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The future is already here — it's just not evenly distributed.

Future Scan 2018

Embracing the changes facing interior design in 2019 and beyond

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Trying to define a future vision for the interior design industry is no simple task.

As an industry, we are deeply entrenched in a new economy that is more open-sourced and technologically connected. We are living in an age of always-on social and knowledge networks that place a high value on the speed of connectivity, decision-making, and delivery. At the same time, the public is more aware of the power and potential of good design. With that acknowledgment comes high expectations for meaningful and measurable results. It's a new era for the design industry.

That's where CIDA comes in. We are here to ask the hard questions and to engage closely with interior design practitioners, educators, industry leaders and our allied partners to help define tomorrow's interior design industry. What does interior design education need to do—what must it do—to keep pace with a global economy? What's the job of interior design education and how can the education model evolve to align with changes in world? What must interior design education do to position and prepare interior design students for whatever tomorrow brings? What are the personal and technical skills and centers of knowledge that will best serve interior design students?

This is where you come in. Sound intriguing? Let's get started.

Please read through the results of CIDA's Future Scan with the objective of assessing the key trends that are influencing the field and imagining the impact these trends may have on the future of interior design.

After you're finished, we'd love to hear if the findings resonate or align with your world view and/or practice experience. What trends do you see as most critical? What's missing?

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Overview

How this trend report is different. Rather than a broad sweep of the typical environmental scan sectors (e.g., economy, politics, society, environment and technology), this edition of the CIDA Future Scan drills down on a more focused set of topics that have, or may have, important implications for interior design education, interior design practice, and the interior design profession. These include not only developments in the built environment sector, social trends, emerging technologies, and higher education, but also vulnerable populations, such as the shrinking middle class and persons with disabilities. Issues of accessibility and wealth distribution will affect both higher education and the built environment over the next decade. And those, in turn, will affect the interior design industry.

How we use this research. CIDA's Future Scan report informs our annual Forecasting Summit, where we convene the CIDA Board and other design leaders to consider the impact of trends on the interior design profession. CIDA's Standards Committee then uses insights from the Forecasting Summit, alongside field audits, to propose revisions to standards.

It's how we ensure that our accreditation standards for interior design education are both future-focused and flexible.

What we learned. Profound changes are taking place in society due to macro trends like the aging of the baby boom generation, the maturation of the millennial generation, income inequality, increased violence, and increasing dependence on computer-based technologies. These are altering how and where people work, how and where healthcare is delivered, the pace of people's lives, how and where they unwind and rejuvenate, privacy, independence, and social interaction. At the same time, these pressures are making people more aware of the need for behaviors, habits, choices, and environments that will keep them healthy and promote well-being and longevity. Safety is another growing concern, particularly in buildings accessible to the public.

Tomorrow's designers will be called upon to provide more pleasing, comfortable, healthy, and functional spaces. At the same time, those spaces will need to be both sustainable and more affordable. Designers will need to be more savvy and current, not only in the use of, but also in the operation of mobile, "smart" and automation technologies, as well as visualization technologies, such as virtual reality and augmented reality. These will become standard components of most designers' toolboxes.

Technology has the potential to revolutionize design practice, but it also threatens some segments of the profession.

Big data processes, artificial intelligence and visualization technology will combine to perform many basic design tasks. Designers will need to enhance their skills and knowledge base in order to present a viable value proposition to clients. For that reason, more interior design research is needed, including applying findings from cognitive and neuroscience, to deepen designers' understanding of how their work affects both occupants and the built environment, so that they can create even richer, safer, more beneficial and salutary spaces for all.

TREND 01

Social and Demographic Trends

U.S. Divided by More Than Ideology and Race.
Key demographic trends are playing out somewhat differently across urban, suburban and rural counties, according to a new Pew Research Center study.[1] Some of these variations are due to differences in demographics; others are the result of lifestyle or values differences. Among those mentioned are that urban areas are somewhat younger than suburban and rural areas, and thus have a lower proportion of married couples and a somewhat higher incidence of children living in households with only one parent. Urban areas have more blacks, while rural areas have more, mostly white elderly. Consequently, different areas have different challenges, are experiencing different kinds of economic impacts, and have different needs for social programs and public services. These affect their sense of identity, community and political ideologies.

In addition, an article in the *Harvard Business Review* states the U.S. is becoming more age segregated, with many younger people and older people having very little interaction with one another.[2] In some parts of the country, age segregation mirrors racial and ethnic segregation patterns. Note the authors, "The abject absence of contact between generations undoubtedly contributes to worries about a coming generational war pitting kids versus canes over scarce public resources. But the biggest problem is widespread ageism rooted in stereotypes and sustained by the lack of contact between old and young."

> **How might interior designers address the increasing problem of age segregation in our workplaces, public spaces, and communities?**

Shift Toward "Surban" Living. Real estate consulting firm John Burns says its research shows a rising trend toward what it calls "surban" living: "Often referred to as mixed-use, surban describes a suburban area with an urban feel, blending the best of urban living (characterized by ample restaurants, public transportation, walk-ability, bike-ability, shopping, and entertainment) with the best of the suburbs (lower prices, lower crime, and better schools). These areas also tend to be more conducive for socialization than pure suburban communities."[3] In a survey of nearly 24 thousand new home owners, half (49%)

wanted to live in a surban location, as opposed to urban, traditional suburban, or rural location. As new communities are formed to meet the demand for new housing, they likely will have surban characteristics.

> **What values are revealed in the shift towards surban living, and how can designers incorporate these values into the design of everyday places and spaces?**

Looming Exodus of Baby Boomer Homeowners.
Baby Boomers have not yet begun to depart homeownership in substantial numbers. In fact, boomer homeownership rates have actually edged up in the past few years. Nonetheless, projections developed by analysts at the University of Southern California and Fannie Mae's Economic & Strategic Research Group indicate that the number of older adults exiting homeownership will accelerate during the next two decades as the bulky Boomer generation advances into elderly age groups (75+) where homeownership attrition rises sharply.[4] The number of older owner-occupants who exit homeownership between 2026 and 2036 is projected to total between 13.1 million and 14.6 million, an increase of at least 42 percent over the number of older homeowners who exited during the last ten years. However, by the time the exodus starts, most millennials will already have settled into their own homes, creating a market void for older homes. "A fumbled intergenerational hand off would reverberate through the housing market and economy," state the analysts. "The coming acceleration of older adults departing homeownership adds urgency to industry and public policy efforts to facilitate a smooth hand off of housing assets from older to younger generations."

> **How might interior designers help the next generation of homeowners embrace (and not fear) the old?**

Increased Dependence on Technology Will Reshape Workforce and Workplace. Two recent studies on the future of the workplace conclude that demand for technological, social and emotional, and higher cognitive skills will rise by 2030. A discussion paper developed by the McKinsey Global Institute states that more widespread use of artificial intelligence (AI) and robotics means the need for more manual and physical skills will continue to decline over the next 10 to 15 years, while

demand for technological and cognitive skills will increase.[5] In addition, AI will replace the need for middle management, and employees and teams will become more self-managing. A large portion of the workforce will be unprepared for these changes, and companies will need to invest more to train and retrain workers.

How might interior designers support self-managing teams in the workplace?

Human resource consulting firm Gartner also observes that smart machines are getting smarter and more ubiquitous, doing not only what was previously reserved for humans, but also what was thought to be impossible for machines.[6] Consequently, Gartner foresees, "extreme digital dexterity will be the modus operandi for how employees will work in 2027." In order to compete, says Gartner research director Mark Coleman, "Employees at the center of this change will have to apply creativity, critical thinking and constant upskilling to solve complex problems."

Millennials Pessimistic About Their Future. In its seventh annual survey of millennials, human resource consulting firm Deloitte finds the nation's largest birth cohort is feeling more pessimistic about the prospects for political and social progress, along with concerns about safety, social equality and environmental sustainability.[7] Young workers had believed companies were becoming more ethical and socially minded, but based on their workplace experience their perception now is of employers prioritizing the bottom line above workers, society and the environment. Many are concerned that they are unprepared for the rapid changes taking place in the workplace and are looking for employers to do more to help them develop the skills they will need to succeed.

What if learning wasn't confined to a training room, but continuous and visible?

Receding Tide of Economic Prosperity. Washington Post columnist Robert J. Samuelson recently wrote an op-ed piece entitled "The Rise of Downward Mobility" in which he cites data indicating that despite the strong economy, many younger people economically are doing worse than their parents did, reversing a trend that began in the 1940s.[8] Whereas 90% of the children of Depression Era parents eventually surpassed their parents' income, for children born in 1970, only 61 percent earned more than their

parents, and for those born in 1980, only 50 percent did. "What's also surprising," he writes, "is that the biggest losers seem to be the children of the middle and upper-middle classes." Factors contributing to this economic slowdown include poor schools that produce poor workers, income inequality that stifles consumption spending, weak housing construction, inadequate innovation, and over-regulation.

What does it mean to design in an age of downward mobility?

Economic Insecurity Affecting Marriage Rates. Two papers delivered at this year's annual conference for the Population Association of America presented preliminary research on Census Bureau data that indicate a strong link between economic insecurity among men and women, marriage rates, and marriage stability.[9] Factors studied included labor force participation, wages, poverty status, and housing. One consequence of this trend is a rise in the number of unmarried parents, including cohabiting but unmarried parents. The likelihood of marriage and marriage stability is highest when both individuals are working and economically stable.

As the definition of "family" evolves, how might we design homes and neighborhoods to better reflect new ways of living?

Rise in At-risk Youth. Results of surveys recently conducted by the Centers for Disease Control[10] and the Human Rights Campaign[11] point to a number of areas of increased risk among U.S. teens, and in particular among LGBTQ teens. While some indicators of risk related to sexual behavior and substance abuse have declined in the past couple of years, today's students report higher incidences of some sexually transmitted diseases, sexual violence, bullying, on-campus violence (including shootings), use of opioids, and mental health issues, including suicidal thoughts and suicide. Similarly, on the Sexual Orientation and Gender Identity page of the National Educational Association's website, it lists bullying, harassment, high rates of truancy, substance abuse, homelessness, and suicide as common issues besetting LGBTQ students in schools.[12]

What role can environment play in helping LGBTQ students feel seen, safe, and supported?

Growing Complexity of Gender and Sexual Identity Issues. Once marginalized, awareness and

acknowledgment of the diversity of gender and sexual identity have become mainstream through human rights and legal proceedings as well as through all forms of media. These issues are emerging at increasingly younger ages, which is having an impact on educational institutions (from elementary to higher education) and child and youth services. As biological, psychological and sociological gender and sexual identities become more fluid, institutions are grappling with how to respect and accommodate the growing diversity of identities and behaviors across a range of interactions, from collecting personal data to providing services and support to creating appropriate physical environments.

How might interior designers help create spaces and services that move beyond gender lines?

Findings from a survey of post-secondary students and teachers, published in the *Journal of Teacher Education for Sustainability*, found that the majority of respondents described themselves as androgynous, with all but some male university students inclining toward feminine characteristics.[13] An article on the website Above the Law states that pre-law students registering with the Law School Admission Council to take the LSAT exam are now offered 11 different gender options with which to identify themselves.[14]

High Cost of Aging. The older population is getting bigger in many industrialized nations, and this generation of elderly is living longer. This is driving up the cost of living for many elderly (health care, medicines, caregiving) and putting their long-term financial stability at risk. An article in *The New York Times* reports that bankruptcy filings between 1991 and 2016 for persons age 55 and older having been going up, whereas for all other age groups they have been going down.[15] In 2016, 12.2% of all filers were age 65 and older, but in 1991 only 2.1% of filers were seniors. At the same time, the cost of social programs for the elderly (e.g. Social Security, Medicare) is skyrocketing as the number of younger workers who pay into these programs is dwindling. Take Japan, as an example, where the cost of social services is expected to rise by 1.6 fold by 2040, and the cost of medical care will increase 1.7 fold.[16] At present, there are no proposed solutions to deal with this impending crisis.

How might interior designers redefine what it means to care for our aging populations?

Americans Are Reading Less. Between 2003 and 2016, the amount of time that the average American devoted to reading for personal interest on a daily basis dropped from 0.36 hours to 0.29 hours, reports author Caleb Cain in an article in *The New Yorker*.[17] Parsing the data further, Cain finds that the average reading time of all Americans declined not because readers read less but because fewer people were reading at all, a proportion falling from 26.3% of the population in 2003 to 19.5% in 2016. The average reading time of readers actually went up, from 1.39 hours to 1.48 hours, perhaps signaling the beginning of a reader vs. non-reader cultural divide. The main reason, the data suggests, is television, rather than the Internet or video game playing, likely remains the primary force distracting Americans from books.

What role should our interior environments play in helping people reduce or limit screen time?

TREND 02

Middle Class Trends and Impact

Middle Class Comprises Majority of U.S. Households. About half (52%) of American adults lived in middle-class households in 2016, according to recent analysis of U.S. government data by the Pew Research Center.[18] (Pew defines "middle income" Americans as "adults whose annual household income is two-thirds to double the national median, after incomes have been adjusted for household size.")

Since 2001, the size of the middle class has remained relatively stable. (In the 1970s and 80s, by comparison, about 6 in 10 households qualified as middle class. See below for additional information on reduction in middle-income households.)

While middle-income households have not kept pace with upper income households in terms of percentage of income growth, nonetheless, middle-class households in the U.S. were better off in 2016 than in 2010. The median income of middle-class households increased from $74,015 in 2010 to $78,442 in 2016, by 6% (in adjusted dollars). (In the same period, upper income households saw an increase of 9% and lower income households an increase of 5%.) Median income of middle-class households declined somewhat between 2000 and 2010, but has now returned to the 2000 level.

Statistics Canada reports the median total income of Canadian households rose from $63,457 in 2005 to $70,336 in 2015, a 10.8% increase.[19] About 70 percent of Canadians considered themselves to be middle class in 2002, but that proportion has now dropped to below 50 percent, according to a public opinion poll conducted earlier this year.[20]

> **What new tools or technology might make interior design skills and services more accessible to middle and lower-income communities?**

Middle Income Households Declined Over Two Decades. A 2017 study conducted by the Pew Research Center found that between 1991 and 2010 the proportion of U.S. adults in middle-income households fell to 59 percent from 62 percent.[21] By comparison, over the same period the proportion of middle-income houses rose to 67 percent from 61 percent in Britain and to 74 percent from 72 percent in France. However, they shrank in Germany, Italy and Spain. The U.S. has the smallest proportion of middle-income households in the study, but those households on average earned more than did those of middle-income households in other countries. For purposes of the study, Pew defined "middle-income" as households that earned from two-thirds to double the national median income.

African-American and Hispanic middle-income families in the U.S. were hit hardest by the Great Recession, reports *New York Times* staff writer Nelson D. Schwartz in a recent article.[22] Citing Pew data, he states, "In 2016, net worth among white middle-income families was 19 percent below 2007 levels, adjusted for inflation. But among blacks, it was down 40 percent, and Hispanics saw a drop of 46 percent."

> **How might interior design educators increase the diversity of our industry, particularly for those African-American and Hispanic populations that were hit hardest in the recession?**

In Canada, middle class incomes were lower in 2011 than in 1976, largely due to a severe drop between the 1980s and mid-1990s, according to Stephen Gordon, a professor of economics at Université Laval.[23] Incomes began to recoup in the early 2000s. For the most part, the middle class in Canada has not shrunk as much as in the U.S., but they typically earn less. Nonetheless, while the middle class in Canada has experienced minimal wage growth in the past 10 years, incomes among the upper 20th percentile have increased substantially.

Standards of Middle Class Vary. The term "middle class" may refer to household income, occupation, education, neighborhood, values, lifestyle, or other factors. In terms of income, whether one is considered "middle class" also can vary depending on where one lives and the size of the household. In the article cited at the beginning of this section, Pew states, "In 2016, the national middle-income range was about $45,200 to $135,600 annually for a household of three. Lower-income households had incomes less than $45,200 and upper-income households had incomes greater than $135,600 (incomes in 2016 dollars)." However, that middle-income range spanned from $26,093 for a single person to $58,347 for a family of five. For nearly all states, the median middle-income households in 2016 was between $75,000 and $80,000.

Data from Statistics Canada, reported by Global News (cited above), show that in 2015 the median income of all Canadians was C$70,336. However, as in the U.S., middle-income varies among provinces from C$33,000 – C$130,000.

> **While the economic definition of the middle class may vary, how might interior designer better understand the mindsets of this substantial population?**

Hollowing-out of Middle-Income Wage Growth. Speaking at *The New York Times'* 2018 New Work Summit, Berkeley professor and former Secretary of Labor Robert Reich said he expects to see a widening in the economic gap between the highly affluent and middle-class workers in the years ahead.[24] While a relatively small group of tech and other professional workers will command high salaries, there will be few well-paying options for other workers. Most of these workers, said Reich, will be employed in "caring" jobs, either in industries such as food and hospitality, or in personal service industries, such as store clerks, child and elder caregivers, or home health aides – positions which do not pay well, offer few if any benefits, and do not provide opportunities for advancement.

> **How might interior designers address the heightened needs of those employed in "caring" jobs, including the physical, emotional and financial stressors they are facing?**

Middle Class Incomes and Wages Are Improving in U.S., Lagging in Canada. Following years of decline and stagnation, middle class income in 2017 rose to its highest levels, according to new data from

the U.S. Census Bureau.[25] A strong economy has boosted employment, increasing the number of households with two income-earners. The extra pay from having another person in the home employed again or working additional hours is the largest factor contributing to rising income, the Census Bureau said. In addition, analysis by *The Washington Post* finds blue-collar jobs are growing at their fastest rate in more than 30 years.[26] Jobs in goods-producing industries — mining, construction and manufacturing — grew 3.3% in the year preceding July, the best rate since 1984, while jobs in the service sector remained relatively flat, around 1.3%.

In Canada, however, the most recent jobs report from Statistics Canada, shows the goods-producing sector lost 30,400 jobs in August, in a decline led by notable losses of 16,400 positions in construction and a drop of 9,200 in manufacturing, and the services sector shed 21,200 jobs.[27] The report notes that many of these losses were part-time positions, while the number of full-time positions increased by 40,000 for the month.

Close to Half of All American Families Cannot Afford Their Basic Needs. While the proportion of upper-income earners has nearly doubled, the proportion of poor households also has grown. According to a 2018 study by the United Way, nearly 51 million households (43%) don't earn enough to afford a monthly budget that includes housing, food, child care, health care, transportation, and a cell phone.[28]

> **How might interior designers engage in more conversations related to the most basic and pressing human needs—housing, food, child care, health care, transportation, and communication?**

Middle Class Faces Many Challenges. A new initiative by the Brookings Institution called "Future of the Middle Class" has identified seven trends that are impacting middle-income households, mostly for the worse: income stagnation; declines in wages, employment and labor force participation; fewer prospects for their children; lower median incomes in black and Hispanic households; where they live; decreased sense of wellbeing; middle class families are more fragile and dependent on two-income earners.[29] A new book entitled *Squeezed: Why Our Families Can't Afford America* presents a more in-depth look at many of these same issues, from decline in employment, wages and real income, to the high cost of housing, health care, child care, etc.[30]

> **How might interior design firms address the negative trends impacting the middle class—for both their clients and their employees?**

TREND 03

Dependent Populations

About 15 in Every 100 People Worldwide Has a Disability. About 15% of the world's population (approximately 1 billion people) in 2010 lived with some form of disability, of whom 2% to 4% experience significant difficulties in functioning, according to a 2011 report from the World Bank and World Health Organization.[31] About three-fourths were age 15 or older. It is estimated that between 110 million and 190 million had a "severe" disability, such as quadriplegia, severe depression or blindness.

Disability has increased (up from about 10% of the world population in the 1970s) for a number of reasons (e.g., aging, poor health care or lack of access to health care, war and violence, substance abuse). And the number of persons with disabilities is growing as population aging increases in many countries as does the incidence of persons with chronic health conditions that can lead to disability.

> **What might it mean to go beyond standards of universal design to strategies that encourage extreme accessibility?**

Each person's disabilities are different and affect their daily lives in different ways, and not all disabled persons are equally disadvantaged. Vulnerable populations (i.e., lower income, women, children, and the elderly) experience higher levels of disability and of discrimination because of their disability.

Among its recommendations to enable access to all in order to ensure persons with disabilities can participate fully in all activities and services intended for the general public (aka "mainstreaming"), the report states, "Adopting universal design and implementing reasonable accommodations are two important strategies."

About 13% of U.S. Population and 15% of Canadian Population Has a Disability. Data from the 2016 U.S. Population Survey (all ages)[32] and Statistics Canada (2012, ages 15 and older)[33] show disability rates are similar to other industrialized nations. Physical disabilities are the most common type, in particular those related to pain, flexibility and mobility.

Disabilities tend to increase with age. Women are more likely to be disabled or become disabled than are men. Among ethnic or racial groups in the U.S., American Indians and Alaskan Natives have the highest rate of disability (17.7%), followed by blacks (14.1%) and whites (14.1%). (Data on ethnicity / race not available from Statistics Canada.)

The incidence of disability has been increasing, but only marginally, within the past decade.

How might we fuel a conversation around greater accessibility for all?

Disabled Americans Earn Less Than Those Without a Disability. Those with a disability earned a median of $21,572 in 2015, less than 70% of the median earnings for those without a disability ($31,872), according to the Census Bureau.[34] Disabled persons are less likely to be employed (18.7% in 2017) and more likely to be unemployed (9.2%) – but large number of persons with a disability is over age 65 and thus not active in the labor force participation. Persons with a disability were more likely to be employed part-time or self-employed than were those without a disability.

However, a study published earlier this year, conducted by a multidisciplinary team of researchers at Kessler Foundation and the University of New Hampshire, Institute on Disability, found that people with disabilities are actively engaging in job preparation and job search activities, and successfully negotiating barriers at work.[35] Among its findings, the study states, "Over 42 percent of survey respondents were currently working, with 60.7 percent of those working more than 40 hours a week. Other findings showed that approximately 50 percent of the respondents used workplace accommodations and were satisfied with their jobs, and nearly 90 percent felt accepted in their workplace."

In the 2012 Canada Survey on Disability (cited above), close to half (47%) of 15- to 64-year-olds with disabilities reported that they were employed, compared to 74% of persons not reporting a disability. The self-reported median total income of 15- to 64-year-olds with disabilities was $20,420, compared with $31,160 for those without disabilities.

What is the responsibility of interior designers to design for all abilities—no matter the budget constraints?

Persons with Disabilities Underserved by Health Care Services. According to the World Health Organization, worldwide people with disabilities have a higher need of health care but often lack access to the care they need.[36] Because of their disabilities, they often develop secondary or co-morbid conditions, and there is some evidence that they are more likely to engage in health risk activities, such as substance abuse. In addition, health promotion and prevention activities seldom target people with disabilities.

How might interior designers use a combination of great design—and smart technology—to create access to healthcare for those in need?

Among the barriers to health care experienced by persons with disabilities, the WHO mentions barriers to physical access: "Uneven access to buildings (hospitals, health centers), inaccessible medical equipment, poor signage, narrow doorways, internal steps, inadequate bathroom facilities, and inaccessible parking areas create barriers to health care facilities."

More U.S. Children and Youth Receiving Special Education Services. According to the U.S. National Center for Education Statistics, from school year 2000–01 through 2004–05, the number of students ages 3 to 21 who received special education services increased from 6.3 million, or 13 percent of total public school enrollment, to 6.7 million, or 14 percent of total public school enrollment.[37] The majority of these students had either a specific learning disability (34%) or a speech or language impairment (20%).

How might interior designers address varying abilities in every single classroom?

According to the Learning Disabilities Association of Canada, learning disabilities are the most common type of disability among children.[38] The most recent Statistics Canada data (2006) finds 3.2% of all Canadian children under age 15 have a learning disability, and nearly 60% of children with a disability have a learning disability. Learning disabilities increased considerably between 2001 and 2006 among Canadians aged 15 and over by almost 40%, making it one of the fastest growing types of disabilities in Canada that is not related to aging.

TREND 04

Health, Wellness & Welfare

[NOTE: Additional information on health and wellness trends can be found under the sections on Interior Design & Human Behavior and Interior Design Research Trends.]

Global Health Trends. Outbreaks of disease (pandemic influenza, meningitis, cholera, yellow fever, diphtheria, and malaria), malnutrition, food poisoning, conflicts, and natural disasters are currently the greatest threats to human health, according to the World Health Organization.[39] Dr. Sneh Khemka, president of Population Health for Aetna International, in a piece for *HealthCare Global* magazine, identified several other key trends, including new consumer attitudes toward health care (e.g., digital care, more access and convenience), pollution, opioid addiction, resistance to antibiotics, sharp rise in diabetes, higher prevalence of lifestyle-induced diseases (e.g., cancer, cardiovascular), inadequate and unavailable mental health care, and the disparity in access to and affordability of health care (including the threat or spread of diseases from areas with inadequate care).[40]

> **Inadequate and unavailable mental health care is a devastating global reality—how might interior designers create environments that tend to our mental health?**

U.S. Health Trends. Based on data from a variety of medical and research institutions, most Americans are likely to face one or more of the following health issues during their lifetime: cancer, blood poisoning, Alzheimer's disease, Type 2 diabetes, heart disease, stroke, and/or obesity.[41] Other major health concerns include substance abuse, tobacco use, HIV/AIDS, mental health issues, injury and violence, environmental quality, immunizations (inability or failing or refusing to be immunized), and inadequate access to healthcare.[42] According to the Institute for Health Metrics and Evaluation at the University of Washington, working-age Americans in 21 states from 1990 to 2016 faced a higher probability of premature death due to higher levels of risk related to use of alcohol and tobacco, substance abuse, suicide, and poor diet or nutrition habits.[43]

> **If we believe that our environments have influence over our behaviors, how can interior design be used to nudge healthy choices?**

Canada Health Trends. Drawing on data from the Canadian government, the website Slice identifies the following as the most common health concerns in Canada: cancer, cardiovascular disease, diabetes, injuries, mood disorders, dementia, tuberculosis, autism, hepatitis, HIV/AIDS, sexually transmitted infections, high risk drinking, tobacco use, substance abuse, domestic violence, multiple sclerosis, seasonal flu, pandemic flu, West Nile virus, and Lyme disease.[44] In her message appended to the *Health Canada: 2018-19 Departmental Plan*, Minister of Health Ginette Petitpas Taylor refers to the opioid crisis as "the most significant public health crisis that Canadians have experienced in recent years" and the government's efforts to restrict access to cannabis.[45]

> **What if designers collaborated with public health professionals to discuss the effects of planning and design on the opioid crisis?**

Wellness Trends. Greater focus on wellness and prevention continues to be a leading trend in health, business and lifestyles, as attested to by the nearly $4 trillion global wellness industry. A trends report prepared by the Global Wellness Summit identified current wellness trends as consumer concern with pre-natal and neo-natal health, fresh foods (organic, free-from, and naturally healthy), clean air, extreme wellness (pushing physical and mental limits), happiness as health prevention, and feminist wellness (by women for women).[46]

A survey conducted by Label Insight, a Nielsen partner, found 67% of Americans said they would be prioritizing healthy or socially conscious food purchases in 2018, including free-from, fresh, low sugar, and plant-based foods.[47] In addition, the survey found consumers are increasingly turning to food as medicine, leveraging the health benefits that certain ingredients bring to the table (e,g., protein, probiotic).

Benefits Canada magazine forecast that, along with mental-health awareness training and chronic disease management, top workplace wellness trends for 2018 would be mindfulness, personal wellness coaching, high-intensity interval training, financial wellness, and standing desks.[48]

> **How might we create workplaces and educational environments that make us feel healthier than when we arrived?**

Healthcare Tech. Increasingly, technology innovation is being directed not just at diagnosis

and treatment but at the delivery of healthcare services as well, as providers and governments seek ways to improve access to care for more people more affordably. Mobile technologies, telemedicine, and the digitalization of health records and other patient information make it possible for physicians and providers to monitor patients and deliver more care remotely and in areas currently underserved by medical facilities.[49] A non-profit group called Open MRS solicits computer specialists to volunteer to build software to bring Health Information Technology to developing areas around the world, where, they say, the need for affordable medical software is paramount: "Health IT improves the quality of healthcare delivery, increases patient safety, decreases medical errors, and strengthens the interaction between patients and healthcare providers," and allows governments and medical personnel to better treat and reduce the spread of disease.[50]

How might healthcare technology better integrate with our environments in the future?

Physicians and providers already are using mobile apps to monitor patient behaviors and vital signs and to communicate with patients (AIMS, cited above). Some app developers are looking at ways mobile technologies can be used to encourage wellness behaviors and enhance monitoring to address issues like stress, isolation and depression.[51] One such app, called Ginger.io, provides emotional support coaching and uses AI for pattern recognition in its users.[52] Once the user has established a baseline in the app, if they suddenly change their behavior, a coach contacts them to make sure they are okay.

Wearable technologies, like fitness bands and the Apple Watch, help patients to track their health and fitness activity and indicators, but in the future will be able to monitor vital statistics like a user's heart rate, lung function, the level of oxygen in their blood, and blood sugar, and will even be able to track and alert the onset of degenerative conditions like Parkinson's or Alzheimer's disease.

Suicide Rates in U.S. Increasing for All Ages, in Canada for Women. New data from the Centers for Disease Control show that between 1996 and 2016, suicide rates in the U.S. increased for all age groups older than age 10 and younger than age 75.[53] It is now the 10th leading cause of death in the U.S. Middle age adults are the hardest hit by suicide. Most persons who committed suicide in this period did not have a diagnosed mental health condition, but nearly all were dealing with "life problems" of various kinds.

What if we built mental health considerations into every project, just like physical health?

Anxiety, depression and thoughts of suicide have increased substantially among younger people in recent years.[54] Some experts warn that girls and young women, especially, are experiencing a "gathering crisis" in their mental health linked to conflict with friends, fears about their body image and pressures created by social media.[55] The CDC's latest Youth Risk Behavior Survey (cited above) reports, "In 2017, 17 2% of high school students had seriously considered attempting suicide in the past year. The percentage of students who had seriously considered attempting suicide in the past year increased significantly from 2007 through 2017.

Citing data from Statistics Canada, *Global News* reports incidence of suicide has been increasing since 2000. In 2015, suicide claimed the lives of 3,269 Canadian men and 1,136 women. Men are more likely to commit suicide than women, but, alarmingly, the rate of suicide rose faster among women between 2000 and 2015 (up 15% for women vs. 12% for men), and experts are not sure why.[56]

Tech-Induced Health Problems. An article in *Forbes* magazine from last December cites several research studies documenting the mental health risks of mobile phone addiction.[57] In addition, heavy use of mobile devices and other technology is increasing incidence of light sensitivity, eye strain, neck pain, and hearing loss.[58] Higher incidence of anxiety, depression, suicide, and other mental health disorders have been linked to frequent social media use, especially among girls and young women (as related above). According to Jean Twenge, a professor of psychology at San Diego State University and author of the book iGen, these conditions are more prevalent in younger people, who use these technologies more intensely.[59]

How are new tech behaviors creating different demands on ergonomics?

Given the controversy around the use of mobile technologies and social media, the Pew Research Center and Elon University's Imagining the Internet Center queried technology experts, scholars and health specialists on this question: *Over the next decade, how will changes in digital life impact people's overall well-being physically and mentally?*

Of the 1,150 experts who responded, some 47% predict that individuals' well-being will be more helped than harmed by digital life in the next decade, while 32% say people's well-being will be more harmed than helped. The remaining 21% predict there will not be much change in people's well-being compared to now.[60]

Care Services Not Ready for Silver Tsunami. Despite the considerable amount of media attention given to the aging of the Baby Boom generation, governments, institutions and private enterprises that provide assistance, support and services to the elderly are unprepared for the vast numbers of older persons who will be reaching their late 70s and early 80s by the year 2030. In a recent article published in *The Elder Law Journal*, Sharona Hoffman, the Edgar A. Hahn Professor of Law at the Case Western Reserve University School of Law, states, "If American society does not prepare for the tens of millions of baby boomers who will become elderly in the coming years, the consequences will be grave in terms of suffering, costs and lives lost."[61] An article in the *Times of San Diego* about a looming resource crisis stemming from a rise in the incidence of dementia in the elderly, cites data from the Alzheimer's Association that one in six Americans is expected to develop dementia, and care can be expensive enough to force even middle-class families into poverty and onto the public payroll.[62]

> **How might interior designers balance demand for innovative, high-tech environments with the needs of our growing elderly population with sensory sensitivities?**

As part of its Aging 2.0 initiative to engage businesses and entrepreneurs in embracing the market opportunities related to meeting the needs of an aging population, the Milken Institute Center for the Future of Aging has identified eight "Grand Challenges" facing today's and tomorrow's older population: engagement and purpose, financial wellness, mobility and movement, daily living and lifestyle, caregiving, care coordination, brain health, and end of life.[63]

TREND 05

Emerging Technologies

Growing Use of Innovative Technologies in Built Environment Industry. Continuing the trends reported in the last two previous Future Scans,

builders, architects and designers are increasingly employing the latest technologies (e.g., 3D printing, wearable devices, virtual reality, artificial reality, artificial intelligence, drones, and robotics, etc.) in their creative processes, construction techniques, project management, and visualization techniques.[64] A few examples:

- San Francisco-based startup UpCodes earlier this year launched UpCodes AI, a software plug-in which uses artificial intelligence to run a "spell check" on a BIM model's code compliance by flagging violations.[65]

- Stanford University startup Alice Technologies has developed an AI assistant for managing construction projects. Dubbed ALICE, it applies a set of rules developed by construction personnel to generate millions of scheduling scenarios within minutes. It then charts the best dozen or so options — each with its own 4D model (3D model integrated with scheduling data) and Gantt chart — along a time-cost curve for stakeholders to review and choose from. It is estimated using ALICE could reduce project time and costs by as much as 15%.[66]

- Extending the BIM toolkit with virtual reality and augmented reality can help construction managers find and manage design coordination errors. VR lets the viewer inhabit the design, move around inside it, and feel like you are there. More importantly, everyone seeing the VR model will interpret the space in much the same way.[67]

- An article in *Architectural Digest* finds that while some architecture and design firms, as well as vendors, are exploring the potential of virtual reality (VR) and augmented reality (AR) technologies to enhance the visualization experience for customers and clients, the technologies are as yet too novel and somewhat unwieldy for mainstream use at present.[68]

- At the start of the new year, ArchDaily reported on five emerging trends in careers in architecture technology. They are: chief technology officer, immersive reality modeler, virtual simulation designer, haptic interface designer, and data scientist/analyst.[69] Remarks the author of the article, "The design community is just scratching the surface of the potential of new technologies. Designers who recognize this and invest in building skills and expertise to maximize the use of these tools in the future will inherently become better architects, and position themselves for entirely new career paths as our profession evolves."

In addition, large-scale data collection and data mining are becoming more common as part of the programming and ideation process. States Jeremy Myerson, the Helen Hamlyn Chair of Design at the Royal College of Art, in a article for *Metropolis* magazine: "Architects and designers have always worked off data, such as org charts, head counts, or net usable space on floor plans. But soon they will have much more dynamic big data to create spaces: building occupancy, email, calendars, meeting room data, all kinds of things. This information is going to allow them to map organizational networks over physical office landscapes."[70]

As our design processes evolve to incorporate new technology, data collection, and data mining tools, how might a user's relationship change with their physical environment?

Voice-activated Environments. The popularity of voice-activated controls, such as Apple's Siri, Amazon's Alexa, and Google Assistant, and the various products that employ them, is growing demand for voice-activated systems in the built environment (e.g., lighting, temperature, entertainment devices, appliances, security systems).[71] Not just homes but some hotel chains have incorporated this technology in their rooms.[72] Marriott, for example, has been testing Apple's and Amazon's voice assistants in some of its rooms in the Aloft hotel in Boston.

How does voice control change how we interact with interior spaces?

Block Chain. Although much of the focus on block-chain technology to date has been focused on crypto-currencies like BitCoin, it has the potential to revolutionize many other sectors where transparency in record-keeping is a priority, such as real estate, accounting, contracts, and asset transfers (e.g., wills and trusts).[73] For example, a recent article for the website HospitalityNet describes a number of ways blockchain can benefit the hospitality industry, from making bookings more convenient to improving network security and stability.[74]

How might block chain improve building and construction?

Tech Fusion. As many developing technologies are maturing and becoming more widely available, one of the burgeoning areas of innovation is looking at ways these different technologies—like big data,

robotics and AI—can be combined to produce more sophisticated machines, devices and products capable of "learning" and more autonomous and interactive activities. Consulting group Gartner refers to this the entwining of people, devices, content, and services as "the intelligent digital mesh" and sees it as the foundation for the next generation of digital business models and ecosystems.[75]

If you could imagine a new environment without barriers between the physical and digital world, what would it look like? Who might benefit?

TREND 06

Cyber and Physical Security

Protecting Occupants from Violent Acts. Given the high number of incidents of shootings and violence in schools and workplaces in the past couple of years, it's not surprising that much attention is being paid to how design can help to prevent or reduce the impact of such occurrences, as well as to protect occupants during such occurrences. Recommendations from recent articles include the following:

- *Interiors + Sources* magazine interviewed Sean Ahrens, security market group leader for Affiliated Engineering Incorporated, and Julia McFadden, AIA—associate principal at Svigals + Partners who recently designed the new Sandy Hook Elementary in Newtown, Conn.—to get their advice on how to use design and technology to create safer schools.[76] They suggest creating a welcoming vestibule to control traffic going in and out of the school building, reviewing sightlines to ensure shooters remain visible but students and faculty can hide, reinforcing walls with everyday items like cubbyholes, and using the latest, most advanced safety products and technologies.

- A blog on the website of architecture and engineering firm BRPH says environments can be made safer by employing natural surveillance (windows, lighting, views), natural access control (fencing, entry control), and natural territorial enforcement (maintaining orderly grounds), along with other components such as mechanical surveillance and access controls.[77]

- In addition to these recommendations, an article for *Building Design + Construction* lists several other specific strategies to improve school safety, including locking systems, fire alarms, laminated

glazing, better school communication systems, and creating concentric rings of control to increase the number of obstacles an intruder would encounter.[78]

- Explaining that security works best when it is least disruptive, architect Marc Gordon, interviewed for an article in *Architectural Digest*, states, nowadays, "security measures are more holistically part of an overall design aesthetic, and better integrated even as they become more effective." Security elements are now "architectural, streamlined, and use materials like automatic LED-edge-lit glass gates and stainless steel, and can be customized with different materials to match the building's design aesthetic."[79]

Schools are not the only environments that have experienced violent attacks. Recent incidents such as the Navy Yard assault in Washington, D.C. in 2013 and the mass shooting that took place in October 2017 in Las Vegas demonstrate that any building used by or accessible to the public needs to integrate security measures into its design.

What if interior designers ensured that the perception of security is just as important as physical security for the creativity and learning of the next generation?

Building Resilience and Cyber Security. A technical briefing produced by the Institution of Engineering and Technology examines potential threats during the lifecycle of a building that may occur due to the convergence of building resilience (as a result of siting, surrounding environment) and cyber security technologies. The briefing describes the 20 critical controls that should be applied to address threats to both intellectual property/commercial data and to the design and operation of building systems.[80]

What does it mean to design a cyber secure building?

Design for Emotional Safety. An article in *WorkDesign Magazine* discusses ways in which the workplace can be designed to reduce the risk or incidence of emotional threats, such as sexual harassment or bullying. These include providing open workspaces, allowing employees to work where they feel most comfortable and secure, making sure all spaces are well lit, using glass fronts on offices and conference rooms, and installing panic buttons.[81]

What role can interior design play in reducing emotional threats, such as sexual harassment or bullying?

Cyber Warfare and Espionage. A new book, *The Perfect Weapon: War, Sabotage, and Fear in the Cyber Age*, by Peter Sanger, national security correspondent for *The New York Times*, examines not just current techniques of cyber warfare and the vulnerability of government systems, but also the broader range of controversies that flow from advances in information technology, such as violations of privacy and the spread of misinformation by foreign governments.[82]

How do we create more secure environments, in increasingly intertwined physical and digital worlds.

Cyber Vulnerability. More and more, the built environment is incorporating systems, fixtures, and devices that are controlled by some type of information processing device, either through a cable connected to an internet server or via wireless or Bluetooth technology, making them more vulnerable to hackers and cyber attacks.[83] Studies show that electronic hotel door locks, for example, can be easily hacked.[84] An article in *The New York Times* reported on how app-controlled smart home devices, such as thermostats, lighting controls, door locks, or voice-activated assistants, have been used by former partners to stalk or abuse their exes.[85]

Thus, builders, designers, IT technicians, facility managers, and security personnel need to employ additional safeguards and monitoring to detect possible threats to systems and occupants where such technologies are being incorporated into the built environment.[86] An article posted on the Designing Buildings Wiki website outlines how to assess buildings for potential vulnerabilities and steps to take to increase security.[87]

What is the responsibility of interior designers to protect building occupants when integrating connected technology?

TREND 07

Neuroscience and The Built Environment

Programs and Certifications in Neuroscience for Architecture. The New School of Architecture & Design in San Diego, Calif., offers a certificate in neuroscience for architecture, which includes classes, seminars and studio work, and this year launched a three-day Neuroscience for Architecture, Urbanism, and Design Summer Intersession Program for professionals and post-graduate students. According to the program description, participants develop a working knowledge of the brain and learn about aspects of its ability to process spatial cues.[88]

Ongreening, a website devoted to green building, announced that the University of Architecture of Venice in the fall of 2017 launched a unique 9-month master's program – Neuroscience to Applied to Architecture Design – offering architects and designers the opportunity to explore the link between neuroscience and architectural design.[89]

The University of East London held an international conference in March 2017 entitled "Between Data and Senses: Architecture, Neuroscience and the Digital Worlds," exploring how the mapping of the brain response can help designers gain a better understanding of human experience in spaces.[90] In January 2017, A&E firm Stantec hosted a presentation at its Toronto office entitled "Cognitive Neuroscience: Understanding the Impact of the Environment on User" during which a Ph.D. candidate from the University of Waterloo who researches how space affects our brains and bodies shared findings from some of his experiments on visual complexity.[91]

> If we know more about the brain than ever, why don't we design interior environments differently than we did 50 years ago?

Application of Neuroscience to the Built Environment. Within the past couple of years there has been increased interest in the application of neuroscience to the built environment, in particular in regards to how the built environments impacts, or can be designed to impact, occupants' response to their surroundings, what some (e.g., the AIA, Gensler) are calling "experiential architecture."[92] This can be seen in the more frequent coverage of the topic in the industry media and in academic journals. Some examples are:

- **Research Journal Articles:** Coburn, Alex, et al. (2017). Buildings, beauty, and the brain: A neuroscience of architectural experience. Journal of Cognitive Neuroscience, May 11, 2017, 1-11. Maleki, Mohammed Rezi; & Bayzidi, Qader. (2017). Application of neuroscience on architecture: The emergence of a new trend of neuroarchitecture. Kurdistan Journal of Applied Research, 2:3, 383-396. Banei, Maryam, et al. (2107). Neural correlates of mobile EEG and the built environment. Asian Journal of Environment – Behaviour Studies, 2:3, 67-75. Dance, Amber. Science and culture: The brain within buildings. PNAS, 114:5 (2017), 785-787.

- **Trade Journal Articles:** Pedersen, Martin. How architecture affects your brain: The link between neuroscience and the built environment. ArchDaily, July 25, 2017. Fisher, Thomas. How neuroscience can influence architecture. Architect, October 6, 2016. Smith, Susan. Neuroscience instills human response in built environment. AEC Café. Blog. May 4, 2017. Park, Stephanie. Neuroscience and architecture. GenslerOnWork. Blog. Gensler. December 20, 2016.

- **Popular Media Articles:** Levy, Nat. The secret science of your office space: How architects are using neuroscience to make workers healthier and more productive. GeekWire, March 21, 2017. Bond, Michael. The hidden ways that architecture affects how you feel. BBC Future, June 6, 2017. Mustatea, Kat. From neuroscience to design: A career in connecting the dots. Forbes, August 7, 2017. Barr, Sabrina. The colors you paint your walls can impact your mood, and here's the science to prove it. Independent, September 16, 2018.

- **Applied Research:** As of yet, more has been written about the potential application of neuroscience to architecture and interior design than has been demonstrated outside of a lab setting. A presentation abstract from IDEC Conference Proceedings entitled "Use of Neuroscience in Interior Design: Impact of Lighting Color Temperature on Attention Deficit Hyperactivity Disorder (ADHD) Subjects" is one of the few testing a link between an interior design element (lighting), neural response and behavioral response.[93]

A firm in Denmark called Neurons, which bills itself as "an applied neuroscience company," has a video on its website called "The Brain on Architecture" based on a study it recently conducted in the United Arab Emirates to understand how people subconsciously and consciously respond to urban developments and landscapes from around the world.[94]

Using stationary eye tracker technology and an EEG brain monitor, the study collected more than 1 million data points of subjects' responses to various images of different environments. It found that while subjects consciously reported liking vibrant environments with lots of social activity, their subconscious response showed that settings with simple, low-level activity, greenery and artistic features are the most powerful drivers of emotional engagement.

> **How might advances in neuroscience influence how we collect information about our existing environments?**

A presentation delivered at the 2016 conference of the Academy of Neuroscience for Architecture (ANFA) entitled "Empathic Response in Office Space: The Notion of Embodied Simulation in Corporate Interiors" drew on evidence from neuroscience research, according to which the experience of architecture is based on a complex relationship between the body, its sensorimotor system, and architectural space. The presenters contend, "Interiors and their users are inseparably tied, as embodied simulation defines users' basic relationship with space." This has implications, for example, for the placement of furnishings and objects in the workplace: "Such a perspective in cognitive neuroscience describes a new model — opposite to the computational view positing perception, cognition and action as separate domains — according to which the same motor circuits that control the motor behavior of individuals sitting at their desk also map the space around them, and the objects at hand in that very same space with their shape, size, orientation and distance from the perceiver."[95]

At the 2014 ANFA Conference, a team of researchers from the University of California, San Diego, reported on an international collaboration between experts in visual neuroscience/perception, child development, and design, through which the researchers created a set of visual interiors for child daycare centers in Belgium.[96]

Higher Education/Design Education

Decline in State and Federal Funding for Higher Education. A report by financial and management advisors Alvarez & Marsal states that more of the cost burden of higher education is being shifted to students and their families.[97] According to the report, state funding of public higher education institutions in the U.S. declined by 16% between 2008 and 2017, while the cost of tuition has risen sharply and household incomes have remained relatively flat. Though student loan debt has grown substantially, federal student loan and other assistance programs face an uncertain future in the current administration. One consequence has been a decline in enrollments in colleges and universities.

> **How might educators communicate the ROI of an interior design education from an accredited program?**

States Addressing Ways to Assist Students with Student Loan Issues. With federal protections for student borrowers in jeopardy, some states are now undertaking measures to assist students burdened with loans and protect them against risky private lenders. According to the National Conference of State Legislatures, in 2017 California, Connecticut, Maine, Minnesota, North Dakota, Iowa and Rhode Island had all passed or drafted legislation that allows state residents to refinance their existing education debt at lower interest rates, often through state student loan authorities.[98]

Student debt is a huge problem in Canada as well. However, there both the national and provincial governments have taken steps to relieve student debt and make it easier to pay off. According to an article from the *Financial Post*, governments in Canada have taken steps to make student debt easier to pay off by increasing to $25,000 the minimum annual income that graduates must earn before they are required to start making payments towards their debt.[99] Even so, the current government has been forced to write off C$200 million dollars in outstanding student loans on which it will never be able to collect.

> **How might we increase the market value of interior design expertise?**

Surge in Freshman Attrition. An article in *The Chronicle of Higher Education* states that, on top of declining enrollments, colleges and universities are experiencing on average a one-third loss of freshman-year students, causing administrations to renew efforts to beef up retention rates.[100] A Chronicle special report presents a case study of one college that has used a holistic approach that combines financial support with enhanced advising, earlier identification of struggling students, and a focus on fostering a sense of belonging to keep freshman from leaving.[101]

Canadian Universities Excelling. Unlike the U.S., Canada has a high post-secondary education enrollment rate – among the highest in the world – and attracts both the children of recent migrants and many international students.[102] According to an article by the BBC News, at university level, Canada has the world's highest proportion of working-age adults who have been through higher education - 55% compared with an average in OECD countries of 35%.[103]

Is Higher Education on a Downward Slope?
An article published in June in *The Atlantic* considers whether, as one futurist forecasts, institutions of higher education have hit their peak and enrollments will continue to decline in the years ahead. If so, suggests the article, either government entities will need to invest more in higher education or some institutions will fold due to insufficient enrollments.[104]

How might we create a more fluid connection between education and practice?

Sounding a similar note, addressing a *New York Times* Higher Ed Leaders Forum in June, Allan Golston, president, U.S. Program, Bill & Melinda Gates Foundation, remarked, "Higher education has historically been — and still is — an important bridge to opportunity and an engine for economic and social mobility. And for many people, that seems inaccessible. Either it doesn't meet the needs or it doesn't seem like it's a place for me or it's unaffordable. So building on that, I think as a system there's a view that it's not keeping up, it's not supporting and meeting the needs of students."[105]

An article in *The New York Times* relates that the market for higher education is mostly local. Yet, approximately 11 million Americans live in "education deserts" that are more than an hour's drive from a public college that accepts at least 30 percent of applicants. And millions more have sparse options, such as a single community college.[106]

In an op-ed piece for *The Washington Post*, Dalton Conley, Henry Putnam University Professor of Sociology at Princeton University, proposes a lottery system would make admissions procedures more egalitarian and improve enrollments.[107]

Online Learning Growth Expected to Taper Off by 2020. A study released earlier this year, produced by Learning House and Aslanian Market Research, predicts the rapid growth of online learning in higher education will likely ebb and even off by 2020, largely due to competition.[108] Overall, participating students are satisfied with the cost and quality of online courses and degree programs. Nonetheless, one of the study's authors in an interview noted that universities and colleges should look to lower the price of online programs but also market them to show value as competition mounts.

How might interior design educators use online education tools to spread the value of our expertise to non–designers?

Growth in Higher Education Employment.
According to an analysis of U.S. Bureau of Labor Statistics data by HigherEdJobs, a job and career website for education professionals, higher education employment increased 0.6%, or roughly 24,200 jobs, during the fourth quarter of 2017.[109] This is in contrast to the decline a year ago in Q4 2016 when they decreased 0.2%, or about 8,100 jobs. On an annual basis, higher education jobs increased 0.6% in 2017, the largest annual gain since 2012.

Applying Hi-Tech to Learning. Schools are now experimenting with employing new technologies like virtual reality, artificial reality and artificial intelligence, as well as using mobile devices and providing specialized mobile apps as learning aids. According to the EDUCAUSE Center for Analysis and Research, among the relatively new technological investments colleges and universities are spending the most time implementing, planning, and tracking are use of mobile devices and mobile apps in teaching and learning, use of application program interfaces (APIs) for software programming, and use of big data collection and analytics to track and analyze student progress and success levels.[110]

Reporting on potentially disruptive trends in higher education, an article on Education Dive observes, "As institutions take the idea of virtual immersion via mobile apps even farther, the use of both augmented and virtual reality as a recruiting and teaching tool will become critical to not just

students' ability to compete in a global marketplace, but institutions' as well."[111] A study conducted at the University of Maryland found that people remember information better if it is presented to them in a virtual environment, compared to when it is delivered via computer or hand-held tablet.[112]

How might educators leverage augmented and virtual reality in recruiting and teaching?

Developments in Interior Design Education. In addition to these macro changes and trends in higher education, the following developments in interior design education are noteworthy:

- Colorado State University recently changed the name of its interior design major in the Department of Design and Merchandising to interior architecture and design. An article on the school's website explains, "Around the country, 24 peer institutions with accredited interior design programs have renamed their programs to 'interior architecture' or 'interior architecture and design.' This national shift reflects the increasing responsibilities...that require interior designers to have technical knowledge of building structures and systems."[113]

What does it mean to be an interior designer in a STEM learning culture?

- A presentation delivered at the International Conference on Innovations in Business, Economics, Management, Social Sciences, held in Kuala Lumpur, Malaysia in January, reported on a research study on blended learning (i.e., classroom and e-learning) involving 90 final-year interior design students.[114] Findings from the study, based on a questionnaire, showed positive responses in students' perceptions and acceptance of the blended learning implementation and its encouraging students to become more constructive and productive. Students reported that blended learning in the interior design studio maximized their engagement in the learning process.

- A research study examined how a student's creativity, spatial ability, and visual cognitive styles relate to design studio performance, measured by grade. Fifty-nine freshman architecture and interior design majors' creativity, spatial ability, and visual cognitive style were measured using a battery of testing instruments. Analysis revealed no correlations between studio course grade and the observed scores; but a positive correlation existed between general spatial abilities and visual cognitive styles.[115]

- A paper delivered at ServDes2018: Service Design Proof of Concept in Milano, Italy in June reported on two case studies drawn from some innovative interdisciplinary programs developed at the School and Department of Design at the Politecnico di Milano, crossing the areas of interior and spatial design with service design, through design thinking, and user- and community-centered design.[116] In the presentation abstract, the authors state, "The contemporary state of Interior Design education is being affected by changes in the professional realm that requires more and more a user/community-centered design to prevent failure in the use phase and to increase the citizen participation in designing their own city-environment. The modern design curriculum is structured to educate students who will go into the field and serve clients and employers effectively and also can lead the market as a change-maker."

- An article in the latest issue of the *Journal of Landscape Research* contends that students studying commercial building design need to experience construction as part of their learning process. In the abstract, the author argues, "Experiencing construction is considered as an important content in the teaching process to obtain better teaching objectives by means of design thought of 'theme setting--physical manifestation--emotional experience,' and assist students to set up design approach adjust to the new market demand."[117]

- A paper published in the *International Journal of Technology and Design Education* presents the results of a study that examined interior design students' implementation of cultural knowledge and identity features in their graduation projects before and after access to the internet.[118] The authors conclude that, contrary to the notion that the universal nature of the internet reduces students' sense of cultural identity, it can lead to opening new horizons of dealing with cultural identity and heritage and integrating them into an architecture that is both contemporary and reflective of its locale's unique identity.

TREND 09

Interior Design & Human Behavior/ Occupant-Centered Design

Impact of Interior Design on Human Health and Wellness. With so much focus on healthy living and wellness, more coverage is being given to ways in which the design of the interior environment (workplace, home, hospitality, healthcare, education) impacts health (physical, mental and emotional), wellness, and quality of life, either for the good or for the bad.

Some recent examples: *Builder* magazine did a feature called "The Future of Healthy Living Comes Home" (August 13, 2018). *Lodging* magazine had an article on how hotels can meet the standards for global wellness with design (July 16, 2018). *The Journal of Building Research and Information* published an information paper entitled "Healing Built-environment Effects on Health Outcomes: Environment–occupant–health framework" (January 10, 2018). *The Construction Specifier*, the magazine of the Construction Specification Institute, reported on the new ASID headquarters with an article entitled "Improving Workplace Health through Design" (January 5, 2018). Taking the opposite tack, website OfficeSpace highlighted "6 Ways a Bad Office Design Stresses Out Workers" (May 22, 2018). Premier, a news resource for the construction, hospitality, and retail sectors in the United Kingdom, looked at the trend of using biophilic interiors in hospitality venues and the positive effect on guest well-being (September 4, 2018). Art and design website Wallpaper.com posted a piece on why thoughtful kitchen design is good for your health (July 20, 2018).

An article for *Interior Design* magazine entitled "Interior Designers Champion the Wellness Movement" states, "As was the case with the sustainability movement, designers have assumed a leadership role as early adopters and change agents, pushing the envelope in strategic ways to galvanize the market." The article cites data from an *Interior Design* survey that 69% of clients are "extremely" or "very" willing to invest in a wellness-promoting space.[119]

SABMag, a trade publication devoted to sustainable architecture and building, published a CEU-credit article for practitioners entitled "Designing Interior Environments that Support Human Health." The article looks at how designers can create interior environments that promote human health, wellbeing and productivity of the occupants. It talks the reader through the various aspects of interior design that impact human health and wellbeing, and introduces strategies that can help achieve a healthier indoor environment.[120]

How might we leverage the overlap between wellbeing and sustainability?

Designs That Improve the Quality of Healthcare. Another health-related area getting attention is the role of interior design in health care environments in regards to protecting and improving patient and staff well being. *The Epoch Times*, an independent, international news source, ran an extensive article entitled "How to Build a Better, Safer, More Welcoming Hospital" co-written by Leonard L. Berry, a university distinguished professor of marketing at Mays Business School and a senior fellow at the institute for healthcare improvement at the Texas A&M University, and D. Kirk Hamilton, professor of architecture at the Texas A&M University (July 24, 2018). The journal *Management in Healthcare* published an article "Hospitals that Heal: Why Evidence-based Design Matters" (1:4, Spring 2017), which states as its premise, "There is an increasing realization that the physical health care environment in which we deliver care can influence a patient's illness, recovery and wellness for decades to come."

On more specific topics, Kari Thorsen, interior design principal with ZGF, wrote a piece for Building Design + Construction on five ways design is transforming behavioral healthcare – including circadian lighting, calming materials, naturescapes, and transparency (July 11, 2018). Rebecca Sanders, a healthcare principal with design firm HGA, is quoted in an article for *Behavioral Healthcare Executive* on how design can provide protections for specific patient populations (August 7, 2018): "Good designers understand the goals, objectives and principles of a behavioral healthcare practice, its program and its philosophy for providing care." And Lynnette McCurdy Tedder, senior associate, Healthcare Interior Practice Leader LA at Perkins+Will, contributed an article to *Contract* magazine on spiritual design in healthcare, in which she states, "As designers seeking to create efficient, highly functional, and patient-centric healthcare environments, making space for spiritual rejuvenation and restoration should be a priority for all of us" (April 16, 2018).

> **How might interior designers become more aware of the spiritual needs of patient populations?**

How Interior Design Influences Behavior. Similar to wellness, there is increased interest in the media in how the design of the interior environment can positively or negatively affect human behavior, especially as it relates to workplace issues (e.g., productivity, innovation, attitude and mood, engagement, stress). QPractice, a website for designers preparing to take the NCIDQ exam, posted an article on human behavior and the designed environment that begins, "Interior design requires a deep knowledge of human behavior—physical, psychological, and cultural...Any interior space directs human behavior. This is especially true for educational, medical, business facilities, or spaces where there is social interaction" (July 29, 2018).

> **In what ways could designers leverage the knowledge of experts in human behavior and psychology?**

A great deal of attention is being paid to how workplace environments affect workers. In a series of articles on "design for people," *WorkDesign Magazine* examined two current approaches to designing workplaces to affect employee behavior, speculating that "if spaces truly shape or, at a minimum, reinforce human behavior, then it should be possible to design work environments to achieve a set of predetermined outcomes" (August 9, 2018). In preparation for NeoCon, Interior Design looked at how manufacturers are creating products to support designs that inspire creativity in the workplace (June 7, 2018). *Forbes* magazine ran an article by interior designer and vice president of sales, Architecture and Design, Haworth North America, Lynn Metz called "Where I Sit Can Make Me More Innovative."

At the intersection of workplace and healthcare, *Health Facilities Management* in its interiors department addressed the topic "Designing for Staff Efficiency: Interior Design Strategies That Help Hospital Staff to Provide Timely and High-quality Care" (May 3, 2018).

Popular media have tapped into research on the ways in which interior design in the home can affect residents' mood and emotional well-being. *The New York Times* reported on how paint choice can impact quality of life (June 22, 2018). Lifestyle website Elite Daily did a story on how your bedroom affects your mood and well-being, drawing on an interview with a "designer and wellness-driven architect" (June 5, 2018). Helping readers to escape the winter doldrums, *The Globe and Mail* offered advice on how using light in interior design can brighten your mood (February 1, 2018). Healthy lifestyle website Mind Body Green provided tips on using design to create an emotionally supportive and happiness-inducing home (n.d.).

Gender-specific Needs and Design. A recent article for *Building Design + Construction* reports on how schools are using design solutions to support the gender-specific needs of students in middle schools in regards to their learning and socialization development.[121] The authors contend, "Based on the changes that students experience in early adolescence, we can start to identify the different kinds of spaces that might help the ease of these changes. Social-emotional learning in teenagers can be supported or inhibited by aspects of the physical environment." They then go on to explore the design implications of this approach in creating education spaces.

> **How should designers approach gender-specific needs in an increasingly gender fluid world?**

Interior Design Research Trends

Macro Trends. Healthcare and workplace environments remain those most researched. Nearly two-thirds of all published interior design-related research studies in the past year-and-a-half have focused on one or both of these environments.[122] The other environments (i.e., education, hospitality, institutional, residential, and retail) each comprise only about three to four percent of all studies. For all environments, most studies examined the effect of the interior environment on occupants (e.g., behavior, health and wellness, cognition and creativity, or satisfaction with or response to the visual environment). Few studies examined occupant safety or injury prevention, or innovations in design practice. As discussed in more detail below, most studies are not conducted by interior designers or interior design educators.

> **How might interior designers and educators approach environmental research in a more expansive, actionable way?**

Focus on Health & Wellness. In the past few years, research on healthcare environments for the first time has outpaced research on workplace environments. Much of this research has been focused on occupant health and well being (patients, staff, families of patients) and how the physical environment may positively or negatively affect outcomes, such as healing rates, reduction of stress and anxiety, safety, and employee performance (productivity, communication, collaboration).

Should the next generation of future designers also become experts in environmental research and data analysis?

The recent trend toward occupant-centered design in commercial spaces has led to more research on how workplace environments may positively or negatively affect employee health and well being, including stress, mood, cognitive function, ergonomics, interior environmental quality (air, lighting, temperature), and comfort (visual comfort, acoustic comfort, physical comfort). As with healthcare, these studies often examine health and wellness issues as they relate to employee performance outcomes (productivity, satisfaction, communication, innovation, and knowledge-sharing) as well as to rates of illness, absenteeism, and employee turnover.

Color Dominates Residential Design Research. As they have for many years, studies on the use of color tend to outnumber those on other topics for the relatively few that focus on residential design, primarily on how color effects occupants' mood and/or well-being. Interest in healthy homes as yet has not led to much research, but many articles on the topic draw on research not specifically conducted in a residential environment.

How do residential interior environments impact occupant wellbeing?

Using Virtual Environments as a Design Tool. Results of a study using virtual environments on the effect of interior design elements and lighting on prospective occupants' perceptions of amenities and efficiency in living rooms, published in the journal *Sustainability*, found that interior design elements such as the quality of materials, surfaces, and colors had little effect on subjects' preferences for one environment over another in regards to satisfaction and affordability.[123] However, the authors note that the study had limitations and suggest that virtual environments could be a valuable tool through which

prospective occupants can provide feedback on proposed designs before they are finalized and constructed.

How might the use of virtual environments as a decision-making tool impact the design process?

Using Crowdsourcing as a Design Research Tool. An experiment reported in the J*ournal of Building Engineering* employed crowdsourcing to investigate which architectural design features people notice immediately as they enter a space.[124] Statistical analysis on around 400 subjects' data show that certain features such as the openness of space, presence of windows and daylighting, flexibility in isolation/socialization, level of artificial lighting, density of spaces, and color of surfaces are easy to notice by people and are also powerful to change the human experience.

What new technology and tools should interior designers explore to collect unique data about the relationship between people and place?

Few Interior Design Researchers. Although interior designers and A&D firms increasingly are using evidence-based research to inform their design solutions, the vast majority of research studies relevant to the practice of interior design (excluding historical research, pedagogy, case studies, and post-occupancy evaluations) are not conducted by interior designers or interior architects. A content analysis of indices and articles in the *Journal of Interior Design Education and Research* (JIDER) and the *Journal of Interior Design* (JID) from 1975 to 1997 found that the most-often published subjects pertained to pedagogy/program development, professional practice, and history, not to research on interior environments.[125]

As noted below, some larger A&D firms now conduct research projects, but many of these even rely heavily on literature reviews of studies conducted by researchers from fields other than interior design or architecture. The same is true of most research-based white papers produced by manufacturers and professional organizations or institutions.

There are many reasons why this is the case, including a lack of time, funding, client cooperation, and the applied learning approach of interior design practice. Another, perhaps, was raised by some graduate students in sustainable interior environments, as related in *Metropolis* magazine[126]:

As designers we are constantly asking questions, both large and small, general and specific. Who are the users of a space? What kind of design will provide them with a functional yet beautiful interior environment?...

To answer these questions, we perform what we think of as research. We make some phone calls or log onto the Internet to find the information we seek – often with wildly varying degrees of success. To address the bigger questions, we consult programs and meet with clients and users and delve into our own creative pasts to develop design solutions that are uniquely suited to a particular place at a given time. There's one question, though, that we don't seem to ask ourselves nearly often enough: Why?

Why, for instance, does the built environment affect patient outcomes in hospitals? Why is there a disconnect between what design students think they know about sustainability and what they actually know about how it works? Why do green buildings seem to enhance worker productivity?

Related to these observations, a study of interior designers' research utilization strategies and information-seeking behaviors involving 104 commercial interior designers and design managers, published in the *Journal of Interior Design*, found that while they had a general interest in acquiring information, most reviewed information very rapidly.[127] In addition, more inexperienced designers were more likely to use information to confirm beliefs rather than explore a problem. Among other conclusions, the author suggests, "Design educators may wish to emphasize the application of research in studio settings."

Creative Practice as Applied Research. An op-ed piece leading off a special issue of the *Journal of Interior Design* entitled "Elocutions, Elaborations, and Expositions of Interior Design Creative Scholarship," proposes that the academy "adjust the working definition of 'research' to include creative practice."[128] Somewhat conflating experimentation with research and the publication of research findings ("text") with research activity, the author goes on to explain, "This paradigm of research includes interior design as a creative process with the capacity to manifest new knowledge, innovation, and/or aesthetic refinement." The author does not address how "the pursuit of critical, reflective, creative activity" or the use of story, both powerful means of conveying knowledge, meet the standards of empirical research, a particular form of knowledge.

What are the opportunities for better research in the physical environment? And, perhaps more importantly, what are the limits?

A&D Firms Adding Research Components. Most A&D firms these days promote themselves as employing research methods and evidence-based design approaches in their practice. Besides being good practice, more and more clients are demanding it. In an interview conducted for *Design Intelligence*, Tim Carl, CEO of HGA, relates part of conversation he had with a prospective client, in response to an RFP for work at the client's university[129]:

> ...while listening is a differentiator in our field...,it is not enough. In the higher education world, they are trying to address rapidly changing needs and solve often unprecedented challenges. To be successful, [she told me] her consultants need to bring a rigorous process that, in addition to listening, helps them think differently about the challenges they are facing.
>
> Increasingly our differentiator will be a research-based approach to our work that understands the intersection of social and technological developments with market specific challenges. Our process must delve deeply and specifically into a client's world, employing a host of tools to understand what is critical to the quality of our work with each.

For that reason, some of the larger firms, such as Gensler, Perkins & Will, MORE Architecture, The Living, Kieran & Timberlake, and others, have added research departments, divisions or institutes. The types of research being conducted vary considerably, from construction techniques and materials to the impact of particular environments on occupants. Some publish results from their research; others do not. Some present their findings at professional conferences and trade shows.

How might design firms be incentivized to contribute to architecture and interior's shared body of knowledge?

TREND 11

Other Interior Design/Built Environment Trends

Design for Social Innovation. In an interview conducted for *Metropolis* magazine, advertising professional Cheryl Heller, the founding chair of the MFA in Design for Social Innovation at the New York School of Visual Arts, observes, "Designers are taught tools and they're taught self-expression. But they're never taught what to do with their work. Right?

How do you use the work to have an intentional outcome?"[130] She defines design for social innovation as "the design of the relationship between people and things instead of only the things themselves." Although her class (first offered for undergraduates under the title "Design for Good") focuses on product design, the emphasis on social responsibility and positive social outcomes reflects a broader trend in the workplace and corporate America that is bound to extend to design thinking in general, including interior design.

How might we think more expansively about the goals of social innovation in our interior environments?

Design for Manufacturing. Affordability has increasingly become a major issue in constructions, and especially in home construction. One approach to reducing costs is modular construction. In its list of top design innovations for 2018, *Building Design + Construction* reported on design build firm Katera Architecture that has developed a process whereby it designs houses based on the modular manufactured materials available, rather than producing materials to realize the design, thus saving customers both time and money.[131] The firm's president of architecture Craig Curtis states that the process is a form of mass customization that still allows for creativity and flexibility in the design.

How do interior designers strike a better balance between material efficiencies and user experience?

Design for Transformation. A related trend is the move toward greater flexibility in construction. In a white paper entitled "Buildings of the Future: Science Fiction or Science Fact?" global engineering consultancy Aurecon predict that to keep up with the speed of transformation, "Buildings of the future will no longer be rigid structures that can't change: by design, they will adapt and their spaces will be adaptable without significant building modifications."[132] Modular construction using 3D printing presents new opportunities in how building designers will create, relocate and shape buildings of the future, the paper says, adding that 3D printed buildings will likely be a reality within 10 years. Looking ahead to the future, the paper concludes, "Those working on buildings in future will need to maintain an appetite for new and advanced technology, materials and methodologies if they want to stay relevant."

If 3D printed buildings are a reality within the decade, what is the potential for our homes, workplaces, and everywhere in-between?

Intelligent Buildings. Thanks to the use of sensors and the Internet of Things (IoT), building management systems today can adjust lighting and ventilation in meeting rooms and operate a range of facilities. Combine that technology with artificial intelligence and big data processing and you get intelligent buildings. According to the Scottish tech news website FutureScot, in the not-too-distant future, "Intelligent buildings become self-learning to the point where individual needs can be predicted based on the analysis of occupancy profiles and preferences, measured by movement sensing and data collection from people's personal devices. In a large workplace, for example, heat maps will tell staff where they can find empty desks or whether air quality is better in certain areas. Visitors will no longer have to 'sign in' when they enter a building because face recognition technology will confirm their identity."[133]

How is connected technology changing the way we experience, measure, and adapt the workplace?

Improving Communication About Interior Design. One the biggest challenges to promoting and advancing the practice and profession of interior design has been finding adequate means to communicate to those outside the field what interior designers and interior design do. Designers have traditionally relied heavily on visual imagery for this purpose. A master's thesis in interior design presented at Iowa State University proposes as one potential solution, thinking of interior design as a form of performance art much like choreography, in that its ultimate aim is to facilitate the movement of bodies through space.[134] Contends the author, "The suggestions of interior spaces for a desired effect come in the same forms as choreographed pieces, being that they are rooted in the gestures, tempo and energy conveyed through symbolism the occupant is surrounded by." The aim of the study, says the author, "is to enlarge and update vocabulary available for interior design description, which will aid in a more expressive and accurate representation of what experience the interior designer intends for the user."

If you had to communicate the outcomes of interior design without images, what would you use?

What's Next for Office Design? Since their inception in the 1960s, open-plan offices have been the workplaces employees love to hate. Numerous studies conducted since the 1970s have documented employee complaints about noise, distractions, poor ambient environmental conditions, and work environment-related absenteeism and health problems. Recently, some research has suggested that in addition to these issues, open-plan workspaces may not deliver the supposed benefits they are intended to foster, such as increased socialization, collaboration, knowledge-sharing, and innovation.[135] It appears that now conventional open-plan offices are going the way of the IBM Selectrix.

An article by Kay Sargent, senior vice president and director of HOK's Strategic Accounts practice, for *WorkDesign Magazine* offers some thoughts about how office spaces are evolving to be more employee-friendly and beneficial.[136] Among the models she describes are the activity-based workplace, "typically designed to be an ecosystem of spaces, primarily grouped to serve four major work functions: solo work, collaboration, learning, and socializing and rejuvenation;" neighborhood-based choice environment, that "create a neighborhood or home for teams to operate out of while still allowing people to have access to a variety of work settings;" MEMO (maker environments, mobile occupants) spaces designed for start-ups looking to "create innovative spaces that foster creativity and speed to innovation;" and immersive environments, which "pull the best lessons learned from work spaces and tailors them to meet the specific needs of a company to create tailored spaces' geared toward outcomes and desired functions."

What happens when we start designing for plurality, instead of equality?

In an article contributed to CNN Style, Emily Wright, a writer for luxury real estate website The Spaces, spoke with six experts from various fields related to commercial office environments as to what the workplace may look like in 10 years.[137] Not surprisingly, their answers were not as specific as the models Sargent describes in her article, but they do provide some insights as to trends that likely will shape office design over the next decade. These include: sustainably responsible, comfortable / more residential in feel, supportive of cognitive processes, provide different environments for different phases of work, more flexibility in space usage, more outdoor space, more automation, return to more private spaces, more amenities, and more emphasis on enhancing performance. All agree that what it is not likely to look like is today's open-plan office.

Thinking Spaces. Sounding a similar note, futurist Richard Watson recently posted a piece on his "What's Next: Top Trends" blog in which he reflects on how physical environments influence how people think.[138] Since he travels a lot delivering talks in a variety of venues, he's noticed "the impact of different types of physical space on workshop outputs on a fairly regular basis. Takeaway? Not enough thought (or budget) is given to where people think, both individually and collectively." Based on his experience, he advocates for natural light (or natural light simulation), nature views, fresh air, and white walls.

What spaces produce the best ideas?

Open-plan Homes on the Wane, Too. Even as workers complained about their open-space offices, they were knocking out walls in their homes to create more open floor plans. That trend, too, may be on the way out. An article in *The Philadelphia Inquirer* reports that today's homebuyers, especially those in the suburbs, are now seeking more privacy in their homes as well as their offices.[139] They want more separated spaces and hybrid floor plans that provide some spaces for socializing and others for privacy and quiet. For millennials starting families, having separate spaces for adults and children is essential. The article discusses several designs solutions that can be employed without having to construct new walls.

How do interior designers help users find a balance between openness and privacy— both at home and at work? ▪

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