations every year, and promises and plans on resources and the environment, often these don't add up or get acted upon. Consumers are becoming more conscious of the challenges, choosing more natural and environmentally friendly products, but concerted and real government action is needed.

- **New world of finance.** The Internet and social media have made it possible for people and businesses to engage in payments, investment, and lending and credit without conducting transactions through the traditional banking system. Like the rest of the world, the financial industry is going digital. We are increasingly being exposed to, if not dragged into, a world of electronic transactions, passwords and digital currencies (e.g., Bitcoin) – a world where paper money no longer rules and the traditional financial system is no longer the sole provider. This raises questions of both accountability and security. In the world of digital finance, what is an asset or currency, who values it, and how is that value secured? Moreover, online criminal activity has become one of the 21st century's growth industries, from identity theft to fraud to money laundering to hacking and cyber attacks.

- **Expanded connectivity.** The world is becoming hyper-connected. Technological advances, lower costs, more networks, the cloud and off-the grid options have made it possible to reach every corner of the Earth via wireless and mobile web connections. Today 3.2 billion people have internet connections and more than 7 billion have mobile-cellular subscriptions. Still, over half the world's population has no internet access, something that is about to change. As internet penetration broadens, along with new types of devices and solutions, connectivity is reaching deep into society and work, changing our daily lives. More devices than ever are tracking, monitoring and recording us. The internet of things and big data might benefit the world but are increasingly preying on our privacy and opening up our data to attack and misuse.

- **The next industrial revolution.** The fourth industrial revolution is knocking on manufacturers' doors in the form of breakthroughs in sensors, robotics, connectivity, smart materials and production methods making once valued workers' skills obsolete and creating the need for new ones. Add in a growing

consumer culture of instant gratification, customization and personalization along with lower entry barriers, easier access to commercialization, cheaper and better technology and materials and the lines between consumers and producers are blurring. At its most extreme, consumers will be producing their own customized goods using 3D printing at home, making the manufacturing industry obsolete – or at least in need of radical change to adapt to a new reality.

- **Managing extreme mobility**. The mass migrations of recent years due to war and political unrest are just the tip of the iceberg. Some 65.3 million people were displaced at the end of 2015, an increase of more than 5 million over the previous year. The tally comprises 21.3 million refugees, 3.2 million asylum seekers, and 40.8 million people internally displaced within their own countries. Increasingly mobile populations – motivated by both desire and necessity – will redefine societies, cultures, economies, governance, work and environments in coming decades. Despite the planet's rapidly growing population, many countries will see a decline in the working-age population entailing the need to import workers and/or resort to automation. Climate changes have generated the world's first climate asylum seekers, potentially the first of many millions – refugees for whom we have no guiding principles or support systems. In addition, a growing number of people are being forced from their homes by poverty, wars, famine, violence, and natural disasters.

- **Population density.** More and more of the world's population now live in cities – not just big cities but "mega" cities, with highly dense populations. The same trend is happening on a larger scale as well, with populations coalescing around certain desirable regions and trade corridors. Urbanization is driving significant economic, social and environmental changes, in particular, in Asia and Africa. Cities now house over half the world's population, a number that will grow to about 5 billion by 2030. Research suggests that cities could inject up to US$30 trillion into the global economy by 2025. Urbanization is a key engine for knowledge creation, wealth and increased living standards. Yet, in many developing nations that is not necessarily the case today. Hand in hand with rapid urbanization comes failure of infrastructure, social instability, water crises, the spread of infectious diseases, poverty, and high unemployment rates leading to criminal and inter-community violence.

The World Economic Forum has identified 10 trends that are shaping civil roles and relationships:

- **Global institutions are no longer fit for purpose.** Members of civil society and business have noted the decline of traditional institutions that have been in place since the end of World War II, and their guiding rules of engagement. Business, government and civil society leaders now want more socially inclusive models of governance and economic policy.

- **The world is becoming hyperconnected.** The power of the individual as a virtual citizen is on the rise. The scale of social networks has shifted the paradigm of citizen expression. Civil society, along with business, government and international organizations, are challenged to respond to, represent, and engage this proliferation of voices online in a way that leverages the power of connectivity. Governments are using such connectivity to experiment with different forms of public engagement and consultation.

- **Interest is growing in the role of faith and religious culture in society.** Individuals within government, business and civil society are exploring new ways to leverage the strengths of on-the-ground faith-based actors within the context of local community development, as well as in overseas aid and economic development. Faith is also seen as a source of ethical principles and values within business models.

- **There is profound public pressure – and increasingly an economic argument – for responding to pressing challenges of inequality.** The extremes of wealth and the depths of poverty that have arisen globally in recent decades provide a stark reality for leaders of government, business and civil society.

- **Significant demographic shifts are under way which have yet to be factored into our economic, political or social systems.** The demographic distribution of young vs. older national populations is having and will continue to have a profound effect on how civil society, business and government position their strategic approaches to deliver job opportunities, health care and mechanisms for responding to citizen needs.

- **There is reduced certainty of funding size, sources and modes from traditional donors and a rise of new socially driven financial actors.** As traditional funding streams shrink, new sources of finance are emerging, such as the rise of emerging market philanthropists, social entrepreneurs, and social investment products. New mechanisms to access finance are also emerging, such as crowd-sourced funding.

- **There is a widening trust deficit towards institutions and between sectors.** The rise of citizen protest reveals a reduction in level of trust by the general public in institutions around the world such as business and government.

- **Governments facing fiscal pressures are scaling back social service provision.** Recent concerns over government debt and attempts to restore competitiveness after the global financial crisis of 2008 have resulted in austerity measures that cut public spending on social services.

- **Private sector players are increasingly developing strategies to address social and environmental challenges.** A number of leading businesses and entrepreneurs are today reorienting their activities with the objective of bringing positive impact to complex societal challenges as a core part of their business and organizational strategies.

- **New patterns of economic and political power are creating a shift in the axis of development.** The traditional North-South development dynamic is being challenged by geopolitical and economic shifts, including foreign direct investment of emerging economies such as China's outward investment in Africa; changing focus of donor countries from aid to trade with key emerging market economies; and the new map of the fastest-growing economies in Africa, Asia and Latin America.

Gender diversity and inequality. Around the world citizens and governments are taking up the cause of gender diversity and inequality. In addition to advances being made in recognizing the rights of LGBT individuals, more attention is being paid to achieving gender pay equity and gender representation in key industries and leadership positions. Organizations like Women on Boards 2020 are tracking the number of women in top leadership positions in companies and on corporate boards. Currently, 20 women serve as the leaders in their countries (Argentina and Brazil lost theirs), not counting sovereigns or other heads of state, and the U.S. may be on the verge of electing its first woman president. Same-sex marriage is now legal nationwide in 26 countries, and in Mexico, where the president has proposed implementing a national law, it is legal in some states but not others. A study by Morgan Stanley found that more truly diverse companies outperform their rivals financially. Yet, despite some progress, gender inequity remains a fundamental issue, especially for women of color.

Eroding democracy and threats to a free press. Increasingly we are seeing highly contested elections and counterclaims of fraud (e.g., Uganda, Ghana, Tanzania), political parties unable to form majority governments (e.g., Spain, Greece), renewed censorship (e.g., China, North Korea, Iran), and leaders who refuse to surrender power (e.g., Zimbabwe, Bolivia, Nicaragua). Political corruption has become a focus of world attention, and world censure and sanctions have little effect on loosening the grip of political strongmen. At the same time, even as communications have become more spontaneous and governments are under pressure to be more transparent, journalists in many countries seeking to expose corruption and malfeasance are under threat. According to the UNESCO and Committee to Protect Journalists, 24 journalists had been killed in the first half of this year across the world. A total of 114 journalist killings were recorded in 2015. Others have been beaten, kidnapped or otherwise intimidated. Aside from undermining decades of progress toward achieving the rights of all people to choose their leaders and to speak freely, these trends also create a great deal of instability and uncertainty, further weakening global trade and investment.

Heightened xenophobia and isolationism. In response to the rise of anti-immigration sentiment in Europe and elsewhere, UN secretary general Ban Ki-moon stated, "divisive political rhetoric on asylum and migration issues, rising xenophobia, and restrictions on access to asylum have become increasingly visible in certain regions, and the spirit of

shared responsibility has been replaced by a hate-filled narrative of intolerance." UN General Assembly President Mogens Lykketoft alerted that "violations of international humanitarian and human rights law are of grave concern... Xenophobic and racist rhetoric seems not only to be on the rise, but also to becoming more socially and politically acceptable…" Ethno-nationalism is on the rise, as can be seen in the Brexit vote, Donald Trump's presidential platform, and recent political gains by alt-right parties throughout Europe. Commented futurist Richard Watson following Great Britain's decision to leave the European Union, "Identity trumps economics." Observes an article in the *Wall Street Journal*, "Even in an era where globalization is thought to be an inexorable force, national sovereignty still matters." What the ultimate outcome of these tensions will be remains to be seen over the next couple of years as nations renegotiate relations and trade agreements and voters go to the polls to decide on their next leaders.

Aging of the world's population. HR trend watcher *The Herman Trend Alert* relates, "With advances in sanitation and medicine, people in virtually every country worldwide are living longer. In addition, they represent an increasing proportion of the world's population and that trend will affect almost all aspects of society." Between now and 2030, the number of people in the world aged 60 years or over is projected to grow by 56 percent; and by 2050, the same group is projected to more than double. Across the globe, the population aged 80 years and over is growing still faster than the number of older persons overall. According to projections by the United Nations, by 2050 this group of people 80 and older will more than triple. The proportion of the world's older persons, aged 80+ years, is projected to rise from 14% in 2015 to more than 20% by 2050. Industrialized, affluent countries have the highest numbers and percentages of older persons, but people are aging faster proportionately in developing countries, which historically have had much younger populations.

ECONOMY

THE BIG PICTURE

- Weak global economy
- Decline in global trade
- Reviving U.S. economy
- Income inequality a challenge to growth

Weakening world economy. The International Labor Organization (ILO) forecasts that over the next two years, the world economy is projected to grow by only around 3%, significantly less than before the advent of the global crisis. The continuing slowdown in economic growth is being driven by weakness in emerging and developing countries and the leveling off of economic growth in China. The other members of the so-called BRICS economies that were expected to help drive global growth (namely, Brazil, Russia, India and South Africa, along with China) also have experienced significant declines within the past year or so. Some economists fear the global economy is on the brink of falling into another period of recession, a sentiment shared by consumers around the world, according to a recent Nielsen survey. Deutsche Bank recently released a report predicting weakening economic conditions globally for the next 35 years. According to

Deutsche, common themes over the next 35 years will include: lower real growth, higher inflation, less international trade, more controlled migration, lower corporate profits as a share of gross domestic product, and negative real returns in bonds.

Global trade slowing down. Globalization appears to be in retreat. According to a recent report from Global Trade Alert, which monitors protectionism around the world, world trade volumes have plateaued since January 2015—an unprecedented slowdown. The *Financial Times* reports, "Economists remain divided on the causes of the slowdown. While some blame a creeping protectionism that has begun to drag on the world's economy, others see long-term trends at play such as the shortening of global supply chains and the increasing role of digital trade." Declining oil prices and the slowdown in China and India's economies may be additional factors. Whatever the reason, the slowdown is putting additional pressure on already weak economies that can no longer rely on exporting as a source of growth but must find ways to boost the local economy instead. The World Trade Organization cut its forecast for global trade growth this year by more than a third in September. The new figure of 1.7%, down from its April estimate of 2.8%, would be the slowest pace of trade and output growth since the 2009 financial crisis. It is also the first time in 15 years that international commerce has been left trailing behind the world economy.

U.S. household income made record gains in 2015. Data released by the U.S. Census Bureau in September show the median household's income in 2015 was $56,500, up 5.2% from the previous year — the largest single-year increase since record-keeping began in 1967. The share of Americans living in poverty also posted the sharpest decline in decades, and fewer children are living in poverty. Significantly, lower-income households saw the largest income gains in percentage terms. The increase in income was attributed to higher rates of employment rather than to wage growth. Still, the figures provide support for the view that the economic recovery, which began in 2009, is finally beginning to bear fruit for the economy as a whole and not just for the wealthiest Americans, as in recent years. According to the Census data, incomes rose for black families, white families, Hispanic families, and Asian-American families. It rose for young people and in households headed by middle-aged adults and older people. However, reports *The New York Times*, the economic recovery remains incomplete. The median household income was still 1.6 percent lower than in 2007, adjusting for inflation. It also remained 2.4 percent lower than the peak reached during the boom of the late 1990s.

U.S. employment up but productivity down. The U.S. is approaching the official level of "full employment," but growth has been inconsistent. After a precipitous drop in May, job growth figures in June and July rebounded, only to decline again in August. Unemployment, which had risen slightly as more job seekers returned to the workforce, remained at 4.9% in August. Increasing employment is bringing some pressure to bear on employers to raise wages, which have remained relatively stagnant since the recession.

On the flip side, the *Wall Street Journal* reports that the increase in hiring is due in part to a decline in productivity, which it says is at one of its worst downtrends ever. Productivity in the second quarter of this year declined at a seasonally-adjusted rate of 0.6%, marking the longest slide in labor productivity since the end of the 1970s. If the trend continues, it will impact corporate profits and thus affect workers wages and standard of living. Given the recent more positive economic news, Bloomberg speculates that, at least in the U.S., productivity may be on the verge of trending upward.

Spiraling corporate debt. A recent article for the e-zine *Salon* examines the perilous financial condition of many of the country's cash-poor companies. U.S. companies now have less cash on hand than they did in the midst of the Great Recession, causing experts to warn that many could be at risk should the economy stall and borrowing costs rise as lenders tighten their purse strings. Half of the country's current cash reserves (now $1.8 trillion) is held by just 1% of the 2,200 companies tracked by S&P Global Ratings. Meanwhile the number of companies whose bonds have been downgraded to "junk" status is on the rise. The reason: low interest rates. Companies are using low borrowing costs to buy back shares (which props up share price) and to fund merger-and-acquisition activities. Michael Roberts, professor of finance at the Wharton School of Business, told *Salon*, "With really low interest rates, you have to be aware of the incentive for corporations to build up debt that could set them up for problems down the road."

Income inequality. One of the prominent topics in this year's presidential campaign has been the ongoing trend in income inequality. Since the 1980s, real income has been consistently decreasing among middle and lower economic households and increasing among the wealthiest households. According to the Center for Equitable Growth, America's top 10 percent now average nearly nine times as much income as the bottom 90 percent. Americans in the top 1 percent average over 38 times more income than the bottom 90 percent. And the nation's top 0.1% average over 184 times the income of the bottom 90 percent. Thus, while the number of billionaires and millionaires continues to increase, more of the middle class is falling into the lower income strata. Even with the recent reported gains in income, finds the *New York Times*, inequal distribution remains an issue: "Gains may be finally trickling down to those at the bottom of the ladder. But the numbers still offer a lopsided picture, with a gargantuan share of income rising to the top. While the bottom fifth of households increased their share of the nation's income, by the Census's definition, to 3.4% from 3.3%, the richest 5% kept 21.8% of the pie, the same as in 2014." What remains to be seen is whether and to what extent rising employment will result in real wage growth and wealth for more workers.

Shrinking middle class. In a report released in December 2015, the Pew Research Center found that after four decades as America's economic majority, the middle class is now losing ground as more income has shifted into the upper income groups. Pew's analysis shows the median income of middle class households in 2014 was 4% less than in 2000. Moreover, because of the housing market crisis and the Great Recession of

2007-09, their median wealth (assets minus debts) fell by 28% from 2001 to 2013. The proportion of the population deemed middle class (defined as adults whose annual household income is two-thirds to double the national median, about $42,000 to $126,000 annually in 2014 dollars for a household of three) fell from 62% in 1971 to 50% in 2014. This has significant implications for the economy at large and the housing industry in particular as a greater portion of Americans' buying power is decreasing and more risk falling into poverty, and thus becoming more dependent on government support at time when pressure is on governments to cut back social services. The most recent Census data (cited above) indicates this trend may be reversing, but it will take more than one year of gains and greater availability of affordable housing to reestablish the economic well-being of the middle class.

Ethics, compliance and transparency in business. One of the consequences of the widening gap in income inequality and the so-called "Wall Street bailout" is increased scrutiny of corporate behavior, including ethics and compliance with legislation and regulation, as indicated by the passage of Dodd-Frank (and current efforts to weaken it). Revelations of corporate misdeeds and quasi-legal behavior from whistleblowers and hackers, such as the Volkswagen scandal involving tampering with emissions metrics and the recent release of the so-called Panama Papers, has put pressure on companies to be more transparent in their operations and financial reporting. "Governments, too, are increasingly under pressure to commit to such global transparency initiatives as the open government movement and the Extractive Industries Transparency Initiative (EITI)," states Richard Bistrong, who consults on anti-bribery issues. All this oversight has increased the cost of doing business, which eventually will be passed along to consumers.

SOCIAL / DEMOGRAPHICS

THE BIG PICTURE

- Millennials enter adulthood
- U.S. population becoming more ethnically diverse; whites will be minority
- Baby boomers not ready or able to retire
- Rise in multigenerational households
- Changing consumerism
- Diversity divides and unites

Millennials will dominate in the next decades. Earlier this year, the Pew Research Center announced that millennials (persons born between 1981 and 1996) have now surpassed baby boomers as the nation's largest living generation at 75.4 million vs. 74.9 million, respectively. Millennials are already having a profound effect in the workplace, on the housing market (good and bad), on social policy, and media. Many, whether out of necessity or choice, have delayed establishing households, getting married, having children, buying homes, and other steps toward adulthood that previous generations have

undertaken primarily in their 20s. That will change within the next decade or so as many enter their 30s, pay off debt and become established in their careers. Their tastes and values will dominate the next couple of decades. According to Pew's analysis and projections, "With immigration adding more numbers to its group than any other, the Millennial population is projected to peak in 2036 at 81.1 million." Millennials are already influencing residential, office, and retail space design, according to industry news site *Construction Dive*. Millennial influences on design include prewiring of office spaces for Wi-Fi; game rooms, lounges and nap rooms in commercial buildings; a reduction in living space in desirable urban neighborhoods; and package and bike storage rooms in apartment buildings.

Baby boomers facing uncertain old age. The oldest baby boomers reached age 70 this year, and the youngest sneaked past age 50. Although as a group they hold substantial assets, mostly in the value of their homes, only a portion are truly affluent in terms of household income and cash reserves. Moreover, they are expected, on average, to live longer than their parents and enjoy better health. Which means they will need additional funds to get through those extra years. Those with pensions and/or retirement investments can look forward to a comfortable, active retirement. On the other hand, many are entering retirement with considerable debt, working longer, and having to manage their own financial futures without guaranteed income. Many saw the values of their homes decline when the housing bubble burst, their wages stagnate during the post-recession recovery, and their savings depleted assisting aging parents or adult children. At current funding levels, Social Security is projected to run out of funds by 2033 and Medicare by 2028. Unless Congress acts, which it has been unwilling to do for the past three decades, a large portion of boomers could face financial difficulties in their later years.

Babies of color are now the majority. Nonwhites are expected to become the majority of the nation's children by 2020. This is now the reality among the very youngest Americans, states an article for NPREd, the education news arm of National Public Radio. Babies of color now outnumber non-Hispanic white babies (1 year or younger), according to new estimates from the U.S. Census Bureau. The newest estimate shows that on July 1, 2015, the population of racial or ethnic minority babies was 50.2%. We've already been seeing this shift in U.S. schools: The 2014-15 school year marked the first time that minority student enrollment in public schools surpassed that of white students. Overall, whites still account for the majority of the population, at 77.1%, according to the most recent Census figures, for 2015, but also are the oldest segment of the population and thus have reached a point where deaths are outnumbering births annually. Demographers predict that the U.S. will be majority-minority for the first time by the mid-2040s. However, four states — Hawaii, California, New Mexico and Texas — along with Washington, D.C., are now majority-minority. Nevada, which has 48.5% minority population, is likely next.

Fewer older women living alone. After rising steadily for nearly a century, the share of older Americans who live alone has fallen since 1990, largely because women ages 65 to 84 are increasingly likely to live with their spouse or their children. A new Pew Research Center analysis of U.S. Census Bureau data finds that from 1990 to 2014, the share of older adults living alone declined by 3 percentage points, to 26%. Among older women, the share declined to 32% in 2014 from 38% in 1990. Among older men, the share living alone ticked upward to 18% in 2014 from 15% in 1990. One explanation for this trend is that an increase in life expectancy, especially among men, has made it more likely that older women would be living with their spouses rather than as widows. Another result of this shift is an increase in multigenerational households (see below). It also likely will have an impact on the demand for senior living facilities, senior care and health care.

More multigenerational households. Aging parents and boomerang children are contributing to a surge in multigenerational households. Households with children, parents and grandparents – so-called "sandwich generation homes – represent 4.3% of all households, according to the latest U.S. Census data. That's up from 3.6% in 2006. Real estate website *Trulia* took a closer look to see what was behind the trend and found two big factors: "First, economics: many families consolidated to make ends meet in the wake the of the Great Recession. Second, America's changing demographics: multi-generation homes are more common among Asians and Hispanics – two of the fastest-growing U.S. populations." Moreover, reports the Pew Research Center, in 2014, for the first time in more than 130 years, adults ages 18 to 34 were slightly more likely to be living in their parents' home than they were to be living with a spouse or partner in their own household. Among the factors contributing to this trend, says Pew, are young adults postponing marriage and lower rates of employment and lower wages, particularly among young adults with less than a college degree.

Diversity and division. The U.S. population is becoming more diverse, with so-called "minority" populations growing faster than the white population. At the same time, society as a whole has become more accepting of other types of diversity, such as sexual orientation and identity, physical and cognitive ability, lifestyle, ethnicity, and religious affiliation. For some, embracing diversity is seen as a threat to their beliefs and way of life, leading to political and social friction. Younger generations on the whole appear to be more tolerant of diversity. A survey conducted by the Innovation Group found members of Generation Z (persons 13 to 20 years old) are more likely than millennials to say gender does not define a person as much as it used to and that they know someone who referred to themselves using gender-neutral pronouns, such as "we" or "they."

The new consumer. Connectivity, rising consumer influence, time scarcity, mobile payments, and the internet of things (IoT) are changing where, when, and how we shop. Call it the on-demand economy, the frictionless economy, the intuitive economy or the hunt for seamless instant gratification, the simple message is that the digital age is rewriting the rules of what consumers want and how they behave, observes Global

Trends. In addition, attitudes about ownership are changing, with consumers choosing to rent, borrow or swap rather than purchase certain goods. Market research conducted by IKEA's Economist Intelligence Unit finds Americans care more about quality of life than accumulating possessions, and the American dream today is more about experiences than owning things.

Changing lifestyles and values. Sheryl Connelly, head of Global Consumer Trends and Futuring for the Ford Motor Company, has compiled a list of "the most compelling movements across the globe that are shaping how we live, work and engage with the world around us:"

- **Embracing heroes**. Across the world, 68% of adults say they are disillusioned with civic and political leaders. But where goodwill is faltering among established leadership, it's gaining among communities and individuals who are rethinking what it means to be a good citizen, neighbor and person.
- **Swiss Army knife**. A rising emphasis on self-reliance has created an ethos of purposefulness and utility. From tiny homes to smartphones to utility vehicles, consumers are increasingly seeking to attain a trifecta from their purchases – quality, versatility and durability. Today, better living is not about having more things – it's about living smarter by pushing to get greater use out of fewer things.
- **Time poverty**. Today, where greater connectivity means we're increasingly "on call," time feels more elusive than ever. The blurred boundary between work and home has resulted in a plugged-in society that's often anxious, and people are desperate for solutions that enable them to keep all balls in the air.
- **The EZ life**. Today, we're seeing the rise of "full-service" technology—the "Connect Concierge," as products shift to become more anticipatory and self-sufficient. With the growing support of artificial intelligence, we can outsource more and more responsibilities to technology that learn and adapt to our needs – expanding our sense of hope and possibilities for a better life ahead.
- **Mindful goes mainstream**. Once the purview of monks, mindfulness has made its way into homes, schools and boardrooms. Two-thirds of consumers across the globe say that mindfulness is not just a fad, and studies show the practice can mitigate the impact of stress.
- **In awe of aging**. The first humans expected to live to age 150 are already alive, according to experts on aging and longevity. Yet as people live longer, healthier lives, the notion of aging is being re-defined. Shifts in health care, nutrition and medical science are driving today's seniors to defy stereotypes and make sure that those "extra" years of life are healthy, meaningful and dignified.
- **Fit for misfits**. Today, one size fits nobody. Some people seek ways to stand out, while others simply don't want to get lost in the crowd – and society is more openly celebrating diverse opinions and interests.

- **Waste not, want not**. Globally, 90% of adults agree society has an obligation to reuse materials and reduce the amount of trash it creates. That means everyone needs to play a role – business, government and individuals alike. Today, innovators are finding ways to get creative with refuse –extracting value from stuff nobody wants.
- **Buying into the flexible economy.** The world of work is changing – and fast. The rise of sharing economy platforms and freelance models are making "gig" jobs more accessible and more lucrative. Business models are adapting to maximize resourcefulness while allowing for greater flexibility and fulfillment.
- **Retail revolution.** Retail is no longer simply about product, it's about experience – and retailers are finding new ways to inspire meaningful connections with consumers.

WORKFORCE

THE BIG PICTURE

- Greater workforce diversity
- More stay-at-home parents
- Millennials redefining work
- People-centered management
- Shortage of appropriately educated / trained / skilled workers
- Technology the top driver of knowledge worker productivity and satisfaction

Workforce becoming more diverse. There are four distinct generations in the workforce (generally ages 25 to 64) right now: Traditionalists (aka the WWII generation), Baby Boomers, Generation X, and Millennials—each with its own characteristics, values and work ethic. And Gen Z, or Gen 2020 as they are also known (i.e., those born after 1997 who will begin entering adulthood around 2020), is now starting to enter the workforce. In addition, the U.S. workforce is in the midst of a sweeping demographic transformation. From 1980 to 2020, the white working-age

population is projected to decline from 82% to 63%. During the same period, the minority portion of the workforce is projected to double (from 18% to 37%), and the Hispanic/Latino portion is projected to almost triple (from 6% to 17%). Managing such a diverse workforce and striving to achieve fairness and equitable representation for the various subgroups will be a major challenge for companies in the coming decades.

Fewer new parents in the workforce. More than half of all adult women now are in the workforce (57%). That's down from a peak of 60% in the 1990s and is expected to decline further, to around 55% by the year 2040, according to the U.S. Department of Labor. One reason may be that more women are choosing to stay home to raise their children rather than return to the workforce. A study conducted by the Pew Research Center in 2014 found the share of mothers who do not work outside the home rose to 29% in 2012, up from a modern-era low of 23% in 1999. Coincidentally, the number of fathers who do not work outside the home has nearly doubled since 1989, from 1.1 million to 2 million in 2012.

Redefining work. Millennials are redefining work patterns and values, and baffling their older supervisors and managers. Millennials want more flexibility in where and how they work and their ability to manage their work/life balance. They are purpose-driven, want to feel they are making a valuable contribution, and want to work for companies that are helping to improve people's lives. A recent Gallup survey found that 93% of millennials who recently changed employers did so because they wanted new roles or opportunities, especially those for more meaningful work or better chances for advancement.

Unemployed—and unemployable—graduates. The gap between skills needed to succeed in today's workplace and the skillsets of job seekers continues to grow, and not just among unskilled workers or tradespeople. In a posting on LinkedIn, staffing and employee relations consultant Alistair Cox states, "In the UK, more than half of graduates are working in non-graduate roles, while in the US graduate unemployment and underemployment (those who work part-time but want full-time roles) currently stands at 5.5% and 12.6% respectively." The reason, he says, is "a fundamental mismatch between market demand and supply of skills. Students are graduating with degrees offering neither technical nor vocational knowledge, yet these are what employers are often looking for first. . . . [O]ne in four roles go unfilled due to the technical skills gap and hiring managers report worrying gaps in graduates' critical thinking, communication and leadership skills."

Freelance economy. A growing number of workers are choosing to work freelance, either full or part time, rather than be employed or to earn extra income. Companies are eager to hire them and cut down on their personnel expenses and overhead. All of which is changing the dynamics of the traditional career path and shifting more of the burden of health care insurance and retirement planning savings and investing onto individuals. In addition, companies are having to learn how to balance relationships between employees

and outsourced workers and how to manage virtual teams to ensure they collaborate effectively and remain productive.

Employee engagement & retention. According to the Gallup organization, which has been studying the issue for several years, the vast majority of employees worldwide, including 70% of U.S. workers, do not feel engaged at work. This is affecting productivity, innovation, workplace safety, and employee wellness. Among the factors that keep employees engaged are purposeful work, making a contribution to the company's goals and mission, good relationships with supervisors and co-workers, and feeling that their contributions are recognized. With employment on the rise and wages beginning to improve, firms may have difficulty hanging onto employees who are looking for more satisfying work or a more positive work environment.

Gender diversity and equity. Recent high-profile lawsuits among well-known Silicon Valley and media companies have elevated awareness that in many fields, professions and industries, women still remain underrepresented, are a small minority among the upper ranks of leadership, receive lower pay for the same work, and are more often subject to harassment and unfair treatment. Despite some modest progress in the last few years, women are still underrepresented in the workplace, according to a new joint study from the nonprofit Lean In and the consulting firm McKinsey & Co. The study found that the proportion of women relative to men declines at every step of the corporate ladder. Women receive less access to leadership opportunities, face more pushback during workplace negotiations, and are less likely to receive feedback and guidance from senior leaders. The situation is worse for women of color. This despite the fact that, as a group, women are now better educated than men as a group. The issue is now getting more public attention, and companies are coming under pressure to rectify the situation, with gender diversity and equity perhaps now the #1 HR issue in the workplace among industrialized nations. [*See related item under* **Global Influences***, above.*]

Older workers delaying retirement. Many older Americans are not financially prepared for retirement or prefer to keep working rather than retire and thus are choosing to remain in the workforce, either full or part time, well past traditional retirement age of 65. A recent Gallup poll found 31% of non-retired U.S. adults predict they will retire after age 67, the current minimum age for receiving full Social Security retirement benefits. Analysis of federal employment data by the Pew Research Center found that in May 2000, 12.8% of those older than 65 held a job. As of May 2016, the number had climbed substantially, to 18.8%. Pew analyst Drew DeSilver told the *New York Times*, in that 16-year period, employment rose not only among 65- to 69-year olds (close to a third now work), but also among those 70 to 74 (about a fifth). In the 75-plus population, the proportion still working increased to 8.4% from 5.4%. Nearly two-thirds are working full-time jobs. This is both a plus for companies that want to retain their knowledge and experience and a negative as it limits opportunity for younger workers to advance to more senior positions.

Workplace culture trends. A weakening global economy and the push for more rapid and creative innovation has made today's workplace ever more stressful and competitive. Instead of feeling crushed under the pressure, many employees are taking it in stride, states an article in *Forbes*, by emphasizing resilience, empowerment, thriving, awareness and intuition (qualitative thinking), and balancing (vs. balance) competing demands of work and life.

Increasing focus on health and wellness in the workplace. Happy, healthy employees are more productive than those who are not. They take fewer sick days and are generally more engaged in their work. Providing the right perks and incentives to drive health-conscious behaviors and improved mental and physical well-being both at work and at home will only increase organizational effectiveness. A challenge for employers, says the Society for Industrial and Organizational Psychology, is determining the "right" incentives and how to ensure employees take advantage of them. An organization may have a great combination of health-related benefits and perks, but if employees don't take advantage of them, the organization will not realize the associated gains in productivity.

U.S. office workers love their jobs—but cutting-edge technology helps. A recent online survey of more than 1,000 office workers in the U.S., conducted by software giant Adobe, finds 70% saying they love what they do. And a remarkable 81% say that state-of-the-art technology was more important to them than an office's design or on-site amenities. Seven out of 10 U.S. workers believe technology improves the work-life balance, and 81% say technology helps them connect with colleagues more efficiently. Those respondents who think their company's technology is "ahead of the curve" feel about twice as creative, motivated, and satisfied as respondents who work for companies with less-than-cutting edge technology. More than half (53%) expects technology to be handling more of their offices' menial tasks—copying, filing, etc.—over the next two decades, even as 55% remain convinced their jobs could never be replaced by a machine.

EMERGING TECHNOLOGIES

THE BIG PICTURE
* 3D printing comes of age
* Commercialization of virtual reality
* Human-like robots
* Interactivity and artificial intelligence
* Wearable technology
* Haptic technologies

3D printing. Advances in 3D printing continue to push the edge of this technology. With the development of 3D printing of concrete and other construction materials, entire buildings are being constructed using 3D printing. Last year China constructed a five-story apartment building using a special 3D printed material. In May, Dubai announced the opening of the first 3D printed office space, and the *New York Times* recently reported on a company developing a 3D printed modular home. Designers are fashioning just about any kind of product via 3D printing, including lamps, chairs and tables. Opportunities for customization and private labeling are practically limitless.

Virtual reality. No longer confined to video gaming, virtual reality (VR) is being applied to a wide range of industries, including construction, real estate and design. The commercial availability of VR headsets and 3D imaging has made it possible for builders and real estate companies to show clients what their project or next home will look like before anything has been built. Clients can "walk through" an interior and inspect design details like materials and finishes. Currently under development are ways of enhancing the experience even further by making it possible for users to sense "touch" and "smell" within the environment they are viewing. *Fast Company* recently reported on a Shanghai

company that is developing a product called Space that works with a virtual reality headset to present the viewer with a multiple-screen environment "useful for anyone who needs multitasking for web pages, videos, native Windows applications, even 3-D models."

Biomimicry. The study and application of biomimicry (the use of models, systems and elements of nature to solve human problems) continues to grow in popularity. Biomimicry has been employed in the development of materials with specialized characteristics (e.g., adhesive, water repellant, heat reflecting) and ways of maximizing energy use in buildings. Now it is also being applied to building materials and the design of buildings as builders and architects explore more efficient uses of space and ways to harmonize the natural and built environments. Researchers at MIT, for example, have found that natural materials like bones, shells, and sea sponges are as strong microscopically as they are to the touch. They are exploring how such structures could replace Portland concrete for the construction of buildings. "There is a wide range of techniques that are well established for studying the complexities of biological and biomimetic materials, which can be easily translated into the cement community," said MIT professor Admir Masic.

Beyond "smart" to "intelligent" technology. Up to now smart technology has focused primarily on imaging and sensor technology to monitor and collect data on a wide range of objects and spaces, from what's in the refrigerator or the oven to the systems of high performance buildings. Control devices make it possible for users to perform certain functions, such as adjusting light levels or temperature settings. The next step is to connect all these devices through a single system so they can communicate and interact with one another, eventually employing artificial intelligence (AI) technologies that would allow them to monitor themselves and make adjustments as necessary or send out alerts when maintenance or some other action is required. In the not-too-distant future, these technologies will be integrated into all built spaces and many of the devices used within them.

Advanced robotics. As robots become more responsive, agile, "aware," and human-like, they will take on routine work traditionally given to employees. For example, a U.S. hospital is now using a robot to greet patients and visitors and help direct them to their destination within the building. To help cope with its country's rapidly aging population, a Japanese company developed Robear, a nursing robot that looks like a tall, white bear and can lift patients out of bed and help them move, and can converse and interact with patients on a rudimentary level. Engineers at M.I.T. have created a robot they call Jibo. Designed to be a helpmate in the home, Jibo uses speech and facial recognition, and natural language processing, to learn from its interactions with people. Labs in Poland and Italy recently announced the successful creation of "soft robots," fragments of plastic that can be manipulated and moved by an outside energy source, eliminating the need for wires, cables, batteries, etc..

Affective computing. A development related to artificial intelligence and interactive robotics is "affective computing." This refers to software programs that through text analysis and facial expressions can read users' moods and intentions and respond accordingly. For example, a *New York Times* article reports, "Researchers from North Carolina State University showed that software that tracks facial expressions can accurately assess the emotions of students engaged in interactive online learning, then predict the effectiveness of online tutoring sessions. The researchers' program, JavaTutor, responds not only to what a student knows, but to each student's feelings of frustration or engagement, just as a human teacher would."

Wearable technology. Today we have smart watches, Fitbits, and apps for smartphones that can collect data about our movements and vital signs. Already in development are garments and footwear that will do the same. Some of these are now being tested on college athletes. In the future, our clothing might also be able to detect our health and fitness status, moods and other physiological changes. The *New York Times* recently ran an article pointing out the potential for violations of privacy by companies or hackers who want to make use of this data, for example teams that may want to acquire performance data on their rival team members.

Audio-reactive technology. Wearable technology creators are inventing new ways to experience and understand music, allowing users to physically feel sound through vibrating motors embedded in fabric, reports consumer trends researcher J. Walter Thompson Intelligence. New releases are mapping sound onto the body to replicate the visceral feeling of music pulsing at nightclubs or live concerts, or to immerse the user in a heightened level of experience. Products designed for the hearing impaired are also at the cutting edge of haptic technology (i.e., technology that recreates the sense of touch by applying forces, vibrations, or motions to the user). A deaf-friendly accessory called Vibeat translates music into vibrations, allowing deaf wearers to feel music through an alternate sensory system. Hearing users can also listen in through connecting headphones.

Emergence of ultra-haptics. Haptics is one of the fastest growing areas in technology. Along with touch-screens and wearable devices, an abundance of research is currently taking place to create systems that will form 3D virtual objects that can be seen and felt in the air, reports technology advisors and trend researchers Technavio. Researchers in Japan have already created a floating 3D holographic plasma display with haptic feedback. Another major use of ultra-haptic displays could be for NFC (near field communication, a form of wireless transmission), where a 3D holographic image is projected as people pass by a store. This will allow users to see all the deals, offers, and discounts available by simply logging into apps such as FOURSQUARE on a holographic display. This application of ultra-haptics is expected to boost the market for haptics considerably by 2026.

Emotion-detecting technology. Researchers at MIT's Computer Science and Artificial Intelligence Lab have developed a device that can determine a person's mood using wireless signals. The device, dubbed EQ-Radio, can identify emotions such as anger, pleasure, sadness and joy by bouncing wireless signals off a person's body and analyzing the reflections to infer breathing and heartbeat signals. Further analysis reveals individual heartbeats and breathing cycles, which are fed to a machine learning algorithm to recognize emotions—without the use of any sort of monitoring device or on-body sensor. The applications of such a device could be widespread, including business applications in getting a better read on customers' emotional states and even infused into smart home technology to create smart environments that could adjust lighting, music, or temperature automatically to match a user's mood.

Transhuman era. We are developing a symbiotic relationship with our technology. We are not only becoming more reliant on technology, we also are having our behavior shaped by the technology we use. And we are integrating technology more with biology. In its report, *Global Trends in Alternative Worlds 2030,* the National Intelligence Council envisions how advanced biotechnologies will have an impact on the human experience, including the potential for enhancement technologies. Imagine a world in which implants, prosthetics, and powered exoskeletons become regular fixtures of human life or, even more fantastic, better than organic human limbs—and represent substantial improvements to innate human capacities. The elderly, in an effort to maintain youthful levels of strength and energy and extend their lives, will employ these technologies as well. We will see brain implants that will allow for advanced neural interface devices—thus connecting minds and machines. Retinal eye implants that enable night vision top the list of other modifications we may expect to see. With advanced neuro-pharmaceuticals seniors will no longer have to be concerned with memory, attention, and speed of thought. A natural consequence of these developments, foresees the NIC, will be a "two-tiered society comprising enhanced and non enhanced persons."

The next generation of Universal Design products. Engineers and designers are using smart technologies to create assistive devices and environments that adapt to the user so the user does not have to adapt to the environment. These technologies are improving safety and mobility for persons who are vision- or hearing-impaired or who have lost a limb. They also make possible automated home health care, through integrated monitoring technologies. Speaking about technology trends in the home, interior designer Patricia Davis Brown told *Kitchen + Bath Business* magazine, "Both in the kitchen and bath, I think we'll continue to see greater advancements made in terms of voice control and automation and how that customizes the user experience for each person. Lighting could be integrated with voice command, for example, to bring lights to the appropriate and safe level for food prep for a grandparent—without the hassle of light controls. We could even take it a step further to have wall-mounted vanities that adjust to the user's height when he or she enters the bath. With the introduction of Siri and Alexa, it's not that far off."

INDUSTRIES RELATED TO INTERIOR DESIGN: ARCHITECTURE, CONSTRUCTION & REAL ESTATE

THE BIG PICTURE

- Housing industry struggling to meet demand
- Technology reducing need for large spaces
- Smart devices improve on-site project management
- Drones and robots improve project delivery times, safety
- Shortage of skilled labor hampering construction
- Increased regulation creates costs, delays for builders
- Abundance of products, concerns about sourcing complicate specification choices

Construction making a comeback. Nearly a decade after the Great Recession stalled construction nationwide, the industry is roaring back, reports the *Providence Journal*. In 43 states, construction is now contributing more to the economy than it did in 2010, creating a demand for skilled workers and transforming skylines from Boston to Oklahoma City. Overall, the construction industry's impact on U.S. gross domestic product has grown by more than 21 percent since its low point in 2011, according to a

Stateline analysis of inflation-adjusted data from the U.S. Bureau of Economic Analysis, states the article. This year, construction's contribution to the U.S. economy soared above $650 billion for the first time since 2008.

Housing shortage. At present, in many areas of the country, and especially in the suburbs, there is greater demand for purchases of existing homes than availability of inventory, as homeowners are choosing to remain in their current homes rather than sell and move. U.S. housing stock fell for the fifth-consecutive quarter in the third quarter of this year, by 7%, resulting in a 6.7% year-over-year drop in total inventory, according to real estate website Trulia. Builders say there is also a scarcity of available lots upon which to construct new housing. Lot availability is at a record low, according to a recent NAHB member survey. The survey showed 64% of the members indicating that the inventory of building sites in their markets was either "low" or "very low." One positive sign of a "healing" housing market, according to an article in *Builder* magazine, is the decline in homes with negative equity (i.e., those with mortgages greater than the assessed value of the home), which has dropped from 31.1% in the second quarter of 2012 to 12.1% in the second quarter of this year.

Housing affordability crisis. Homeownership in the U.S. is at an all-time low, and an historic shortage of affordable housing is preventing first-time buyers from entering the market. In its 2016 *State of the Nation's Housing Report,* the Joint Center for Housing Studies of Harvard University states, "the need for more affordable rental housing is urgent. The record number of renters paying more than half their incomes for housing underscores the growing gap between market-rate costs and the rents that millions of households can afford. Governments at all levels must redouble their efforts to expand the affordable supply." *Trulia*'s analysis shows starter (-10.7%) and trade-up (-9.2%) inventories were particularly hard hit during the third quarter, driving up prices for these homes, which are in the most demand. This situation is not likely to improve for the next several years, creating greater demand for multihousing, which, in turn, is driving up rents. A new survey by the NHP Foundation, a nonprofit affordable housing provider, finds three out of four Americans are concerned that they or someone close to them could lose their housing because they are paying too high a percentage of their income for rent or a mortgage.

Smaller houses becoming popular. Whether current owners or first-time buyers, today's home shoppers generally are looking for smaller homes. The American Institute of Architects' *Home Design Trends Survey for 2016* showed "renewed homeowner interest in larger homes, including volume and lot size" as one of the significant trends of the previous 12 months. However, the National Association of Home Builder (NAHB)'s *Eye on Housing* news source, citing U.S. Census data, stated the average square footage of new single-family homes declined slightly, from 2,674 (the largest on record) in 2015 to 2,657 in the first quarter of this year, perhaps signaling a reversal in demand for larger properties. Many newly formed households are small, and empty-nester baby boomers

often are looking to downsize. In its roundup of 2017 housing trends, *SpecSpaces* selects Micro ("think smaller regarding space and cost") as growing in popularity. Real estate website *Curbed* reports tiny houses (300 sq. ft. or less) have caught on with those, especially younger adults, who want to "escape" from the traditional American Dream. Recently, the *Chicago Tribune* reported on a decline in demand for McMansions, noting that even among affluent buyers looking for larger properties they want new homes that are better suited to their tastes and lifestyles.

Millennial migration. "For years, the conventional wisdom has been that millennials prefer urban living and the culture and excitement of the big, dense cities, want to be flexible and avoid owning a home," observes an article for *Curbed*. "But as millennials age, and more marry and consider starting families, the numbers tell a different story." Real estate consultants Lachman Associates note that only 13% of this age group lives downtown, mostly clustered in 11 magnet downtowns. Only about a third of the entire age group even identify themselves as urban. Still, says Sara Jones of Bamboo Realty, which specializes in urban real estate, "With few affordable options right in the city, millennials are moving to close-in neighborhoods and buying the oldest homes. They aren't moving to the furthest suburbs with the newest and biggest homes, best schools or infrastructure. They're living in the next closest place they can afford." One reason is that many suburbs do not offer the kind of property millennials are looking for. That may lead to a boom in renovations in the coming years as millennials look to update and upgrade existing structures.

Boomers doing their thing. As in years past, a new survey by Freddie Mac of homeowners age 55 and older finds two-thirds plan to age in place. However, aging in place doesn't necessarily mean staying put, says the study. Many homeowners say they plan to move again, and almost three-quarters of those say they will buy rather than rent. That suggests roughly 18 million homeowners over age 55 may be shopping for another house in the next few years. Surprisingly, a desire to downsize doesn't play a major role in that decision. Affordability of the community, the need for retirement amenities, and less maintenance lead the reasons for moving; downsizing is only number eight. Bucking traditional wisdom, baby boomers are not all ditching their homes in the suburbs and heading to the Sun Belt, as some predicted, but are displaying their usual heterogeneity and pursuing a variety of options. Some are choosing to stay close to friends and family or work. Some are moving to major metropolitan areas or college campuses in order to enjoy the culture and other amenities offered there. Some are building or purchasing new single-story homes with open floor plans, Universal Design features, and smart technology. And some are choosing senior living facilities with resort-like amenities. Much depends on their resources and personal situations.

Evolution of senior housing. Senior living facilities continue to evolve as they seek to attract a new generation of residents. Employing better design, the latest technology and evidence-based knowledge, they are morphing into specialized resorts for aging. In a

related trend, some universities are building senior housing adjacent to their campuses to attract better educated, more affluent seniors interested in pursuing lifelong learning and maintaining a connection to the younger generations. Among top trends in senior housing, according to real estate website *Redfin*, are life plan communities that promote active, healthy aging; specialized memory care; co-housing; and independent living rather than assisted living communities. Although the majority of baby boomers are at least a decade away from reaching the typical senior housing demographic, a top concern for providers is how to deliver all the choices and amenities tomorrow's seniors will want and still make facilities affordable for most, according to an article for *BisNow*. An article for *Senior Housing News* says the emerging consensus as to how middle-income seniors housing communities should be run is first to meet their needs rather than cater to their wants, and then see what "wants" they can afford. That could include choosing "nice" rather than high-end furnishings or amenities.

Construction industry inundated with technological innovation. Reporting for *Construction Dive*, Kim Slowey writes, "Every day, contractors of all sizes are inundated with the latest and greatest gadgets and software the technology industry can throw at them." Along with drones and robotics (see below), the number and quality of mobile apps for various aspects of the construction industry is on the rise. In addition to improving on-site communications, builders are now using apps to prototype structures and solutions, to manage projects and crews, and to keep clients apprised of progress. Laser scanning has become a useful tool, as well. Slowey recounts that many larger firms now have innovation teams to assess the usefulness of new technologies, the firm's adaptability, and time and cost to implement.

Increased use of drones and other robotics in construction. Large building and construction firms are using drones for surveillance and to monitor both progress and safety on the job. In time, drones will also be used to perform certain functions, such as delivering or placing components. A recent NAHB survey found that although awareness of drone use on construction projects (66%) is high among builders overall, only 22% of all builders have used drones, even taking into consideration that 43% of larger builders reported having used them. The survey also found that although 20% of all homebuilders are likely to use drones within the next three years, 38% said they are not at all likely to use them. Again, use was highest among larger builders (41%). Automated robots are being used to construct beams, lay bricks, drill, dig, paint and perform almost any task required to build structures, according to an article in *Forbes*. "What is really exciting in this space is the ability to perform construction remotely and unmanned," writes contributor Mike Kavis. "Innovative companies have built solutions that allow smart robots to work synchronously to construct complex objects. All this can be done under the watchful eye of a technician from across the world over the web."

Impact of regulation on cost and schedules. Both residential and commercial builders are claiming that increased regulation and government oversight is driving up the

cost of construction and causing delays in schedules, which is having a negative impact on both their ability to deliver projects on time and the affordability, and thus quality, of new projects. In May, NAHB released a study, *Government Regulation in the Price of a New Home*, which showed that on average, government regulations account for 24.3% of the final price of a new single-family home. In fact, the regulatory costs for an average single-family home went from $65,224 in 2011 to $84,671 in 2016 – a 29.8% increase in five years. "The cost of regulation in the price of a new home is rising more than twice as fast as the average American's ability to pay for it. That is simply not sustainable," commented NAHB Chief Executive Officer Jerry Howard. As a consequence, new "starter" homes are being priced out of the reach of first-time buyers.

Shortage of skilled labor. In both residential and commercial construction there is a shortage of skilled labor, as many tradespeople left the industry during the recession and have not returned. Despite demand, fewer unemployed workers are choosing to take up construction trades, preferring to enter technology-related fields instead. Thirty-six states added construction jobs between August 2015 and August 2016 while construction employment increased in only 24 states between July and August, according to analysis of Labor Department data released in September by the Associated General Contractors of America. Association officials said demand for construction appears to be cooling in some markets but added that many firms report they would be expanding their headcount if they could find qualified workers to hire. In a recent AGCA member survey, 69 percent of respondents said they're experiencing difficulty filling hourly craft positions.

Consolidation of product databases. Products continue to proliferate, and designers are under greater pressure to be knowledgeable about all aspects of a product (sourcing, materials, manufacturing, environmental impact, etc.). A movement is underway to begin to consolidate product databases so that designers can reduce the time they spend searching for and specing products. For example, *The Editor at Large* reports that *Interior Design* magazine and the online community and product directory Architonic have partnered to create ProductFIND, a new tool that will provide architects, designers, homeowners and design enthusiasts with a consolidated product database of more than 300,000 products across 1,500 brands.

Intelligent buildings. Today's smart technology is about more than using sensors to operate lights or adjust temperature. New developments are being used to monitor building performance, indoor quality and occupant safety. "Building owners are realizing that the metrics they use to evaluate the assets in their portfolios are changing," says Navigant Research, which has produced a white paper on intelligent building trends. "Shifting customer demands, climate change mitigation and sustainability goals, power reliability and resiliency concerns, and budget constraints are driving demand for intelligent building solutions." Comfy, the maker of an app that crowdsources data from employees to determine occupant preferences and then optimizes the workplace for comfort, productivity, and savings, states inexpensive tiny embedded processing chips

are leading a surge in interest in the Internet of Things (IoT) for buildings. They predict that multiple system interoperability will soon become a necessity, allowing for a more holistic and efficient approach to facilities management. A growing concern, however, is that as buildings become "smarter" and increasingly connected, opportunistic hackers have countless avenues into a building's network, to gain access to critical data or even take control of a building's systems.

Mega-tall buildings. The latest "space race" is to see who can build the world's tallest building. New materials and technologies are making it possible to build ever higher, and designers are being called upon the give these futuristic mega-towers the appropriate ambience. Several record-breaking mega-tall buildings opened this year, and plans have been announced for others, each competing to be the world's tallest. *Building Design + Construction* recently announced that China's Greenland Group, developer of four of the world's tallest skyscrapers, is moving forward on a project, Spire London, that could be the tallest residential building in western Europe. A number of other mega-tall buildings are being planned or are already under construction in southeast Asia and the Middle East.

Integration of technology. From interactive wall panels and countertop displays to LED-lighted wallcoverings, new technologies are being built and manufactured into the essential building blocks of interior environments. Increasingly retailers, health care providers and institutions are integrating interactive technologies in walls, floors and furnishings to engage and assist customers and provide help with wayfinding. An article in *VSMD* magazine earlier this year highlighted several retail projects using multiple forms of interactive technology to engage customers and facilitate the purchasing process. One retail pop-up included wall-to-wall "smart" fixtures (featuring 900 individual screens) outfitted with glass-top digital displays, and LED-driven visuals within the store. Shoppers making their way through the space could be recommended products based on what they had been browsing in-store. As they passed a highlighted product, the wall physically moved toward them to recommend the item it held. The store can easily be changed from one brand to another without having to rebuild or redesign the physical store.

New dimensions of BIM. Building Information Modeling (BIM) continues to evolve to meet the demands of the industry for fast, cost-efficient construction. Website *ForConstructionPros* reports, "Instead of 2D drawings, 3D computer designs using Building Information Modeling (BIM) are becoming the standard, providing owners better visualizations." In addition, they relate, "More and more design firms are adopting 5D Macro BIM at the earliest stages of design. These models show owners how early design concepts affect cost, schedule and constructability, allowing them to evaluate large-scale options and make informed decisions."

SUSTAINABILITY / WELLNESS
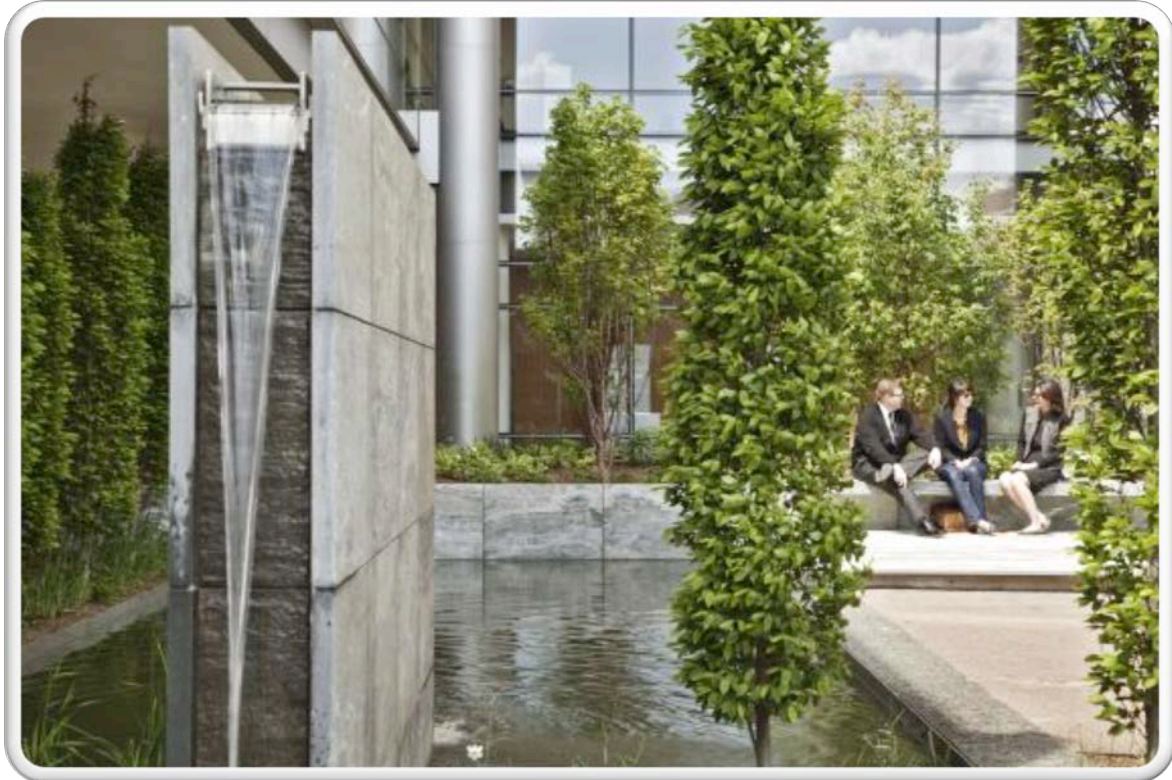
THE BIG PICTURE

- Wellness is the new sustainability
- Sustainability forecast for strong growth
- Design takes it cue from nature
- Encouraging healthy behaviors
- Higher standards for high performance buildings
- Sourcing and distribution critical to specifying product
- Certification and rating systems overload

Wellness is the new sustainability. Just as the movement to make buildings greener and more sustainable dominated the industry in the first decade of the 21st century, today the focus in on health and wellness—the result of a greater interest in occupant well-being and the ever-spiraling cost of healthcare and poor health, which makes taking preventative measures more affordable. Across sectors—from healthcare and workplace to hospitality to schools and homes—builders, architects, designers, developers and building owners, and those representing occupants and communities are calling attention to the need to make buildings healthier and more supportive of healthy behaviors. In releasing the latest version of its *The Drive Toward Healthier Buildings* report, Dodge Data & Analytics states, "the design and construction industry in the U.S. is poised for

wider adoption of building practices that prioritize the physical, mental and social well-being of tenants and occupants. The study also finds that the owners of such buildings are already starting to see business benefits, such as increased leasing rates and higher asset values."

The marriage of wellness and sustainability. Wellness is now commonly aligned with sustainability as a major goal of many projects. Perhaps the most obvious indicator is the launch of the WELL Building Standard to complement LEED. Representative of this trend are remarks made during an interview with a member of an on-campus wellness initiative, BeWell@Stanford, by Fahmida Ahmed, who directs the university's Office of Sustainability: "Sustainability matters because we all care about the future. We are part of the natural world and dependent on the use of natural resources to sustain our business and activities. Just as personal wellness is about a long-term living and existence, wellness and sustainability are linked philosophically and in practice because they have the natural environment as a common denominator."

Sustainable building gaining ground around the world. Recent reports show a surge in green building around the globe, finds *Construction Dive*. The global green building materials market is on pace to hit $255 billion by 2020, growing at an annual rate of approximately 12%, according to a report from Zion Research. According to Dodge Data & Analytics' *World Green Building Trends 2016* report, green building is doubling every three years. And a September 2015 U.S. Green Building Council study found the green building industry will account for more than one-third of jobs in the nation's construction industry—3.3 million—and $190.3 billion worth of labor earnings by 2018. A number of factors are fueling this trend, including greater attention to environmental issues, as well as government regulations requiring more sustainable construction and the success of high profile standards like LEED. The article also states that although commercial construction has typically led the pack in green adoption, the residential sector is starting to catch up with increased buyer demand.

Next generation of "high performance" buildings. Today the term "high performance" refers to buildings that maximize the use of energy and water. That definition is now expanding to include health and wellness factors as well. "High performance" is becoming a term pertains not just to engineering and mechanical systems, but to the well being of occupants and their "performance" as it relates to the purpose of the building (e.g., office, retail, healthcare). In naming its list of "Green Giants" for the year, *Building Design + Construction* observed, "The easiest and most cost-effective strategies in sustainable design—daylighting, optimal building orientation, a tight envelope, super-efficient HVAC systems, LED lighting—are taken for granted today. AEC leaders in green building are stepping up to a higher level of innovation." More and more, clients and governments are demanding that buildings achieve higher standards of performance in regards to conserving energy and water, as well as meeting or exceeding LEED standards for sustainable design and construction. Interest in

repurpose and reuse of existing structures, as opposed to new building, has also increased, especially in cities looking to revive once-thriving neighborhoods and business centers.

Regenerative design. Taking sustainable design a step further, regenerative design focuses on a "partnership" between natural systems and the built environment to ensure that buildings not only do not harm the natural environment but, in fact, help to sustain it. Although the concept has been around for some time, regenerative design is now gaining more attention. Critics of current green building standards argue they do not go far enough in ensuring a sustainable future. In an article for the REMI Network, Ray Cole, professor at the School of Architecture and Landscape Architecture at the University of British Columbia and the academic director of its Centre for Interactive Research on Sustainability, explains, "Regenerative approaches challenge the orthodoxy of current green building practice, the design tools that support it, and, perhaps most significantly, what constitutes 'successful' performance."

Biophilia and integration of nature / natural settings. For some time a niche interest within architecture and design, biophilia has now gone mainstream, with an emphasis on the many benefits (health, wellness, productivity, healing) of incorporating nature views and spatial relationships into the built environment. As we spend more of our time in interior environments gazing at screens, the desire for natural views increases. Research increasingly supports the instinctive notion that people are healthier, happier and more productive when they have access to nature and natural surroundings. This trend has had a big impact on healthcare and workplace design, but is now expanding into hospitality and other sectors. An article for *Sourceable*, for example, points out the benefits of biophilia in retail environments, such as improving customer mood and preventing "visual overload" from product displays by providing nature views and vistas. Taking the concept a step further, a symposium held at the University of Minnesota this spring brought together representatives from architecture, art and biology to discuss ways that creative fields are increasingly looking to biology and biological principles for inspiration and guidance.

Physiological interaction of the person with the space. With more attention being paid to occupants, designers and researchers are exploring the many ways that physical space affects occupants both physically and mentally. Writing for *Building Design + Construction*, Jon Penndorf of Perkins + Will discusses a research project that examined links between specific design strategies and the positive psychological benefits they may provide when building occupants are faced with a crisis event. Among other findings, the study showed installing a green roof on a building provides a number of sustainability benefits but can also ease depression and reduce stress levels if available as an outdoor refuge to building occupants who may need to shelter-in-place. An article for *Sourceable* points out that changes to the physical environment have been shown to reduce stress in the workplace, which has been linked to such common forms of mental illness as post-

traumatic stress disorder, burn-out, adjustment disorder, depression, and anxiety. In its *2016 Workplace Survey*, Gensler found that poor workplace design can hinder creativity and innovation. Similarly, a study conducted in the United Kingdom found that the classroom environment can affect a child's academic progress by as much as 25% in a year. Researchers studied the holistic classroom environment, including classroom orientation, natural light and noise, temperature, and air quality, as well as flexibility of space, storage facilities and organization, and use of color. *Metropolis* magazine recently reported on research into artificial lighting and how it affects circadian rhythms, which in turn trigger biochemical reactions that regulate sleep and body function and thus can affect performance.

Obesity. The obesity rate among U.S. adults in 2015 climbed to a new high of 28.0%, up 2.5 percentage points since 2008. This represents an increase of about 6.1 million U.S. adults who are obese, according to the Gallup organization. More than two-thirds of U.S. adults are either overweight or obese, relates an op-ed piece in the *New York Times*: "It's a serious problem—life threatening, for many people—with multibillion dollar health care consequences." In addition to creating serious health and social issues, the alarming rise in obesity has also become a design issue, affecting the use of public spaces, transportation, healthcare, etc., as accommodation needs to be made for both weight and girth, giving rise to the field of bariatric design.

Sourcing and distribution chains. Concern about indoor air quality and environmental impact, as well as socially responsible purchasing, has designers wanting assurances that the products they specify are green, healthy and produced under conditions that do not exploit children or other workers. This is placing a burden on manufacturers and suppliers to provide detailed information about sourcing and distribution chains, as well as manufacturing and distribution. A report by EY (formerly, Ernst & Young) released earlier this year, *Let's Talk Sustainability*, notes, "the last decade has seen an increase in external scrutiny over how large corporations engage with their supply chains." In addition to environmental factors and labor exploitation, compliance with regulation, susceptibility to economic or government/political instability, and reputation for business ethics also enter into ethical purchasing decisions.

Avalanche of certification & rating systems. During *Interior Design* magazine's healthcare roundtable at NeoCon this year, Donald Cremers, vice president of interior design at HOK, commented, "My clients are overwhelmed with standards." Literally dozens of certifications and rating systems for sustainable and wellness design exist, and new ones keep getting introduced every year. Some are more legitimate or reliable than others. Builders, architects and designers are calling for better oversight and consolidation of these systems, which have become unmanageable and confusing.

Homebuyer preferences for green features linked to savings. The NAHB's latest home buyer preference survey finds buyers give high marks to particular types of green

features, such as ENERGY STAR® rated appliances and windows and above-code insulation. Comparing results over the last several surveys shows a stable trend: preferences for particular green features in 2015 were about the same as they were in 2007 and 2012. The survey also shows that buyers in general are willing to pay more up front to save on future utility bills, but within limits. They are less interested in paying for features that are good for the environment but do not produce notable savings.

OCCUPANT BEHAVIOR

THE BIG PICTURE

- New kinds of work and new ways of working are reshaping the workplace
- Guests using their own smart devices to customize and manage their hospitality experience
- Patient-centered approach is transforming delivery of health and senior care services
- Designing classrooms to prepare students for the workplace
- Growing popularity of smart homes
- VR will replace the need for design in the home

Smaller, denser offices. In many fields, employees are spending less time in the office and more time working offsite, whether traveling or working from home. Companies are reducing their overheads by downsizing their office space and space-per-employee, putting more employees in the space, reducing the number of offices or dedicated workspaces, and shifting toward more communal spaces and more flexible, multipurpose spaces. The *2016 Workplace Report* released by international architecture and interior design firm Ted Moudis Associates, which examined a total of 17,084 U.S. workspaces

and 2.5 million square feet of office space built during the period 2014 and 2015, found that 89% of the office environments were comprised of open workspaces, with 67% of these open workspaces making use of desking or benching arrangements involving the use of shared amenities or alternative workspaces, reports *Sourceable*. The increased use of open space benching arrangements has also raised the density of new office environments, with the average amount of usable square feet per seat (USF) standing at 142. This compares to prevailing standard of between 175 to 200 USF per seat just a few years ago. The leveraged seating ratio–or the number of people per desk in an office—has hit 1.3:1, indicating that mobile work habits have made it possible to utilize the same seating for multiple employees.

The end of the corporate office? Some smaller companies are choosing to rent temporary office space on an as-need basis and forgo owning or leasing company space. Co-working environments are just a portion of this trend. An article for e-zine *WorkDesign* reports on the growing trend of office space as a service. Says Duncan Logan, founder of RocketSpace, a tech campus for startups, "We haven't even seen the tip of the iceberg. I think a large chunk of the market—10, 15, even 20 percent of the real estate industry—will move to some sort of office space as a service market," which he describes as "more like a hotel model than a lease arbitrage model." One consequence is that such spaces will need to be designed differently from traditional office spaces, making them adaptable and flexible for quick changes and multiple needs.

Transformation of work place into home/living space. As work/life boundaries have continued to blend, the trend toward making a place for work in the home has found its corollary in companies redesigning their workspaces to make them feel more like home. For *Metropolis* magazine's June issue dedicated to trends in workplace design, senior editor Avinash Rajagopal moderated a panel on the intersection of the office and the home, what employees are looking for from their workspaces, and how design can facilitate a work-life balance. His takeaway: "We've moved beyond slight changes in the workplace," and are now facing the opportunity for drastic implementations of new intersections between home and personal lives. In addition to keeping employees at the office longer, these spaces help to improve productivity, innovation and morale by encouraging socialization and reducing stress. Companies also are using design to manage human resource issues, such as adding lactation rooms for new mothers and creating quiet spaces for introverts.

Evolving trends in healthcare design. *Interior Design* magazine reported on key trends that emerged from its annual healthcare roundtable held at NeoCon. These include: the influence of hospitality and retail on healthcare environments as administrators strive to enhance customer service and amenities; more focus on staff experience and providing better accommodations for staff; emphasis on wellness rather than treating illness; and the introduction of new technologies for diagnosis, treatment and patient care.

Patient-centered design shaping healthcare design. Competition, transparency and the increasing use of evidence-based design are prodding healthcare administrators to focus more on the patient experience and satisfaction. That shift is reflected in the design of healthcare facilities. Along with making facilities more like hospitality and retail spaces (as noted above), healthcare design today, according to *Health Facilities Management* magazine, "includes a multimodal approach to patient safety, access to nature, good acoustics, functional lighting design, analysis of space planning issues such as patient bathroom design, patient room and locations of sinks and caregiver work stations." *Facility Executive* featured an article in June on a research project that studied the link between more supportive waiting room design and an improved patient experience. The Center for Health Design recently published the findings of a study that looked at patient rooms in medical/surgical, ICU, and maternity care spaces and pulled together the known EDB features that should be incorporated into their designs.

Impact of technology in healthcare environments. New research from Steelcase Health finds switching to electronic medical records has made laptops and tablet devices ubiquitous in healthcare settings that were not designed to accommodate them, disrupting physician-patient interaction. Institutions are exploring ways to redesign spaces, such as exam rooms, to improve ergonomics and physician-patient interaction. *Health Facilities Management* magazine reports that healthcare furniture designers at this year's NeoCon showcased new products to "reimagine the patient exam room."

Broadening demographics altering design of senior living. With individuals living longer and some choosing to move to senior living communities at a younger age, providers of senior living facilities are having to finds way to accommodate a broader demographic, with younger residents preferring more hospitality-like environments and more likely to be living as a couple, while elderly residents more often are single and in need of a higher level of care. Moreover, states an article in *Long-Term Living* magazine, facilities also must be mindful of how adult children view the environment, as they often influence or make the decision as to whether their parent will move in.

Designing for dementia and other special needs. Recognition that persons who are "neuro-diverse" (e.g., those with autism, Down's syndrome, Alzheimer's, dementia) experience interiors differently has led to a growing body of research and practice into how to design spaces that are supportive for these individuals. Panelists at ASID's 2015 Impact Summit discussed ways that designers can use wayfinding, biophilia, lighting, and space planning to help individuals with special needs to navigate unfamiliar spaces. The Dementia Care Centre at the University of Stirling in Scotland is using virtual environments to explore how to create well-designed, beautiful buildings for persons with dementia that, as well, do not cause them any unnecessary disability. The Dementia Enabling Environments Project in Australia, in addition to providing an abundance of material on residential design for persons with dementia, has developed an app intended to help users make informed decisions when adapting or designing a home for a person

living with dementia. Ohio-based developer of senior living facilities, The Lantern Group, is experimenting with new ways of designing assisted living communities for memory care, reports *Senior Living News*, to allow persons with Alzheimer's or other forms of senile dementia to live independently at home for five to ten years or more.

Designing classrooms for tomorrow's workers. Lecturing and teacher-led discussions are out. Teamwork and small group interaction are in. Today's classrooms need to allow for greater flexibility of student use and configurations, as well as integrate the latest mobile and instructional technology. In naming its list of K-12 School Giants, *Building Design + Construction* offers a case study of a prototype classroom on the campus of Baylor University, in Waco, Texas, in which school officials and teachers experiment with new types of furniture, workgroup configurations, projectors, writing boards, and mobile technology to test new teaching methods and classroom layouts. "The lab is a kind of flight simulator where educators experiment in ways that address forces in the corporate world and trends in technology influencing K-12 education," states the article. "New styles of working—more collaborative and project-based—and mobile technology are changing how people work. The K-12 education sector is responding to those trends." The *New York Times* recently did a story on colleges and universities that are building deluxe structures for the "generation of wonderful ideas," especially for fields like computer technology and engineering. Much like many new corporate buildings, these spaces are designed to encourage innovation through the mixing of disciplines, places to perform work out in the open, and the use of transition zones like hallways and staircases as sites for productive run-ins.

Downsizing of retail environments. Brick-and-mortar stores are becoming not much more than display windows where consumers go to check the merchandise they will later order online. Consequently, retailers are cutting back on floor space, using pop-up shops and other more economical means of connecting with customers face to face. Says Steve Matthesen, president of Nielsen Retail Vertical, "Hyper-localization and specialization are fueling today's retail growth. As lifestyle and consumption habits change, we're seeing a structural shift in where consumers shop and what they buy, and some small formats are driving big growth."

Increased use of mobile technology in hospitality industry. From reservations and check-in to concierge services and guests' ability to personalize their room environment, the hospitality industry is being transformed by mobile technology and smart devices, which in turn is changing layout and design. Some luxury hotels are embedding the technology in walls or furniture or providing tablets in guest rooms. Millennials especially are having a big impact on this area. Gensler's Lisa Kong, writing for *Building Design + Construction* states, "Because of this new hyper-focus on the millennial consumer, we are seeing so much innovation that we're waiting to finalize technology in new build hotels because it will become outdated before construction even starts."

Resorts as a wellness destination. More and more hotel and resort operators and owners are working to include wellness and sustainability into new and current offerings, finds Andrew Cohan of hospitality consultancy Horwath HTL in a report released earlier this year. "The themes of sustainability, wellness and experiential travel have become closely intertwined as they are complementary aspects to increasingly demanded guest preferences," he says. "It appears that from the perspective of the hotel guest, what the leisure resort offers has moved well along the spectrum from an 'escape for indulgence' to an 'escape for vitality.' Hotel and resort management, consequently, must also transition their mission from one of spoiling guests with extravagance to one of providing a soothing and perhaps exotic canvas for guests via the physical environment, along with all of the necessary tools and programs with which guests can create their own desired experiences."

Consumers warming up to smart homes. A new survey by Houzz finds nearly half of renovating homeowners (45%) are incorporating "smart" technology: systems or devices that can be monitored or controlled via smartphone, tablet or computer. Nearly a third of upgraded smart home systems or devices can be controlled via a central hub (30%), and a quarter include voice-controlled features (26%). Homeowners are installing smart devices for security/safety (25%, entertainment (18%), climate control (14%) and lighting (12%).

Living La Vida VR. Futurist Ian Pearson predicts that by 2050 our lives will be dominated by virtual reality. Homes will be blank slates of screens and interactive panels from which we can conjure up whatever imagery we want and through which we will connect to the world outside. In a report entitled *Home Life 2050* developed for online retailer Matalan Direct, Pearson states, "Tomorrow's generation will spend less time cooking and cleaning, but more time socialising with their full-resolution life-sized 3D friends, who are only virtually present…. VR will substitute some travel allowing people to explore the world and experience the full sensation through virtual environments, within their own home." Dr. Pearson predicts that by 2050, 98% of people will also use VR as a means of recreational activity.

Designing for an uncertain world. One of the trends featured at this year's Dwell on Design in Los Angeles was installing safe rooms — a safe place to retreat to in the face of danger, such as a break-in or a natural disaster. For the second year in a row, the show featured a panel on the topic. This year's talk was titled "The Modern Bomb Shelter: Why People Are Investing in Safe Rooms," and the building trend was described as being driven by "an anxiety-ridden cultural climate." That same climate may help explain the growing popularity of "rage rooms." These are spaces filled with old technology and other refuse where individuals can pay to take a sledge hammer and break things in order to rid themselves of anger and tension. Rage rooms already exist in the United States, Canada, Russia, and Italy. Observes trend forecaster and futurist Richard Watson, "This is a very strong weak signal and indicative of something quite nasty potentially."

INTERIOR & PRODUCT DESIGN

THE BIG PICTURE

- Interior design activity trending upward
- Virtual reality the next big thing in interior design
- Commodification of interior design services
- Products incorporating innovative technologies
- Changing wants and values of interior design clients
- In the future, environments that can be redesigned with the touch of a button

Interior Design industry rebounds. The business of interior design has been quite good over the past 12 months, and the American Society of Interior Designers expects that to continue, reports website *Woodworking Network*. Last year's ASID *State of the Industry* report showed that interior design had fully recovered to pre-recession levels, and the momentum carried through this year, with only slight moderation. According to the U.S. Bureau of Labor Statistics and the U.S. Census, the number of interior designers grew by 11.9% from 2014 to 2015, to 68,067. ASID says there are 12,642 design firms in business, an increase of 6% from the previous year.

The future of interior design is virtual. The media was chockfull of stories this year on how virtual reality technology is being used or will be used in interior design. *Interiors +*

Sources magazine reported on a partnership between design firm NBBJ and Visual Vocal to create a VR-based tool that will allow distributed project stakeholders to immerse themselves into unbuilt environments and provide instantaneous feedback to inform a collaborative design process. At NeoCon, Configura, which makes space-planning software, announced the launch of CET Designer Virtual Viewer Extension, a VR tool that lets users "walk around" in full-screen mode using gaming controls. Another software manufacturer, Oasys, issued a press release proclaiming A&D firm Interior Architects was using its product, Flow, and virtual reality to inform designers, clients, builders and consultants about how humans will interact with a project before it's even built. *Fortune* magazine ran an article on how interior construction company DIRTT (Doing It Right This Time) is using Oculus Rift headsets to show clients exactly what their banks, office buildings, and other projects look like before construction has even begun. CBS News in New York did a story on interior designers using virtual reality to plan room layouts for clients. Home and garden supplier Lowe's is providing VR headsets to customers to help them select kitchen-remodeling products. Put on the HoloLens visor and a life-sized holographic kitchen appears before your eyes. Choose countertops and other options at the point of a finger. And, yes, there is an app for that: iStaging is an app for Android or iOS smart devices that employs augmented reality (AR) technology to allow the user to easily picture the placement of furniture inside their home. Their device's camera gives a view over the room, while the software lets them place items (actual-sized) in real-time.

Designing virtual environments. The flip side of using VR tools to do interior design is the opportunity for designers to apply their skills to creating virtual interior environments for a variety of uses. Online design firm Decorist, for example, blogged about being asked to create virtual environments for a home furnishings catalog shoot.

Running a virtual design firm. The ready availability of free or low-cost communications technologies, video streaming, cloud-based software and storage, all accessible through handheld smart mobile devices has opened up opportunities for designers to put together teams and operate their firms anywhere at anytime. Website WinBeta, which covers Microsoft-related news, relayed the story of interior designer Allison Harlow, who relocated with her husband to Norway and was able to maintain her business, CURIO Design Studio, and take her clients with her using tools like Skype. Said Harlow, "As long as I have my laptop I can work. I have worked from the United States, Canada, Germany, Kazakhstan, Japan, Norway, Denmark, Poland… the list goes on."

The commodification of interior design services. All this new technology, design apps and online tools, design blogs and photo sites, and design cable TV shows has helped to promote good design, but at a cost to interior designers, who are experiencing the erosion of their intellectual property and role as design expert. Today, design is looked upon as something "anyone" can do, and retailers who cater to DIY consumers

are helping to reinforce that view. A gaming website for teenagers lists 15 different interior design games teens can use to design their bedrooms and other rooms in the house. Adding to the commodification of design is the rapid growth in online interior design services offering reduced rates. The *Los Angeles Times*, in a review of four such companies, told readers, "Interior designers are increasingly going online, offering their services at a fraction of the cost and time it takes to work with a traditional decorator."

Does design have a future? Two articles posted recently on the website for *Design Intelligence* explore the question of what the future holds for A&D in the face of increased use of computer software, robots, virtual reality and other technologies that appear to be encroaching on what traditionally have been architects' and designers' knowledgebase and skills. In an address to the Design Futures Council, architect and principal George H. Miller remarked: "These new methods help us work better and faster and in a more integrated way with engineers and consultants. Yet, I argue that the design process is dominated by design thinking. How does a building respond to the program and the environment in which it is built? The inspiration does not come from computers. They assist with the process and make the designs better. But quality design comes from the ideas that architects and their teams generate. This is the business of design." *DI* chairman James Cramer advises practitioners to prepare for and embrace the future: "These [changes] will enable architects and engineers to discover new zones of service through the use of new technologies. The tools of the future can exploit natural human creativity." Is the role of the designer in the future that of consultant? That is already becoming more common in residential design.

Enhanced surface materials. *Interior Design* magazine recently reported on how manufacturers are incorporating new enhanced materials and surface finishes into everyday interiors. These include the use of nanotechnologies that can mimic coatings found in nature to create surfaces that are anti-smudge, anti-fingerprint, anti-bacterial, and resistant to heat, marks and scratches; strengthening woods such as rattan and plywood with resins that enhance their performance; new ceramic composites that are harder and use glazes or coatings that are more hygienic and easier to clean than traditional ceramics; metalized window coverings that help control heat, glare and noise; specially coated wall coverings that resist scratches and dents; and surfaces that can wirelessly recharge devices such as smart phones and tablets.

Luxury is not what it used to be. Products and services once considered exclusive to only the very wealthy are now within the reach of affluent consumers. Today luxury is defined less by what one owns or can afford to buy and more by the quality of one's experiences and the "luxury" of having leisure time to enjoy life to the fullest. Presenters at this year's *Financial Times* Business of Luxury Summit observed people don't need more things; they are seeking items and experiences reflective of their personal wishes and hopes, their history and heritage. Millennials, especially, are searching for some form of social recognition, products that do good, in a philanthropic sense, and do well

economically. In addition, consumers' purchasing is closely linked with their digital experience of a product or service—making for a whole package.

Chameleon-like smart textiles and furnishings. In his *Home Life 2050* report, futurist Ian Pearson envisions, "By 2050, fabrics will have the ability to change appearance, colours, patterns and textures enabled by intrinsic smart yarns." He also foresees, "Furnishings will often adapt to our body shapes to make us perfectly comfy."

Design is in the eye of the beholder. Pearson, moreover, imagines consumers will be able to select both the fashion and décor they want at any time by making them appear differently through a manipulation of optics: "…active contact lenses worn in the home will allow people to change their décor frequently, a simply decorated room could look elaborate and luxurious – all this combined will make redecorating an easy everyday option."