

5

TECHNOLOGY TRENDS TO WATCH

A SPECIAL
SUPPLEMENT TO



Consumer
Technology
Association™





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5

TECHNOLOGY
TRENDS
TO WATCH



AN INTELLIGENT WORLD

5 TECHNOLOGY TRENDS TO WATCH

Technology is transforming industries, businesses and lives. Sensors embedded into devices are providing a new level of intelligence that is creating a smarter, more connected world for all of us. But this significant paradigm shift is just beginning. It promises to improve consumers' lives with enhanced safety, efficiency and an expanding array of choices. And it is entrepreneurs with an innovative mindset that are driving this new wave of technology, products, services and apps.

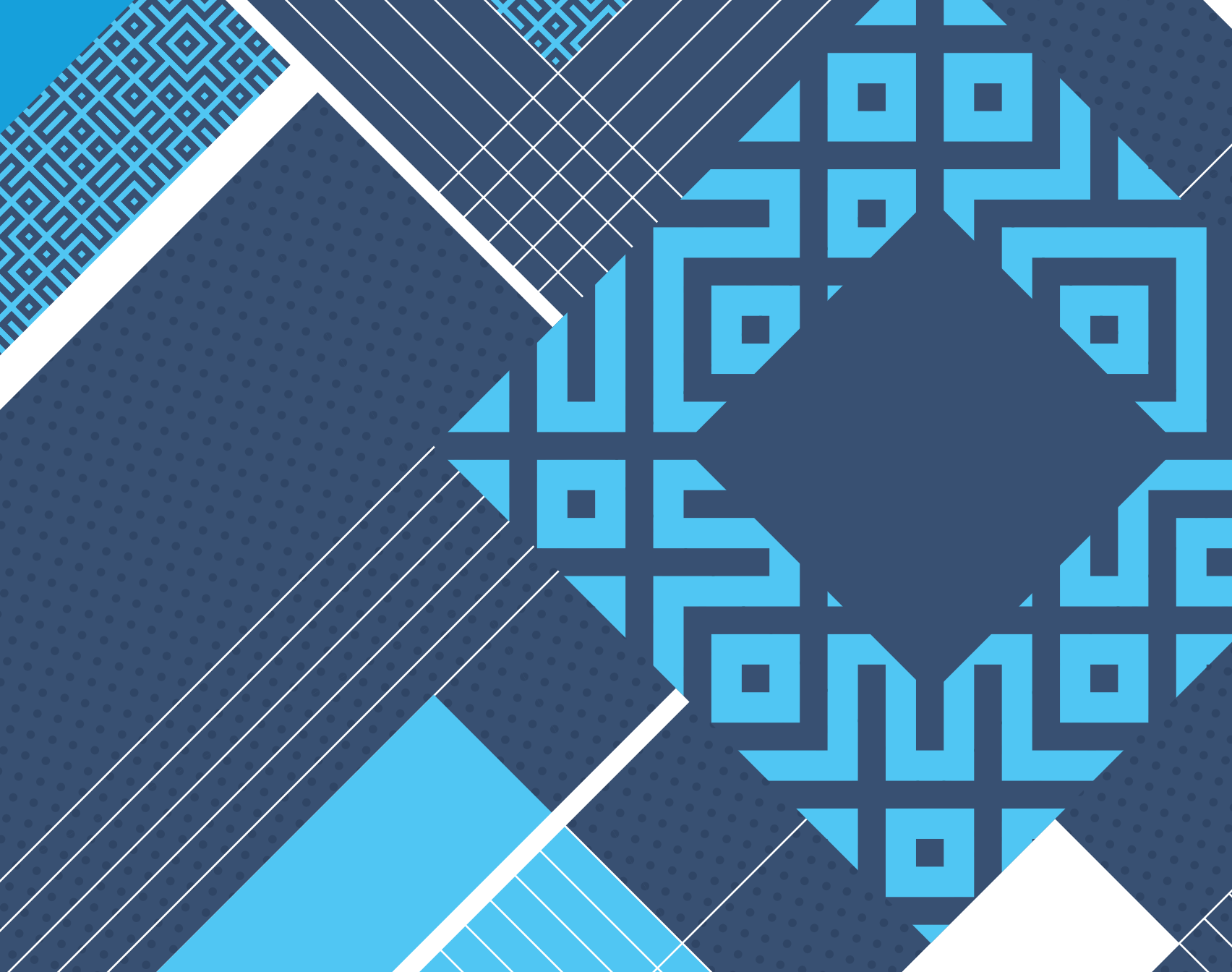
Cutting-edge technology defines the dynamic \$321 billion consumer technology industry. To provide context on these developments, the Consumer Technology Association (CTA)[™] produces *Five Technology Trends to Watch* each year. CTA analysts select five top trends to explore how these areas could impact our future. For the 2018 edition, we focus on 5G and the smart cities that these high-speed networks will enable; cybersecurity and new techniques in the pipeline like behavioral biometrics driven by machine learning that will help to further secure information; the experience economy; the future of work; and a look at how the technology choices of Gen Z, those born after 1995, will impact society.

CTA owns and produces CES[®] — the world's gathering place for all who thrive on the business of consumer technologies and the best place to see

the future. To learn more about these vibrant innovations, I invite you to come to CES 2018 on January 9-12, to get a glimpse of amazing advances in health monitoring, robotics, implantables, virtual reality, machine learning, biological body enhancements and replacements, self-driving vehicles, drone deliveries, 3D-printing, and facial and voice-based security. New technologies are solving real problems and making the world brighter for global citizens.

At CES, visit the Innovation Awards Showcase to see exceptional product and engineering design, the CES Marketplaces that showcase technology growth areas and Eureka Park where startups introduce their ideas and business models to the world. Only imagination limits our future. Come see the innovations on the horizon. For the most up-to-date information, visit CES.tech.

Gary Shapiro
CTA President and CEO



5 TECHNOLOGY TRENDS TO WATCH

5G ENABLES SMART CITIES

01

01

5G ENABLES SMART CITIES

**FAST, FOCUSED WIRELESS TECHNOLOGY WILL
REVOLUTIONIZE OUR CONNECTED WORLD.**

BY GARY ARLEN

Although 5G (Fifth Generation) wireless technology is still in its early field trial phase, projections for its vital role in upcoming “smart cities” developments are already underway. 5G’s capabilities to provide “cost-effective high bandwidth, low latency and pervasive connectivity” are lauded by the Alliance for Telecommunications Industry Solutions (ATIS) as vital for “citizen-centric functions, improving traffic flow, public safety and more.”

Ideas for better living that will rely on 5G are also emerging, such as “radically programmable” city streets with markings that can change to authorize loading zones or street hockey, depending on the time of day. Technologies to further improve the low-latency (milliseconds) and to expand the range into licensed and unlicensed spectrum are also in play. As a result, policymakers are also exploring 5G’s role in smart cities.

Right now, as wireless carriers and equipment makers accelerate their push for new technology and civic officials evaluate service delivery in an era of budget constraint, there are countless fertile dialogues about the role of 5G in the smart cities movement. Growing interest in “sustainable cities” is tempered with concerns about how to deploy



microcell equipment (tiny as it might be) for 5G transmissions. By some estimates pervasive 5G service will require twice the number of small cell towers now in use. Although 5G will have ultra-low power consumption, the ability to connect more sensors and devices will come with its own management burdens.

And of course, there are the ever-present questions about privacy and security as 5G technology works its way throughout the civic ecosystem.

Such challenges are not fazing the technicians and policymakers who are pushing ahead with their plans. Donald Stockdale, chief of the Federal Communications Commission's (FCC) Wireless Telecommunications Bureau, affirmed the agency's objective "to encourage and protect innovation-driving competition and to remove regulatory barriers to deployment. By unleashing the potential for 5G, we can accelerate the growth of our economy, create new jobs and new opportunities, and improve the quality of life for all Americans," Stockdale said in a July speech to a Free State Foundation seminar about 5G. He explained that the FCC "is working to free up spectrum in all ranges" that could be used for 5G.

Major U.S. wireless carriers and suppliers, global telecom providers and civic groups have quickly taken up 5G for its implications in business as well as a public service opportunities.

Whether it's Internet of Things (IoT) devices, autonomous vehicles, smart roads, healthcare or any other part of the emerging connected society, fast-emerging 5G wireless technology is expected to play a vital role. Its impact on the evolving "smart cities movement" can be extrapolated from the growing number of such projects. A recent CTA study identified a 38 percent jump in the number of smart city projects globally from



5G at CES 2018

The Smart Cities Marketplace and a conference track about connected and smart technologies will converge at CES 2018. Collectively, they will bring together an important topic that CES has showcased in recent years, such as leading-edge smart city innovations, Internet of Things devices, self-driving technology, smart home systems and drones.

The Smart Cities Marketplace will feature enabling technology such as artificial intelligence systems, sensors, data analytics, transportation, network infrastructures, and other devices and services. The multiday conference agenda will highlight 5G technologies and public/private partnerships with presentations by experts in utilities, health, safety and other public services.

Gary Shapiro, president and CEO, CTA, cites the new CES initiatives as a showcase of developments that "are making our cities more efficient, sustainable and responsive through the use of data to enable better processes and decision making." He adds the new Smart Cities agenda is "a perfect stage for city planners and decision makers to explore these world-changing technologies because of the diversity of technologies and industries in attendance, including mobile, transportation, data and sensors and digital health.

2013 to 2016. CTA estimates that the global smart cities market will be a \$34.35 billion sector by 2020.

Understanding Smart Cities and 5G Technology

Nearly 100 U.S. communities, and hundreds more around the world, are developing systems to provide security, safety and convenience for their residents in projects that range from traffic management, garbage collections, first-responder capabilities and parking meters. Smart roads equipped with sensors and monitoring systems are being integrated with the features of smart cars (both self-driving vehicles and ones with other enhanced capabilities). Firefighters who have access to dynamic diagrams of buildings could do their jobs more effectively.

Smart grid electric distribution could produce \$160 billion in benefits and savings through reduced power usage and fuel costs. And drivers could access current status information about nearby gas stations and electric recharge stations via such systems.

At the same time, 5G development is hurtling forward. Accenture Strategy estimates that the economic impact of 5G will:

- Create three million new jobs
- Boost annual GDP by \$500 billion
- Drive \$275 billion investment from telecom operators

5G means “the automation of everything,” according to Marcus Weldon, chief technology officer at Nokia. With technology that can operate at 40 times — and eventually 100 times — faster than today’s standards, 5G is considered a gateway to unlimited new services. Sensors in self-driving cars can identify a potential collision in two milliseconds, and stop

the vehicle almost instantly. Qualcomm research points out that 5G can deliver “fiber-like performance, ushering in the next generation of highly immersive, always-connected user experiences.”

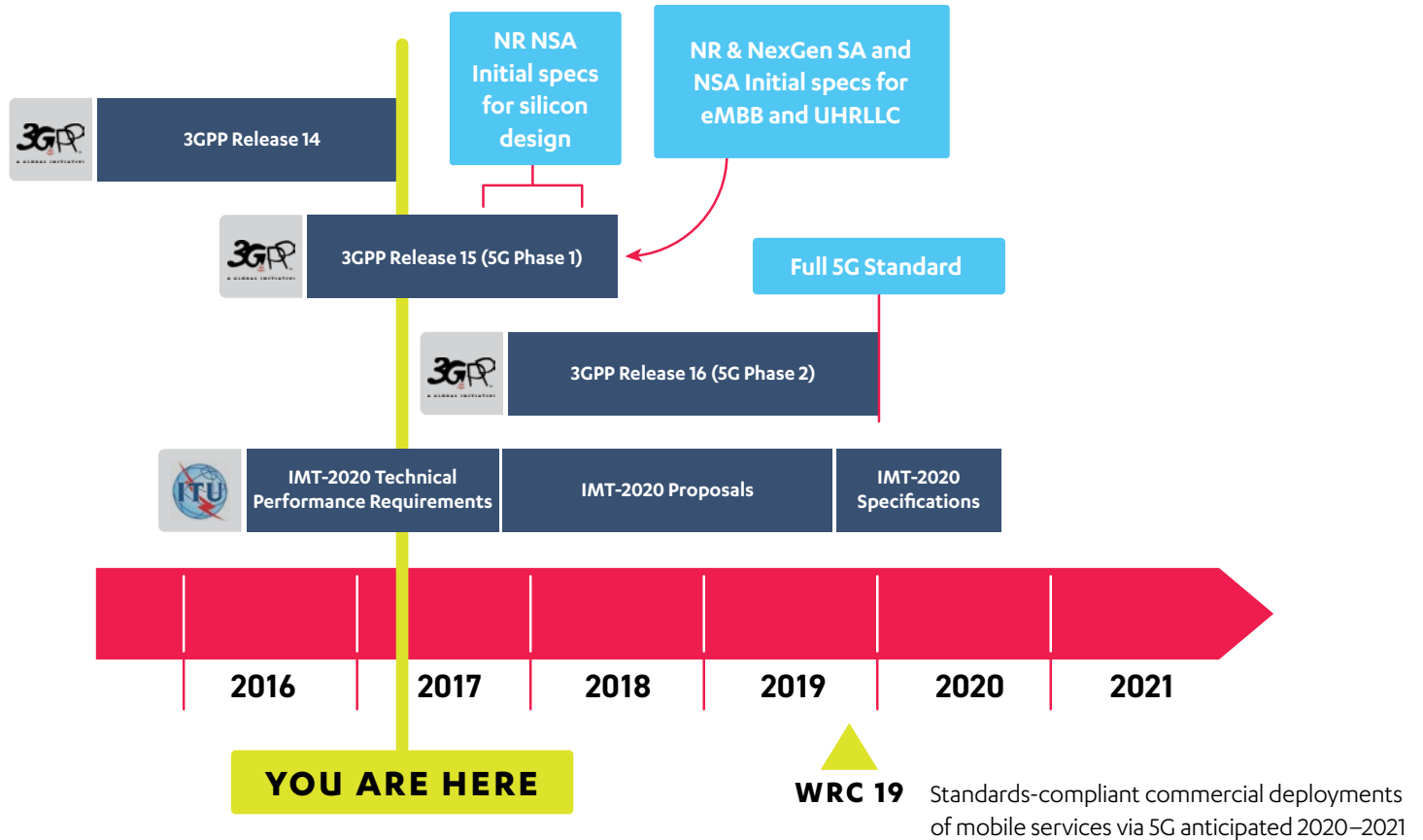
Since 5G signals can penetrate walls, foliage and barriers that interfere with other signals, there are new opportunities for faster, more uniform data rates both inside and outside buildings. Adaptive beamforming and beam tracking techniques make it possible for 5G signals to go around obstructions.

“5G will be a unifying, more capable communications fabric that will take on a much bigger role than previous generations of mobile technology,” explains Matt Branda, director of Technical Marketing at Qualcomm. “It’s a layer of connectivity that will become fundamental to our cities, jobs, homes and ourselves.”

Telecommunications carriers are eager to jump into the 5G arena, even though full rules and standards are not expected until 2020. For example, AT&T launched its “5G Evolution” service in about 20 markets during 2017, giving customers who use Samsung Galaxy S8 or S8+ handsets access to speeds about twice as fast as on AT&T’s 4G LTE network. AT&T said it was “laying the foundation ... for our evolution to 5G while the 5G standards are being finalized.” AT&T cited values such as reduced gaming lag and less buffering when watching your favorite videos on the go. In addition, AT&T allowed participants to stream live TV via DIRECTV NOW, the offshoot of the satellite TV service that the company acquired in 2015.

For its part, Verizon had 11 5G field trials running by mid-2017 (Ann Arbor; Atlanta; Bernardsville, NJ; Brockton, MA; Dallas; Denver; Houston; Miami; Sacramento; Seattle; and Washington, DC). Among them was a test in

Projected 5G Standards Timeline



SOURCE: AT&T IN ATIS SMART CITIES ROADMAP REPORT



Florida using License Assisted Access (LAA), a technique that mixes licensed and unlicensed spectrum, in this case the same 5GHz channels now used for Wi-Fi. Data rates reached gigabit speeds via existing 4G Long-Term Evolution (LTE). Verizon expects to begin commercial roll-out for initial 5G services in 2018 as it gathers results from the current trials, which seek performance experience in different environments and settings.

Robert S. Fisher, senior vice president, Federal Government Affairs at Verizon, cited “a sense of urgency” in the 5G agenda, calling for the need “to bring together private industry and public policymakers – industry and citizens” – to deal with infrastructure and rights-of-way issues. Speaking at the Free State Foundation event, Fisher pointed out that “driverless cars don’t work without robust wireless networks.”

Raising Awareness

Typical for new developments, especially ones that intersperse advanced technology with massive societal implications, there is relatively low public awareness about smart cities and the 5G applications being proposed.

According to the CTA’s report, *The Evolution of Smart Cities and Connected Communities*, a recent Frost & Sullivan market study found that barely one-third of Americans were familiar with the “smart city” concept, although people with higher education and/or income levels said they have heard the term.

Identifying Values for Smart Cities

In June 2017, the U.S. Department of Transportation issued results of its first “Smart Cities Challenge,” which sought ideas from mid-sized cities on how to create integrated, innovative smart transportation systems that would use data, applications and technology to help people and goods move more quickly, cheaply and efficiently. More than 70 cities offered proposals after the December 2015 announcement, and seven finalists (Austin, Columbus, Denver, Kansas City, Pittsburgh, Portland, OR, and San Francisco) worked with DOT to further refine their concepts.

Among the proposals: systems to implement autonomous shuttles to move city residents, to electrify city fleets, and to collectively equip more than 13,000 buses, taxis and cars with vehicle-to-vehicle Dedicated Short Range Communications (DSRC) technology.

Among the plans are Austin's effort to create a Mobility Marketplace that will improve access to mobility services for unbanked users, older Americans and those with disabilities. Columbus, OH authorities focused on the needs of newborns, citing the high infant mortality rate. New features will include a system to integrate an electronic appointments and scheduling platform for doctor visits with transit tracking so that rescheduling is automated and mothers do not need to wait weeks to reschedule appointments. The Kansas City plans call for an open data architecture to allow for "unprecedented studies in transportation engineering, urban systems operation, planning and the social sciences" with a goal of promoting entrepreneurship and empowering citizens.

Other cities' proposals include an array of telecom-based innovations. For example, the Atlanta proposal includes a network of multimodal transportation centers serving as hubs for mobility, economic development and community activity, while the Boston plan focuses on "radically programmable" city streets with dynamic markings that can change from loading zones to thoroughfares to spaces for street hockey, depending on the time of day and season." The Las Vegas vision features "new connected autonomous shuttles" to transport workers to Las Vegas Boulevard, and new solar powered electric vehicle charging stations to reduce emissions.

Although the plans did not necessarily specify 5G as the enabling technology, the imaginative collection of projects represented viable

transportation initiatives that would benefit from the sturdy, dynamic capabilities of the service.

In its seminal report *Smart Cities Technology Roadmap*, ATIS, a standards-setting organization, emphasizes that, "The promise of high bandwidth/low latency networks are embodied in the development of 5G solutions and standards."

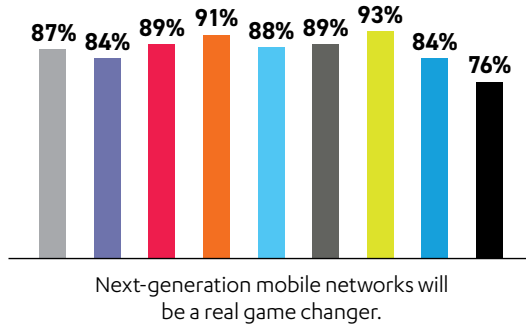
"While 5G is expected to experience widespread commercial adoption, the application to smart cities is impactful and extensible," the analysis continues, noting that "5G in the marketplace can be viewed as the product of three core elements: massive machine type communication, enhanced mobile broadband and ultra-reliable low-latency communications."

"Mobile network advancements are also key to the integration of municipal services with citizen-based commercial applications" for smart city values, ATIS concludes.

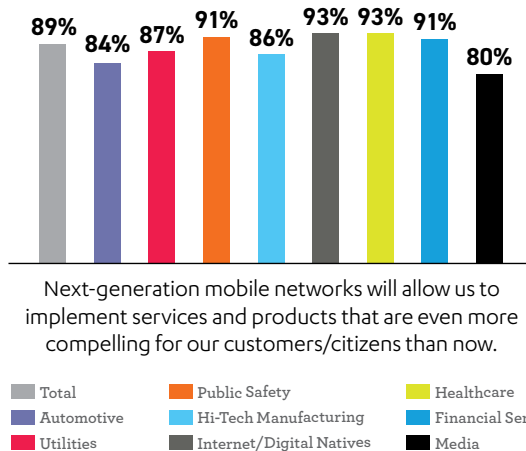
Tom Anderson, ATIS's senior technology consultant, describes the evolving 5G use cases as "dreams that are used to create the specifications." Anderson expects the initial 5G applications will "beam gigabit enterprise services," but that it won't take long for the new facilities to deliver "much higher bandwidth that can reach people and devices" throughout a community.

"Everyone stands to gain, including startups," he says. "Everything will flow over incumbent networks, which will see more traffic." He expects small operators to "create cool applications that will drive these businesses." Like others, Anderson foresees augmented reality as an initial

5G Use Cases by Industry



Scenarios of IMT for 2020 and Beyond



SOURCE: ERICSSON, OPPORTUNITIES IN 5G

popular application, offering users a “more immersive experience as they move through a venue.”

5G as a Game Changer

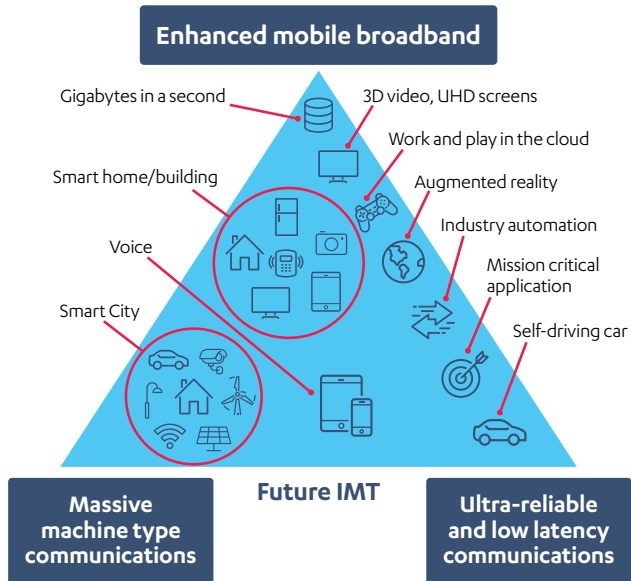
In its *Opportunities in 5G* survey of industry leaders from different lines of business, Ericsson concludes that executives perceive next-generation mobile networks as a “game changer” for their industries. They say that 5G will pave the way for innovative new technologies and services in industries such as healthcare, where remote diagnosis and surgery could radically broaden the delivery of medical services.

At the same time, many respondents voiced concern about the disruptions already underway or expected ahead thanks to new broadband connectivity and cloud services. In the Ericsson survey, public safety and healthcare organizations were among the categories with the highest levels of concern (61 percent each) about disruptions by new entrants and new business models. On the other hand, both those categories have high confidence (93 percent each) that 5G will enable them to create compelling new offerings (see chart).

Refining the Technology

The International Telecommunications Union (ITU) has also recognized the value of the features that are embedded in 5G technology. In its framework for future telecom systems, ITU singled out the relationship between the International Mobile Telecommunication (IMT) system and 5G, stressing the value of “working towards realizing the future vision of mobile broadband communications.” ITU called IMT “an essential foundation of modern society, a global force for change and empowerment, [and] increasingly the sole means for accessing communication, information, and entertainment.”

Scenarios of IMT for 2020 and Beyond



SOURCE: INTERNATIONAL TELECOMMUNICATIONS UNION: ITU-R RECOMMENDATION M.2083-0

ITU's triangle of Future IMT characteristics (see chart) includes enhanced Mobile Broadband (eMBB), massive machine communications and ultra-reliable/low-latency connections. Companies supporting the 5G agenda invariably point to this ITU structure as a mainstay of their agenda.

Inevitable Regulatory Hurdles

Since 5G technology is not confined to any specific spectrum frequency, the game is afoot to snag airwaves that best suit the services that

5G will deliver. In August, the FCC launched a proceeding to identify how mid-band spectrum (3.7 Gigahertz to 24 GHz) could be allotted for new uses. A coalition of wireless carriers and equipment makers lauded the initiative, calling it "particularly timely given that wireless data services are expected to increase 500 percent over the next four years." The proponents include AT&T, Broadcom, Cisco, Comsearch, CTIA, Ericsson, Google and Alphabet Access, HPE, Intel Corp., Information Technology Industry Council (ITI), Nokia, Samsung, T-Mobile, Verizon and the Wi-Fi Alliance.

Meanwhile, the FCC continues to deliberate larger issues of 5G deployment, pointing out that, "Future 5G networks will rely on three key elements: spectrum, infrastructure and backhaul." The Commission says it is "taking steps in all of these areas to ensure that the U.S. will lead the world in the deployment of next-generation wireless technologies."

In his remarks to the Free State Foundation in July, FCC Commissioner Michael O'Rielly focused on the immense cost and the construction process for 5G. "The biggest obstacle standing in front of 5G networks is infrastructure deployment," he said. "To realize its potential 5G will require a densified network of millions of small cells. This will clearly be a timely and capital intensive undertaking." He noted some local and state regulatory hurdles and voiced concern that providers are being asked to pay "astronomical fees" for the micro-cell towers that would be used in 5G technology.

Nonetheless, O'Rielly concluded with optimism about "the enormous potential of 5G networks to change the commercial wireless marketplace and the individual consumer's wireless experience."

CTA has weighed in on the FCC deliberations, pushing for increased access to spectrum, noting that “5G will revolutionize our connected world” with higher data rates and systems that are “five times more responsive than today’s networks.” Julie Kearney, CTA’s vice president of regulatory affairs, says that, “Connecting millions of IoT devices will place unprecedented demands on the wireless network infrastructure, so regulatory efforts must directly promote the deployment of 5G.”

Separately, in response to a Department of Commerce request for input about its “Green Paper” on ways to advance the Internet of Things, CTA recommended coordination by government agencies in approaching the topic “due to the complex, interdisciplinary, cross-sector nature of IoT.” CTA also recognizes the value of such coordination “when working with international and private sector partners.”

“Voluntary, consensus-based, global standards are best positioned to help advance IoT development and innovation because they promote interoperability and provide a clearer path along which technologies can evolve,” CTA explains, citing the benefit of agencies (including the National Institute of Standards and Technology and the National Telecommunications and Information Administration – both agencies within the Commerce Department) working together to develop such standards.

On Capitol Hill, Rep. Mike Doyle (D-PA) has circulated a “5G Acceleration Act” to spur Congressional discussion and set deadlines for the FCC and NTIA to push ahead with 5G agendas. “Wireless broadband is a major driver of our economy, and spectrum is the infrastructure of the 21st century,” Doyle said. “This draft bill is intended to benefit

consumers, wireless providers and the stakeholders who use unlicensed wireless technologies.”

The complicated standards approval process involves several major technology groups, including the 3GPP (3rd Generation Partnership Project), a consortium of seven global standards development “Organizational Partners” that worked on earlier wireless standards. It is now involved in establishing 5G specifications. The Next Generation Mobile Networks Alliance, a Germany-based organization of 80 mobile operators, manufacturers and researchers, is, among other things, examining 5G use cases for their diverse requirements in such categories as user experience, system performance, enhanced services, business models and network operation.

Work in Progress

As with any fast-evolving technology, 5G is facing continual enhancements. For example, Qualcomm is citing the broad support for its 5G NR (New Radio) platform, pointing to the expected completion of its Stage 3 Non-Standalone (NSA) features in December 2017, followed by the Stage 3 completion of a standalone (SA) version in June 2018. According to Qualcomm, 5G NR NSA will use “the existing LTE radio and core network as an anchor for mobility management and coverage while adding a new 5G carrier. This is the configuration that will be the target of early 2019 deployments (in 3GPP terminology, this is NSA 5G NR deployment scenario Option 3).”

In the Accenture Strategy vision for 5G, there is a complex matrix of activities and cost savings, ranging from energy to parking meter management. For example, Accenture predicts that by spacing self-driving cars at a safe distance apart, to reduce air flow drag over a convoy of

vehicles, fuel savings would be 25 percent. For public transportation, smart wireless systems would optimize bus inventory and reduce rider wait times. In the public safety category, Accenture cites the ability of micro-cell sensors to identify the location of gunshots and assist police in responding to emergency incidents.

Security and Privacy

Whether it's tinkering with an automated parking meter or hijacking the controls of a self-driving vehicle or a catastrophic incursion into the smart grid or community water system – cyber threats are part of the new equation of smart cities and wireless technology. Public policy is addressing such concerns on multiple levels, well beyond the scope of this 5G status report. For example, in its filing on the Commerce Department's IoT Green Paper, CTA honed in on the issues of "Cybersecurity and Privacy." It endorsed programs to support and promote "policies that encourage risk-based approaches, security by design, and the ability to patch insecure software and devices" as well as the use of strong encryption and consumer education programs.

"IoT unquestionably presents serious security issues that must be grappled with by all elements of the marketplace, including device makers, product dealers, hardware and software vendors, service providers and other stakeholders," CTA says. "Multi-layered protection must at least protect storage, and enable device identification and authentication, software authentication and trusted execution environment."

ATIS, in its broad report, asserts that "encryption is becoming a pervasive reality in the networks we run today, and 5G will be no exception to that rule. It is critical to have visibility at all layers of a communications stack as well as at different points in the network, allocated equally as pervasive"

How Big Will 5G Be?

With so much 5G development underway, forecasters are having a field day guesstimating the size of the market. Here are a few recent predictions.

Ovum Ltd., a British analyst firm, expects 389 million 5G subscriptions globally by the end of 2022. That will mark a sizeable jump from around 100 million 5G subs worldwide by the end of 2021. Ovum explains that it upped its forecast (which previously had topped at 25 million worldwide at the end of 2021) because of an expected surge of usage in the Asia-Pacific region. It also cited the accelerated timeline for 5G standards.

Meanwhile, Ericsson is even more enthusiastic, forecasting that the world will have more than a half billion 5G users by the end of 2022. It too cites the recent technology momentum and fast-track standardization. Ericsson pointed to "large-scale" trials and deployments that will start in 2019. Its calculation does not include machine-based connections or fixed wireless access services.

to assure safety throughout "the critical infrastructure that operates the mobile networks today."

Despite such challenges, the 5G juggernaut continues to plow ahead. As Ericsson points out in its assessment of 5G use within the public utility sector, 5G "will play a major role" in cutting costs and securing facilities. ■

5 TECHNOLOGY TRENDS TO WATCH
CYBERSECURITY

02

02

CYBERSECURITY

CONSUMER EDUCATION, SECURITY GUIDELINES, MONITORING AND RESPONSE ARE ALL PATHWAYS TO A MORE SECURE, CONNECTED FUTURE.

BY MARK CHISHOLM

In the first half of 2017, it has been nearly impossible for the world to ignore that cyberattacks are becoming one of the most pressing threats to the industry and the nation. Recent assaults such as the massive Equifax breach, WannaCry ransomware attacks and the hacking of HBO have put cybersecurity front and center in the news cycle. These events, of course, followed on the heels of last year's email hack of the Democratic National Committee, which played out in dramatic fashion in the 2016 election and beyond. Security threats are not only becoming more commonplace, but the scope and severity of such attacks are increasing in kind. The WannaCry ransomware attack of May 2017, for example, was reported to sprawl across 150 different countries and financial losses were estimated at anywhere from \$2.5 to \$5 billion.

In the recent *2017 Annual Cybersecurity Report* by Cisco, the company attributes the growing frequency of cyber threats in part to the "increasing attack surface" for hackers. As mobile connectivity becomes ubiquitous, more devices are connected and more personal information is stored in the cloud, more lucrative opportunities for attackers

Security Professionals Biggest Sources of Concern Related to Cyber Attacks



Mobile Devices

58%



Data in Public Cloud

57%



Cloud Infrastructure

57%



User Behavior

(For Example, Clicking Malicious Links
in Email or Websites)

57%

Percentage of Security Professionals Who Find the Categories Very or Extremely Challenging

CISCO 2017 SECURITY CAPABILITIES
BENCHMARK STUDY

emerge. The increasing regularity of attacks naturally puts an increased strain on firms to monitor and detect such attacks. Cisco's *2017 Security Capabilities Benchmark Study* found that "organizations can investigate only 56 percent of the security alerts on a given day."

While such attacks are increasingly focused on extorting money from victims in exchange for the promised return of their private data, the data itself is becoming more valuable as more sensitive information is stored digitally. The reality of the situation? Cybersecurity Ventures,

a firm delivering cybersecurity market data, insights and forecasts, predicted in its quarterly report (May 2017) that global cybersecurity costs will exceed \$6 trillion between 2016 and 2021.

Means of Attack

While ransomware attacks have become more frequent and made headlines in recent months, there continue to be a wide range of cyber threats that companies, consumers and security professionals alike should be keenly aware of.



SOURCE: FEDERAL BUREAU OF INVESTIGATION'S 2016 INTERNET CRIME REPORT

HACKING: The term “hacking” may be the most common term referring to cybersecurity intrusions, but it is just one of many cybersecurity threats companies and consumers face today. Often used as an overarching umbrella term covering the entire range of cyber threats, hacking can be simplified as an attacker gaining unauthorized access to a computer or database.

For websites, the most prevalent attack vector for hacking is SQL injection. SQL, or structure query language, is developed for the purpose of managing data held within a database. In simple terms, an SQL injection attack involves inserting malicious instructions, resulting in the exploitation of a security vulnerability. These attacks can range anywhere from “spoofing,” or faking, a user’s identity to the complete disclosure, or destruction of data within the database. And often, simple measures such as “sanitizing” database entry input aren’t taken – resulting in user inputs being executed instead of treated as data. While considered a basic security measure, the sanitization of database entry input is not a given, even in today’s environment.

DENIAL OF SERVICE: Another frequent type of attack is a Denial of Service (DoS), which seeks to make the target system or network unavailable for access. Often achieved by overwhelming a network with requests, crippling it and making it unavailable, this style of attack commonly relies on a number of systems working in unison. By denying service, such attacks can have a huge financial impact.

The variant known as a Distributed Denial of Service (DDoS) attack made news in October of last year. The DDoS attack – now known as the 2016 Dyn cyberattack because it targeted a range of Internet Protocol (IP) addresses operated by the domain name system (DNS)



Cybersecurity at CES 2018

Given the breadth of the industry, cybersecurity was a theme all across CES 2017, including at the Cybersecurity Forum, presented by CyberVista, and the Cyber & Personal Security Marketplace. At the Forum, speakers from agencies including Homeland Security and the U.S. State Department were joined by such industry leaders as AT&T, CTA, Dell, Intel and Symantec to discuss growing threats and prevention. At the Cyber & Personal Security Marketplace, nearly 30 exhibitors showcased security innovation. Products and technologies for both enterprise and consumers ranged from biometrics, secure payment methods, private internet access and wearables. CES 2018 will again be the best place to explore how cybersecurity touches every part of the consumer technology industry. The CyberSecurity Forum and the Cyber & Personal Security Marketplace will both return to give updates on the world of security.

provider Dyn – caused widespread disruption across a number of large-scale websites and services including Twitter, Pinterest, Reddit, PayPal and many others. This specific attack relied on a number of connected (but unsecured) devices in users' homes. These devices – many part of the Internet of Things (IoT) – ranged from security cameras, to routers, baby monitors and more. In a truly nefarious fashion, devices developed and intended to increase security and peace of mind were transformed into the “perpetrators” of the attack.

In the case of the Dyn cyberattack, as related to IoT devices, prevention lies not only with consumers (change your default passwords!), but also with manufacturers of these devices. To that end, CTA has developed a set of “best practices” principles to guide manufacturers and installers when incorporating security into their devices (see sidebar).

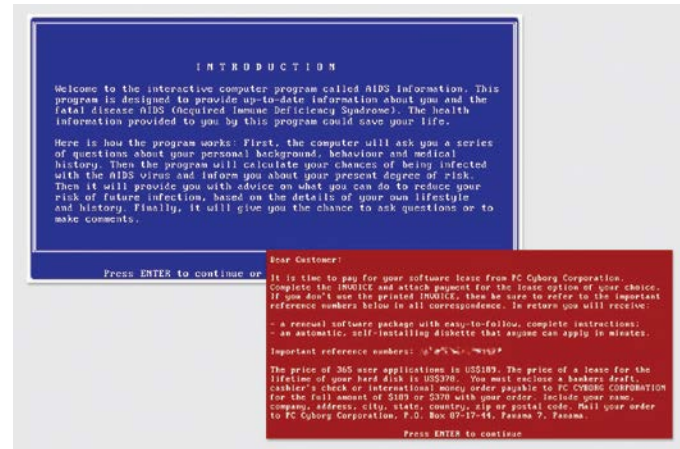
RANSOMWARE: Because of the recent WannaCry attack, ransomware may be the cybersecurity threat at the top of most people's mind. This style of attack relies on malicious software (or “malware”) such as a Trojan horse or other virus, which encrypts private data on the user's machine and displays a message demanding a ransom to unencrypt the data for use. Should a user refuse to pay the ransom – typically deliverable through “cryptocurrency” such as bitcoin – they are locked out of their data.

While ransomware is an undeniable hassle when a single user's computer is infected – and that's putting it mildly – it also becomes much more expensive and fraught with risk when an organization or government agency becomes infected. Such a situation can arise from the mistake of a single employee. Kaspersky reports that 718,000 enterprise users fell victim to

crypto-ransomware between April 2015 and March 2016, compared to the previous 12 month total of 131,000.

In some cases, including the recent WannaCry attack, ransomware can even endanger lives. As for WannaCry, the malware crippled systems belonging to the United Kingdom's National Health Service (NHS). At least 18 organizations across England and Scotland, including hospitals and general practitioners, were hit by the ransomware. This resulted in staff needing to “go analog” with pen and paper, and in some cases, turn away patients. Interestingly, the first known ransomware attack also targeted the medical industry. In 1989, Dr. Joseph L. Popp distributed 20,000 floppy disks (the big ones) masquerading as AIDS educational software, to researchers in 90 countries. The disks, however, were infected with malware that activated after it was installed on the computer and was restarted 90 times. At that point, the malware became active and displayed a ransom note demanding a payment of \$189 to \$378 for what it referred to as a “software lease.” The malware connected to the infected computers' printers, and printed a request for payment to be sent to a Panamanian P.O. box. After payment, the users received decryption software. The malware eventually became known as the AIDS virus, or AIDS Trojan.

Sadly, just as the spread of malware has been aided by connectivity, so has the payoff. While WannaCry was reported to demand ransoms of “just” \$300 (some attacks have demanded five figures or more), the widespread nature of the attack made WannaCry much more profitable. Elliptic, a London-based startup that tracks cryptocurrency, estimated that by Monday, May 15 – three days after the initial infection – more than \$50,000 worth of Bitcoin payments had been made to the attackers.



A screenshot of the 1989 “AIDS Trojan”

CTA Connected Home Security Checklist Tool

In March, CTA launched a security checklist for internet-connected devices, along with an accompanying tool to help home installation professionals and dealers in safeguarding products and networks. The tool details security protocols for installing and configuring products to help protect consumers and their smart home devices from unwanted malware or hackers. The tool is mobile-friendly and ideal for job sites, offering installers a quick reference of industry practices for topics including passwords, networks, modems and routers, VPNs and Z-Wave/ZigBee. To ensure consumers are well informed about the work completed in their homes by professionals, the tool also emails customers a comprehensive assessment of the security steps performed, as well as recommendations.

“Good cybersecurity practices are critical at the installer level – one of the first lines of defense against security breaches,” said Melissa Andresko, chair of CTA’s TechHome Division and communications director at Lutron Electronics. “To better safeguard consumers’ privacy and sensitive information, CTA created the first-ever tool designed by installers, for installers, that outlines existing best practices, standards and methods for today’s smart home security challenges.”

The tool, available to CTA members at no cost, is based on CTA’s *Device Security Best Practices* Whitepaper. The whitepaper, intended for integrators, alarm contractors and others involved in the professional installation and maintenance covers such topics as password guidelines, networking guidelines, modems and routers, virtual private networks, near field communication and encryption. The whitepaper is online at CTA.tech.

Even though a “kill switch” for WannaCry was discovered by 22-year-old security researcher Marcus Hutchins shortly after the ransomware began to spread, the urgency that arises when a system belonging to a hospital or other critical organization is affected could lead to immediate capitulation and the subsequent payment of the ransom. This, combined with the sensitivity of the data, contributes to the growing “popularity” of ransomware, and the importance of security measures. (Some of the simplest include making sure all systems on a network are patched and running an up-to-date operating system). Unfortunately, cyberattacks featuring ransomware are expected to become more frequent.

Social Engineering

In everything from the medical profession to driving, human error remains one of the greatest threats, and this is also true in the cybersecurity realm. Social engineering threats rely on this vulnerability to gain unauthorized access to consumer information or enterprise systems. In such a scenario, an attacker would “phish” for user information – including, but not limited to names, birth dates and social security numbers – and use this personal information to gain access. These sometimes take the form of “cold calls” where an attacker calls a user and pretends to be a technical support employee, and warns of problems with one of a user’s private accounts.

Unfortunately, human nature being what it is, social engineering hacks remain one of the more difficult issues to address, as prevention relies on education rather than a security patch for human gullibility. Large scale attacks based on social engineering include the much-publicized 2014 unauthorized access of celebrity Gmail and iCloud accounts. The attacker, who was convicted on felony violations of the Computer Fraud and Abuse Act, explained that he used social engineering techniques

Policy Looms

The growing cybersecurity threat has not gone unnoticed in Washington, where in early August, lawmakers proposed legislation to improve the security of IoT devices in the home. The bill, The Internet of Things Cybersecurity Improvement Act of 2017, introduced by Sens. Mark Warner (D-VA) and Cory Gardner (R-CO), focuses on government applications of IoT devices and how they relate to cybersecurity. Among other requirements, it would mandate that IoT devices — including those without screens – sold to government agencies be capable of receiving software security updates. Senator Warner told *Recode* shortly after the bill was introduced that while the bill is focused on government agencies, he hopes it will promote security improvements across the board since cybersecurity is everyone’s problem, from end users to service providers to manufacturers.

Nasdaq CTA Cybersecurity Index (NQCYBR)

Since 2015, CTA has been partnering with NASDAQ to manage a cybersecurity industry index. The Nasdaq CTA Cybersecurity IndexSM tracks the performance of companies engaged in the cybersecurity segment of the technology and industrial sectors. The Index includes companies primarily involved in the building, implementation and management of security protocols applied to private and public networks, computers and mobile devices in order to protect the integrity of data and network operations.

including “spoofed” emails, appearing to originate from Google or Apple, which asked for login information for the accounts.

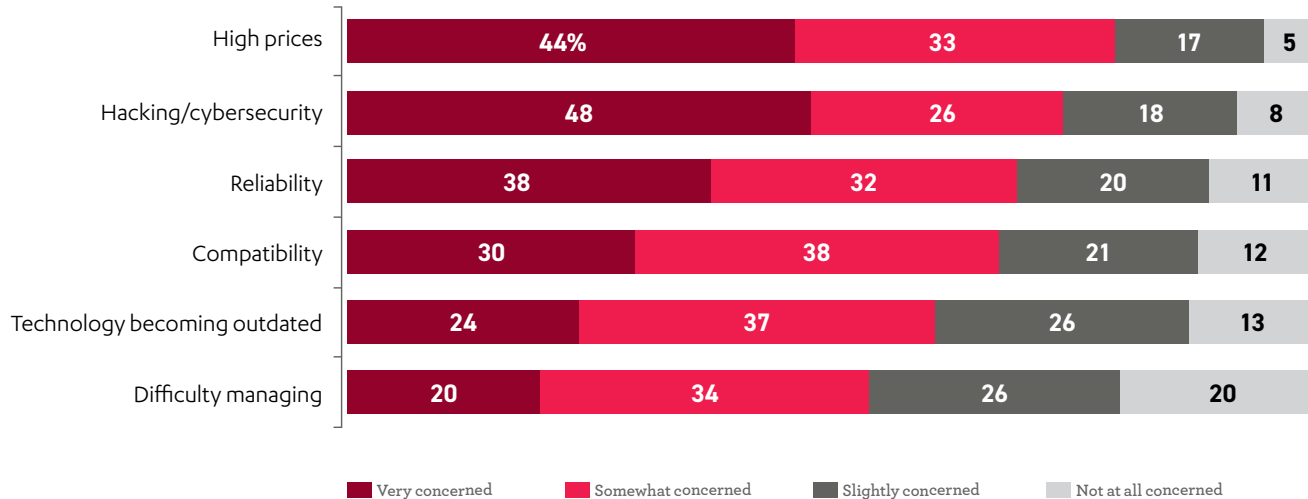
If you’ve ever used an online service – think a messaging service – which clearly states a message along the lines of “We will never ask you for your password,” you’re aware of one of the tactics used to inform and educate users about phishing and social engineering techniques. Prevention does not stop at adding a disclaimer, however. Service providers and employers alike must be vigilant and train their users and employees in best practices, to avoid one of the most common vulnerabilities: the human-technology relationship.

The Safety Dance

What Cisco refers to as the “increasing attack surface” for cyber threats is making attacks more common, and more difficult to prevent and address. For example, in late July cybersecurity researchers at Google discovered a new form of spyware for a very small number of Android devices – 0.000007 percent. The “Lipizzan” malware not only can monitor emails, texts and other messages, but it can also listen to and record calls, record audio and video, and access a user’s location. To be clear: this malware bypassed Google Play protection features including the required disclosures about application access, and just fewer than 100 devices were found to be infected, but Lipizzan still provides a good idea of just how compromised connected devices can become if not vigilant.

As the world transitions to a connected, IoT-fueled existence, it behooves everyone – from developers, to security researchers and consumers themselves – to pay close attention to the information they make available, and how it is safeguarded. As a result, consumer adoption of connected devices will benefit from easing the concerns of consumers through

SMART HOME DEVICE CONCERNS



SOURCE: CTA MARKET RESEARCH, *CONSUMER PURCHASE JOURNEY: SMART HOME DEVICES*

education, as well as monitoring the security of products and services and offering updates.

When exploring the adoption of smart home products, CTA found that security was indeed a concern. “Owners tended to bring up concerns about security in the conversations. They felt there was a lack of information, and expressed surprise at how easily some products can be hacked. There was

the impression that this issue is being addressed more frequently with newer products,” CTA wrote in the study *Consumer Purchase Journey: Smart Home Device*.

Beyond Basic Biometrics

While biometric security measures such as fingerprint and retina scanning have already been implemented into many technology products



including smartphones and laptops, future biometrics will become an even more robust, personal defense of our products and personal information. Compared to traditional passwords, biometrics bypass the need for a credential, instead depending on the users themselves as a physical qualification – one that is more difficult to forge or steal. Biometrics may also offer an escape from what the National Institute of Standards and Technology (NIST) refers to as “security fatigue.” Although security is everyone’s responsibility, that doesn’t mean that managing upwards of 20 passwords doesn’t wear on us. This weariness often results in poor security practices such as reusing passwords. Biometrics aims to alleviate this exhaustion, which will become even more important as the attack surface increases and more personal information is stored digitally.

Moving beyond the typical concept of “static” biometrics focused on a user’s physical attributes, the industry has arrived at the idea of behavioral biometrics. These security measures rely on examining a person’s use pattern similar to credit card monitoring services that are alerted to irregular activities such as charges in a different part of the country. After gathering information on a user’s patterns, such as typing speed, mouse movement or time(s) of access, these security systems begin to build a personal profile and make note of any irregularities in usage. “Because users can be enrolled in the background during a handful of normal interactions, behavioral biometrics is completely frictionless and doesn’t slow, interrupt or otherwise interfere with the user experience,” according to the International Biometrics+Identity Association (IBIA) in its whitepaper *Behavioral Biometrics*. An additional benefit of behavioral biometrics is that they do not rely on additional hardware, such as a fingerprint sensor, to function. These software-based security measures can be implemented into current hardware, removing a potential barrier to execution.

Security Standards

CTA's Tech and Standards department has been working to ensure the products of tomorrow feature robust security and offer consumers not only convenience, but peace of mind. CTA standard CTA-TR-12, *Securing Connected Devices for Consumers in the Home*, provides guidance to product designers and managers on how to enhance cybersecurity. In addition to work on this standard, CTA helped develop and launch the Building Security In Maturity Model (BSIMM) online assessment tool, which measures how well a company is addressing security implementation in its products. The BSIMM study looks at various organizations and examines what security practices are shared and which are unique, with the aim of providing a more complete view of security across the industry.

But without a robust user profile, behavioral biometrics are not an effective security measure, and may result in false alarms (again think back to the time your bank unnecessarily put a hold on your card while travelling). Therefore, effective behavioral biometrics will depend on widespread machine learning and artificial intelligence (AI). "The role of artificial intelligence in behavioral biometrics is unique. As opposed to other fields such as image recognition and speech processing, in behavioral biometrics the AI is doing work that no human expert can do," says IBIA in their whitepaper.

Once a robust user profile has been built, however, does the existence of such information itself create a security liability? Luckily, static and behavioral biometrics are not exclusive and can be used in parallel to safeguard data. Swedish IT and security company BehavioSec has created such a

platform, and is partnering with companies across the financial sector. BehavioSec was recently selected by Accenture and FinTech Innovation Lab in New York alongside such companies as Guardian, J.P. Morgan and Fidelity Investments.

"As we are now moving past implementing in early adopter banks, this dialogue is of great value, both with market understanding and commercial projects," says BehavioSec COO Olov Renberg.

As the economy becomes more connected, the industry needs to realize that this is an "all hands on deck" moment. Consumer education, security guidelines, monitoring and response are all pathways to a more secure, connected future, but the road ahead will not be an easy one. ■



5 TECHNOLOGY TRENDS TO WATCH

EXPERIENCE ECONOMY

03

03

IT'S ABOUT THE EXPERIENCE

BY BOBBY BAUMLER

For many businesses, the focus and enhancement of the customer experience is achieved through the use of technology.

B. Joseph Pine II and James H. Gilmore first predicted the transition to the experience economy in their 1999 namesake book. *The Experience Economy* explained to readers how the model of simply providing goods and services to consumers would no longer be sufficient for meeting consumer needs. Rather, Pine and Gilmore predicted a new order where consumers would demand memorable and personalized experiences.

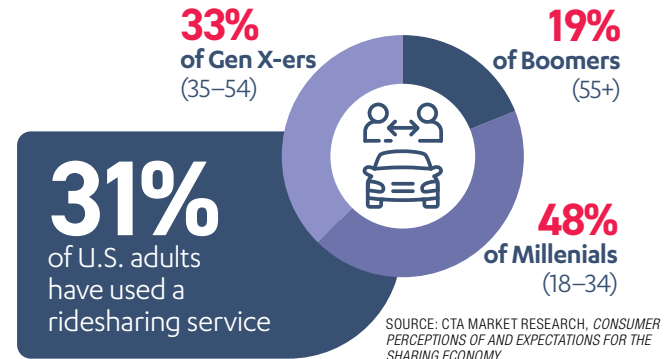
Since the book's release, the world has certainly changed. Technology has played a vital role in advancing the experience economy and today a convergence exists between technology and lifestyle. In 1999, there wasn't social media, smartphones were not in the hands of consumers and dial-up internet was still dominant in homes. Add to this a generation that spent their childhood as witness to this technological revolution while simultaneously observing the housing and economic collapse of 2008.



Generation Y, better known as millennials, or those born after 1995, now represent more than a quarter of the U.S. population. The millennial generation is a significant driver for the shift toward an experience economy. Millennials place a stronger emphasis on the value of experiences over material goods. As more millennials enter the workforce and progress into their prime earning years, they will have an increasingly larger impact on the economy and the industry must embrace and adapt to changing consumer preferences. Such changes in consumer trends have significant implications as personal consumption accounts for over two-thirds of the U.S. economy according to the Federal Reserve (68.9% Q12017).

Consumer market research indicates that the trend of moving away from material items and toward experiences transcends beyond the millennial generation. In a recent study on experience versus ownership conducted by Sachs Media Group, 81 percent of respondents across all age segments identified as “doers,” meaning they enjoy experiences over having physical possessions. In the study, only nine percent identified as “havers” and valued physical possessions over experiences. (10 percent were split equally between “doers” and “havers.”)

Experiences have always existed and certain industries including hospitality, tourism and travel are inherently experiences. Now such industries seek to build on existing experiences and strive to raise the bar further. More recently, traditional service-based industries have sought to elevate the customer experience to remain competitive. Technological

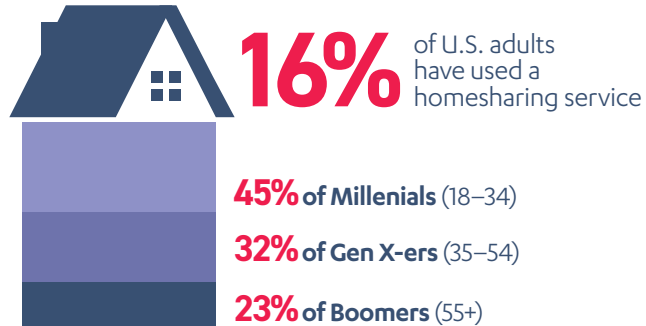


advancements allow industries to respond to changes quicker and in more personalized fashions than ever before. Collectively, a focus on the customer experience is allowing marketers and industry to enhance existing business models and improve customer satisfaction.

Retail Therapy 2.0

Recent headlines suggest that the shopping mall is on the verge of extinction. Savvy mall owners have reversed this narrative transforming the mall into an experiential experience for shoppers. Many “Class A” malls around the country have undergone extensive updates to modernize the shopping experience with the addition of new amenities and technological upgrades.

Collectively, the experience economy improves customer satisfaction, loyalty and engagement.



SOURCE: CTA MARKET RESEARCH, *CONSUMER PERCEPTIONS OF AND EXPECTATIONS FOR THE SHARING ECONOMY*

Shopping malls now boast far more than apparel and soft pretzels. As department stores struggle and online channels threaten brick-and-mortar sales, shopping malls have adapted to include experience-based amenities. It is not uncommon to visit a mall with tenants including movie theaters, indoor skydiving, swimming pools and high-end bowling alleys. Operators have also improved mall events to include pop-up stores and services, fashion shows and charging lounges.

Mall patrons also benefit from an improved dining experience, with an expansive assortment of options beyond fast food in the food court. Restaurants have long been known to provide guests with an experience. Whether a restaurant is known for its farm-to-table ingredients, trendy mixology, or the affiliated celebrity-chef, diners are accustomed to paying a premium for a memorable and sharable experience. By incorporating such restaurant concepts into mall designs and embracing new amenities, malls are redefining the definition of a traditional tenant and the consumer

experience is more immersive. Such refinements encourage shoppers to visit with their friends and family to share in the experience.

Beyond the mall tenants, technology remains at the forefront for personalizing and improving the shopping experience. Upgrades go beyond Wi-Fi hotspots and digital signage. Increasingly, malls are deploying loyalty programs that link to both the shopper's smartphone and credit card to improve personalization. The loyalty programs reward customers with exclusive promotions and can make customized suggestions based on a user's previous shopping history in real time.

The Coffeehouse Revolution

Following a trip to Milan, Italy in 1983, visionary Howard Schultz developed the concept for a coffeehouse experience known as Starbucks. From 1987-2007 Starbucks grew from 17 stores to more than 15,000 locations. Schultz revolutionized the U.S. coffee industry, elevating coffee consumption from a beverage brewed over a percolator into an immersive experience where consumers can spend nearly \$5 for a coffee.

As Starbucks expanded, Schultz intended for its stores to be a third place, along with a customer's home and office. Walk into a Starbucks and you find a cozy and inviting store with all of the conveniences you might need including electricity for your laptop, Wi-Fi, and possibly a fireplace. The coffeehouse experience encourages customers to catch-up with friends, set-up a makeshift office, or read a new novel in solitude.

More recently, Starbucks has been at the forefront of incorporating new technology to improve the customer experience. Starbucks first introduced its mobile payment app in January 2011 and recorded more than 26 million transactions in its first year. By 2016, mobile payment

accounted for a quarter of all store transactions. Starbucks further enhanced its mobile app with the ability to store and order your favorite beverage in advance, enabling customers to bypass the line and pick-up their drink from the coffee bar in an instant.

Driving New Experiences

Arriving to your destination by taxi was a fairly utilitarian experience before ridesharing services rose to prominence. Hailed from the convenience of a smartphone, technologies including Lyft and Uber make for a better experience and have disrupted a \$125 billion a year industry. Nearly a third of respondents (31 percent) in a recent CTA study have used a ridesharing service, including nearly half (48 percent) of millennials.

A ride in a taxicab was long known to be inconsistent, unreliable and certainly without frills. With the advent of ridesharing technology, riders are

now greeted with a notification on their phone with a picture of their driver, the driver's name and car information. Once onboard it is not uncommon for the passenger to be offered a bottled water, access to a charging cable for their smartphone or an offer to play their favorite artist on the stereo. Perhaps this level of service contributes to ridesharing's high user satisfaction rate. In the CTA study, 87 percent of participants indicated that using a ridesharing service was a positive experience.

Dinner Delivery

In the fast-paced and overbooked world in which we live, preparing a nightly home-cooked meal is often not possible. Rather than settle for unhealthy takeout, the emergence of meal delivery services allows the inner chef in all of us to prepare a wholesome and delicious meal with minimal time and effort. Services including Blue Apron, HelloFresh, and most recently Amazon allow customers to select meals on their smartphones



SOURCE: SACH'S MEDIA GROUP, *EXPERIENCE VS. OWNERSHIP STUDY*

How would you spend a gift?

61%

#1 RESPONSE

Take family/friends on
vacation to somewhere
we've never been

SOURCE: SACH'S MEDIA GROUP, *EXPERIENCE VS. OWNERSHIP STUDY*

or computer. The delivery includes all of the ingredients from proteins to sauces to herbs each perfectly portioned, chopped and ready to be assembled efficiently in your kitchen. The result greatly improves the weeknight dinner experience. Meal preparation becomes enjoyable, interactive and far healthier than fast food or restaurant takeout.

When you look at life's accomplishments, they are usually based on experiences rather than possessions.

Improving Your Stay

Hospitality is the quintessential customer-service centric industry. Hoteliers continually look for ways to improve the guest experience and provide a memorable stay to build loyalty for the brand. Technology is a leading force in achieving this objective.

In 2014, Hilton became the first in the hospitality industry to provide digital check-in, room selection and checkout in more than 4,000 hotels across the world. The technology also allowed for guests to use their smartphone to purchase upgrades, make special requests and have items delivered to the room. Since the initial rollout, Hilton completed an update in 2016 to enable app users to bypass the front desk entirely and use a smartphone in lieu of a room key.

This year, Wynn resorts installed Amazon Echo digital assistants in all 4,748 guest rooms at the Wynn and Encore Las Vegas. The Echo enables guests to control everything in the room, including the lighting, thermostat, drapes and television.

Homesharing Authenticity

For some travelers, lodging does not include a hotel at all. The newest flag in hoteling is Airbnb. Homesharing platforms including Airbnb, HomeAway and VRBO not only allow for a more affordable accommodation by renting from individuals, but more importantly can improve the authenticity of a traveling experience. Instead of traveling to a new city and staying in a hotel located in the traditional commercial corridors and tourist-centric areas, users can instead decide to be a part of the neighborhood. Airbnb allows its guests to be immersed in the culture of the city by stepping out of their front door.

Homesharing's popularity is leading to increasingly more luxurious options, with services including Oasis Collections, Squarebreak and onefinestay. Each of the platforms improve upon the homesharing guest experience by blending the convenience and flexibility of services like Airbnb, with the service of a high-end hotel. Paris-based AccorHotels, best known for luxury brands like Fairmont and Sofitel, has recently invested in or acquired Oasis, Squarebreak, and onefinestay to take the homesharing experience to a new level. Guests of onefinestay are greeted on-site at arrival by a local team. Each luxury home property is inspected and approved for the service and homes are appointed with linens, toiletries, and towels akin to staying at a full-service hotel. The objective of services like onefinestay is best summarized by co-founder Greg Marsh, who opined that "onefinestay will become a globally recognized byword for exceptional experiences, extraordinary service and handmade hospitality."

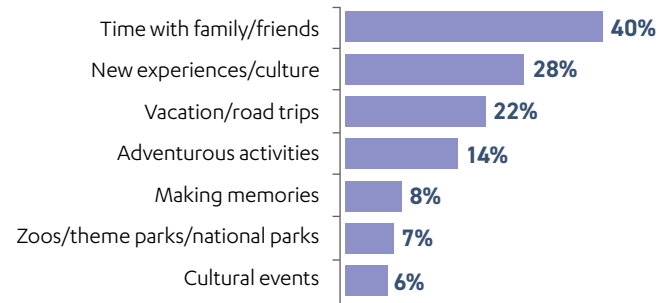
According to a recent CTA study, 16 percent of respondents have used a homesharing service, including 45 percent of millennials. The same study reported an 82 percent overall user satisfaction rate among homesharing users, including 89 percent of users with three or more stays in a year. The popularity of the homesharing experience is reflected in the industry's growth. Homesharing (including vacation rentals, homes or rooms rented on a short-term basis) is approaching one-fifth of the size of the U.S. hotel market based on revenues. In 2016, the market grew by more than double the rate of the hotel industry at 11 percent (hotels grew at five percent in 2016).

Experience at Sea

We witnessed the future of the cruise industry at CES 2017 as Carnival Corporation unveiled the Ocean Medallion. The announcement was about more than a physical medallion and instead focused on improving the customer experience. Carnival Corporation's CEO Arnold Donald exclaimed, "Great guest experience is our ethos. The Ocean Medallion is an amazing use of technology that potentially redefines travel as we know it. It opens an entire world of experiences, and the personal power it unleashes is huge."

Carnival's wearable will allow guests to make reservations, order drinks and make purchases on the ship without carrying a wallet. It even offers a digital concierge. The Medallion is read by the thousands of sensors on board the ship to provide customized food and beverage pairings, assist in locating friends and family, and serve as a passenger's identification for ship embarkation. Incorporating such capabilities into a device eliminates many of the inconveniences and frustrations associated with traveling and enables the guest to focus entirely on enjoying their cruise. Since inception, the cruise line industry has been an experience and

What Makes for a Valuable Travel Experience



SOURCE: SACH'S MEDIA GROUP, *EXPERIENCE VS. OWNERSHIP STUDY*



The Carnival keynote at CES 2017

Disrupting Industries

40+ Million

Uber's monthly active users (as of October 2016)

3+ Million

Property listings on Airbnb

SOURCE: JUNIPER RESEARCH, *SHARING ECONOMY 3 INDUSTRIES RIPE FOR DISRUPTION*

You can't put a price on having new experiences. Some things really are priceless, and they don't sit on your mantle.

advancements including the Ocean Medallion will further strengthen this experience. According to the Cruise Lines International Association, cruise lines are the fastest growing segment within the leisure travel industry, with annualized annual growth rate of seven percent since 1980. In 2016, a record 24.2 million passengers cruised globally.

Enhancing the Magic of Walt Disney World

When guests arrive a Walt Disney World theme park, everyone is wearing the same colorful accessory known as the MagicBand. The MagicBand was first introduced in 2013 and is a wearable sensor that serves as your entry into the park. However, it is also a device designed to enhance the guest experience at a place already known to be the “Most Magical Place on Earth.” Disney has long been known as a leader in providing customers with a memorable experience and it only makes sense that the MagicBand was introduced to further build on the guest experience. The MagicBand can be customized for each patron and the device serves as a hotel room key, enables guest to purchase food and beverages, enter FastPass park lines and link/purchase photographs. Since the MagicBand's inception, revenues at Walt Disney Company parks and resorts increased by 20 percent from \$14.09 billion in 2013 to \$16.97 billion in 2016. Worldwide, Walt Disney Parks welcomed more than 140 million guests to its properties in 2016.

Sharing Experiences

Perhaps the most paramount contributor to the experience economy is the proliferation of social media. The penetration rate for social media is nearly 60 percent in the U.S. and more than 30 percent globally. In just over a decade, Facebook's user base has grown from one million (2004) to nearly two billion (2017). More recently, Instagram and Snapchat have emerged as real-time platforms for sharing experiences. Instagram

WHAT YOU LOOK FOR IN YOUR LEISURE TRAVEL EXPERIENCES



SOURCE: SACH'S MEDIA GROUP, *EXPERIENCE VS. OWNERSHIP STUDY*

launched on the iPhone in late 2010 with one million users. By April 2017, Instagram's user base had grown to 700 million. Snapchat's growth story is similar, growing from 100,000 users in early 2012 to 158 million users by the end of 2016.

Social media platforms continue to evolve, and services like Facebook, Instagram, and Snapchat provide users with the ability to share their experiences and generate content for friends, family and other followers. From using Instagram to post a new culinary find to sharing the latest concert on Snapchat, social media allows people to share experiences like never before. Every day, Instagram alone accounts for more than 95 million photos and videos being shared and users of

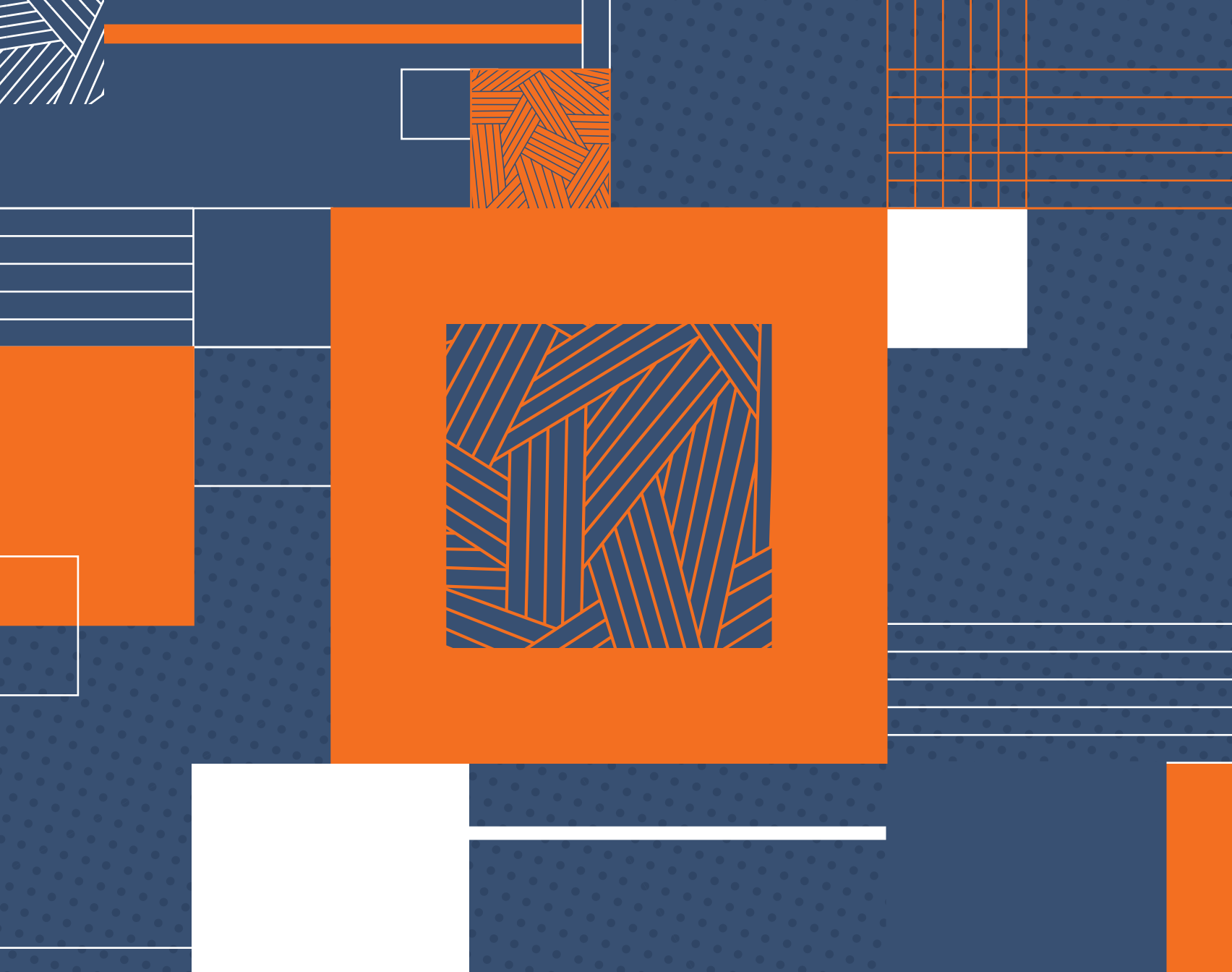
Experience CES 2018

The experience economy will be everywhere at CES 2018 including interactive experiences in the Augmented Reality, Gaming and Virtual Reality Marketplaces. At CES 2017, Carnival debuted its Ocean Medallion, a wearable that embraces technology's role in the experience economy and offers cruise guests more convenience, information and opportunities. Vacationers can use the internet-connected, pocket-sized sensor to order food, unlock their door and access customized information about their preferences. "We aren't innovating to be different – we are innovating for an even better guest experience," said Carnival CEO Arnold Donald during the company's keynote. "This little medallion is but one central component of a much larger ecosystem that empowers both simplicity and personalization."

Snapchat view more than 10 billion videos, providing a captive audience to share experiences.

Moving Forward

Businesses in all industries must continue to take note and be prepared to adjust for the continual shift from the service to experience-based economy. Increasingly, this adaptation will become a necessity for survival as consumers are looking for more in all facets of their daily life. Technology plays a vital role for improving experiences as witnessed from the customer purchasing coffee at Starbucks to the passenger embarking on a cruise. Collectively, the experience economy improves customer satisfaction, loyalty and engagement. ■



5 TECHNOLOGY TRENDS TO WATCH

THE FUTURE OF WORK

04

04

THE FUTURE OF WORK

THE RISE OF ROBOTS AND STEM EDUCATION

BY JEREMY SNOW

When the employees of Amazon's warehouse walk the massive floor, they aren't alone. The company's robots are rolling through the warehouse aisles, twisting and turning, programmed to locate, pick up and move entire shelves of items so workers can easily sort and ship them. With the help from these bots, Amazon can get a product ready for shipping in as quickly as 15 minutes, while also ensuring a more efficient and consistent factory.

"You are going to see there are 4,000 people working in this building – even with all the automation," David Clark, Amazon worldwide operations senior vice president, told CNET. "Our focus with automation is about helping people do their jobs, not replacing people."

Since 2014, 45,000 warehouse robots have helped Amazon keep up with its explosive growth. It's been so successful, they are offering a quarter million dollars to a team that can build a more advanced bot for them to use. One day, they hope, these robotic workers could completely eliminate the need for workers to walk through the factory.



Automation may seem paradoxically like the problem, and the solution, behind the future of jobs. Already, there are 260,000 robots in U.S. factories, with many more on the way. While it will open the floodgates of innovation for entrepreneurs and engineers everywhere, there is no doubt advanced machinery and artificial intelligence will make some factory and blue collar jobs obsolete. The American workforce's next dilemma is finding a way companies can continue using groundbreaking robotics without rupturing the workforce that supported them for so long.

As emerging technology becomes cheaper and faster, more engineers, programmers and developers will be needed to ensure companies can keep up with the latest tech. Instead of backing away from inventions that can grow businesses and change the world, we must educate and train our workforce to adapt to the challenges of an evolving job market.

Charging Up

Automation is inevitable. In a 2017 CTA survey, 52 percent of industry leaders said most or some job functions will be automated in the next five years. Just 17 percent of industry leaders believe no job functions will be automated. And according to a 2017 report from McKinsey Global Institute, the U.S. has the potential to automate roughly 46 percent of work activities, much of it in industries like agriculture, manufacturing, hospitality and food services.

Many Americans will not be surprised by these numbers, since robots have already engulfed jobs and entire careers in their meteoric rise. Many repetitive, data-based jobs are being replaced, alongside careers that became obsolete from wider internet access. Both Wendy's and Panera Bread have begun adding digital ordering kiosks to replace cashiers and McDonalds even saw record-high market shares after installing digitized



cashiers. Meanwhile, professions such as travel agents have declined due to sites like Kayak, which let consumers gather their own info and book flights without help. Truckers may be next, as the first self-driving cars are expected by 2020, and could completely remove the need for someone behind the wheel for deliveries.

Robots thrive in positions like these, offering the ability to efficiently and consistently perform simple tasks common in offices, factories and businesses. Next, expect robots to perform more mechanically complicated duties, like making a cup of coffee, or cooking entire meals for you. The rise in robots is very similar to the shift the workforce faced when personal computers rose in popularity. While computers started as massive, tool-specific machines, they eventually grew into essential pieces of all-purpose technologies. Many predict automated robots will follow a similar track, including the company Rethink Robotics, which is developing a "high performance collaborative" machine named Sawyer. Robots like Sawyer work side by side with humans and can be programmed to

Robots Everywhere

As AI becomes increasingly advanced, more robots are capable of mimicking any human task. So far, engineers are working to teach robots to write, make sales and even create art. Here are some of the most surprising jobs we may see robots performing:

LAWYER: A UK-based startup called Luminance can analyze hundreds of pages of legal documents in under a minute to find meaningful data and information.

MUSICIAN: Emily Howell, created by UC Santa Cruz Music Professor David Cope, can individually create new compositions using the outputs from a previous composing program. Right now, she's just on Soundcloud, but one day could be at Coachella.

WALL STREET: Since AI can read data just as well, if not better, than humans, companies are subbing in robots for stock trading and other financial positions.

JOURNALIST: The Associated Press and *The Washington Post* are currently using robots to write finance and sports stories, many of which follow more straight-forward patterns and focus on statistics and data.

perform a large range of labor-intensive tasks that would normally take up a big chunk of a worker's time. Once set up, a factory can leave Sawyer by itself to package, inspect, or load and unload products.

"We pontificate at CTA regularly for the need to safeguard innovation and we want an innovation-led economy," Steve Koenig, CTA senior director of market research, said during the New American Jobs Summit. "To maintain that competitive edge in an increasingly competitive global marketplace where the playing field is far from level, we need the space to automate certain processes."

Advanced robotics will be especially beneficial with among small- to medium-sized companies, who could greatly benefit from the efficiency boost

they provide, according to the International Federation of Robotics. They will also move beyond just the automotive industry – the current driver in robotics – to the electronics, aerospace and medical industry as robots become more sophisticated. By 2019, IFR predicts 1.4 million new industrial robots will be installed in factories around the world.

Stop Worrying and Love the Bot

While businessmen and technologists may be excited for a future with automation, many are anxious about the intense and rapid change it will have on the job market. But automation is not a horror story: 70 percent of industry leaders say they "will hire more employees" in the coming years, particularly among larger organizations, according to CTA research.

Instead of having your job replaced by a robot, it is much more likely you will be working alongside a robot to make you faster and more flexible. To prepare for this, factories will need to fill jobs to fix, program and monitor the new technology. As tech advances, factory workers won't be in charge of the more repetitive, simplistic tasks when a machine can do it twice as fast. Instead, they will be programming the machine or work alongside it to accomplish its goal even better. In the case of the Amazon's robots, while less workers are needed to walk the merchandise from shelf to shelf, they need more workers closer to the end of the product line to keep up with the extra efficiency.

"From 2010 to 2015 – and this is historically correct in the U.S. market – if you look at when robots increase, unemployment goes down," IFR President Joe Gemma said at a recent press conference. "When unemployment goes up, robots go down, and that's historically correct in every period in the last 30 to 40 years."

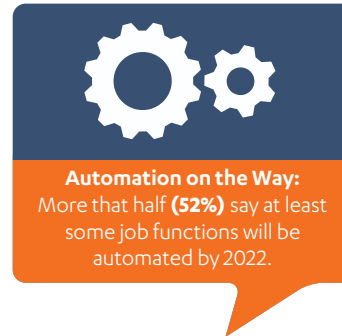
Automation's swift rise comes during an important time for American manufacturing. Other countries, especially China, have pulled ahead in manufacturing by embracing the technology the U.S. has been slow to adopt. Many predict emerging technology could make U.S. factories more productive and competitive with other countries, thus resulting in a stronger economy and more jobs.

Large companies aren't the only ones who will benefit. Automated 3D printing, for example, helps small- to mid-sized businesses create their own products without the access or funds needed for mass production. 3D printing enables smaller entrepreneurs, such as someone just working from their garage to create personal tools or manufactured parts ideal for just what they need.

Future of Work on Automation

Automated Job Functions

While approximately half (52%) say most of some job functions will be automated in the next five years, 17% of industry leaders say no job functions will be automated.



	% of Respondents
SOME + MOST	52%
Most	7%
Some	44%
Very few	29%
No function will be automated	17%
Don't know	3%

SOURCE: CTA MARKET RESEARCH

Future of Work on Technical Skills

Job Skill Requirements

Most companies surveyed mention they “will need more employees with technical skills” (86%) and “will hire more employees” (70%) in the coming years—particularly larger organizations. Four out of five companies within the tech industry do not believe their full-time workforce will decrease over the next five years.



	Strongly Agree + Agree [% NET]
We will need more employees with technical skills.	86%
Will hire more employees.	70%
We will automate certain job functions to remain competitive.	55%
We will hire more part-time or contract workers.	48%
We will shift more work outside the .U.S. if we can't hire the employees we need here.	32%
We will seek to hire more foreign born workers who have higher technical job skills.	26%
Our full-time workforce will be smaller.	18%

SOURCE: CTA MARKET RESEARCH

Companies like Local Motors, for example, have pushed this idea to its limits. The company uses a large 3D printer to create entire exteriors of cars. Instead of requiring multiple workers and machines to build a car, the single 3D printer builds it from start to finish by itself. With their creations, they hope to give other creators and workers access to a less expensive, completely customizable way to make vehicles.

A Changing Workforce: STEM for All

Skills – not degrees – are the basis for hiring today. So to ready America and its workers for the future of work, the approach to education must move as fast as technology does. It is necessary to support STEM (Science, Technology, Engineering and Math) education from an earlier age and also support lifelong learning to prevent a divide of digital understanding between generations. America must focus on reskilling the workforce for more advanced, highly technical manufacturing jobs. Computer science, engineering and coding need to become more common in all job fields.

Even with two million graduates entering the labor force in 2017, many do not have the requisite skills to fill the positions needed. According to the computer science nonprofit, Code.org, there were more than 500,000 open tech jobs in 2016, yet only 43,000 computer science grads in 2016 truly capable of filling them. And by 2022, there will be nine million STEM jobs available, says the Bureau of Labor Statistics.

In a June White House American Technology Council meeting among tech business experts, Apple CEO Tim Cook pushed for students of all ages to learn computer science. “Coding should be a requirement in every public school,” he told President Trump. “We have a huge deficit in the skills we need today versus the skills that are there.”

As the workforce changes, so must classrooms and colleges. Getting kids interested in computers, math and science from an early age is one of the most straightforward ways to narrow the skills gap. And while everyone will not need to be a programmer, primary schooling will be responsible for preparing future workers for an increasingly tech-infused environment.

For now, 40 percent of schools do not teach computer science, according to Code.org, and only 10 states have created K-12 computer standards. A lack of diversity is also creating a divide. Only one-fifth of computer science students in both universities and high schools are female, even though women who take AP Computer Science are ten times more likely to major in it. Black and Hispanic students are seven times more likely. Supporting a larger group of students would go right back into the economy – a computer science major can earn 40 percent more than the college average, the nonprofit says.

One of the best ways to increase interest in technology in classrooms is rather straightforward – put the latest technology in the classroom. Not only are computers an absolute necessity, but other STEM-based, tech-savvy equipment are beginning to pop up. Some schools offer students a chance to use virtual reality sets, for example, to provide new ways to visualize complicated biological ideas or see countries or historic sites they may never visit. It's a brand new approach to visual learning for many of them. According to a digital education survey from TES Global, 84 percent of K-12 teachers already use tech in their classroom. Roughly 10 percent want VR sets and 3D printers, while about 19 percent want to put tablets and laptops to use. STEM lessons are going beyond classroom lessons as well, thanks to toys and like Legos and robotic sets made especially to teach students coding and robotic skills. As STEM becomes part

Finding Skilled Candidates

Ease of Finding Skilled Candidates

A majority of industry leaders (71%) say it is difficult to find candidates with the right skills and abilities today, and only 9% believe it will become easier to fill positions with qualified candidates in the next five years.



	% of Respondents
SOMEWHAT + DIFFICULT	71%
Difficult	34%
Somewhat difficult	37%
Neither easy nor difficult	14%
Somewhat easy	11%
Easy	1%
SOMEWHAT + EASY	13%
Don't know	1%

SOURCE: CTA MARKET RESEARCH

Automation at CES

To see what is next for automation, the Artificial Intelligence Marketplace at CES 2018 will show how technology can perform human intelligence tasks. The area will feature cutting-edge developments in big data analytics, speech recognition, predictive technology and decision-making products. Last year at CES, more than 30 exhibitors showcased advances in automation in the Robotics Marketplace, presenting machines that could mow your lawn as well as all-purpose robots capable of manning the front of a store. For example, LG showcased a robot designed to guide travelers in airports and answer their questions. Also see what innovations are ahead in the Robotics, Self-Driving Technology and Smart Home Marketplaces at CES 2018.

of children's daily lives, we are seeing technology and STEM education enter children's hobbies and interests. Technology is also changing how we communicate within classes. Online classes allow anyone to teach across the world – meaning as long as there's internet access, there can be educational access.

Besides K-12 and university, trade schools and community colleges also need to provide the alternative career paths that can fill future jobs in a successful way. Just a high school education no longer provides the skills needed for many entry-level jobs. Two-year programs or certification classes provide affordable alternatives to university, by offer training for growing fields like electronics or IT. A federal cybersecurity jobs, for example, requires certain accreditations community college can provide. Even those with bachelor's degrees are seeking community colleges to gain training in certain skills to improve their salary or offer more to employers.

Continued Learning

With the economy changing so rapidly, adults must continue to be educated as well. The current workforce needs to update the skills and technology needed to grow professionally. Not only must they be ready if their job requires something new, but also prepared to adapt to a different position if necessary in the next few years. Community colleges are a start, but workers also require a strong foundation of tech skills. AT&T, for example, is offering employees classes, workshops and opportunities to learn topics that may have not existed when they went to school, such as big data and machine learning. Companies are also taking advantage of local colleges and online courses to encourage their employees to attend classes. For example, online tech courses are offered by Udacity where students earn Nanodegrees.

Walmart is taking another approach to internal training thanks to a two-to six-week program focused exclusively on providing the skills needed

to advance at the company. Walmart Academy provides employees with training courses specifically focused on helping them move forward in their job. One way, they stress, is to become more familiar with technology.

“To better meet the demand of our customers and the way we all shop, we are looking at how to upskill the frontline, hourly associate so they are not only ready to meet the demands of today, but also the demands of tomorrow,” Walmart Federal Government Relations Director Micaela Fernandez Allen said at CTA’s recent New American Jobs Summit. The retail store is using iPads in their training, for example, to not only make learning easier, but teach their workers how to use the tablet. Their goal is to close the “digital divide:” the idea that older generations are more unfamiliar and less skilled with devices like these, as well as those in areas that have restricted access to technology.

Other groups are focusing on the senior community to stop the digital divide. While many think seniors reject technology, many have realized that this bias has stopped some from accessing tech’s benefits. Many organizations, such as Older Adults Technology Services, help teach the older generation how technology can be used to find jobs or make money. Some classes teach seniors how to use gig economy sites and apps like Etsy, allowing them to sell crafts or use their skills to earn extra money. For example, one senior charges to edit documents online in order to help pay her bills.

Getting each and every worker ready for the future is essential – whether they are a senior, blue collar worker or Fortune 500 CEO. Education is the first line of defense to ready these Americans for what is to come. Since the Industrial Revolution, technology has flipped industries upside down, disrupting entire markets and putting workers in perplexing spots. But the

Call 1-800-WORK

Since many people’s jobs are dependent on computers, more are working entirely from home. In fact, 43 percent of Americans say they spent at least some time working remotely last year, according to Gallup’s *State of the American Workplace* report. Here are some of the reasons more employees are embracing teleworking, according to SurePayroll:

INCREASED WORKER PRODUCTIVITY: Two-thirds of employees say they are more productive when working remotely

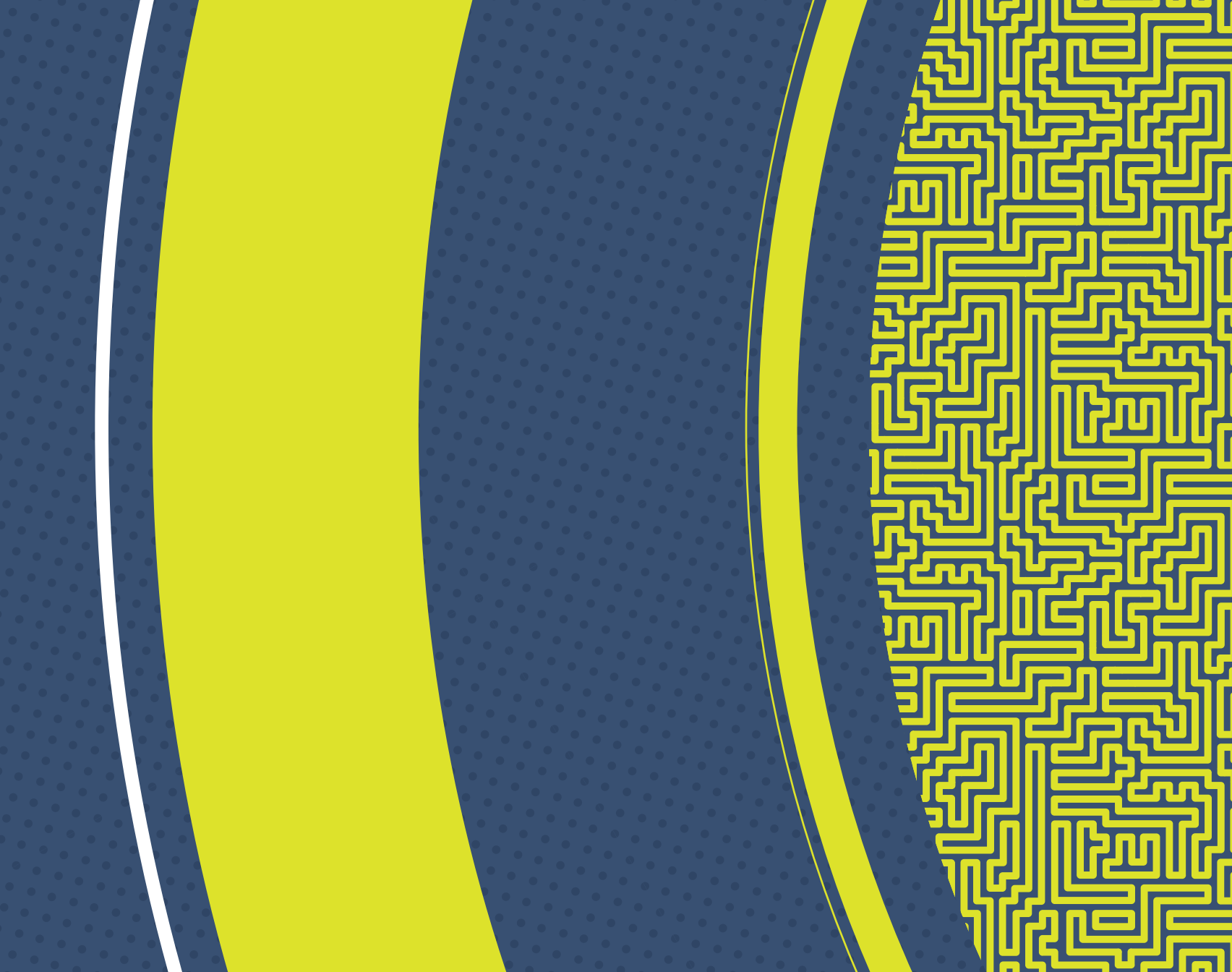
AVOID INTERRUPTION: Twenty-eight percent of the average worker’s office day is focused on unnecessary interruptions

IT’S NOT THAT DIFFERENT: Forty-six percent of workers already use email, IM and phone as their main form of communication

RECOVERY TIME: Teleworking lets employees ease back into work after being away for medical issues

workforce has always found a way to survive and carve a demand out of their skills.

“Yes, [automation] is going to disrupt the way we used to do things, but it is going to create jobs that do not even have a name yet,” said Sen. Marco Rubio, a proponent of the future of work. “It is going to create industries I cannot yet describe to you.” ■



05

5 TECHNOLOGY TRENDS TO WATCH

GEN Z & TECH

05

THE TRUTH ABOUT GENERATION Z

THE TECH THEY LOVE AND HOW THEY USE IT MAY SURPRISE YOU

BY NATALIE HOPE MCDONALD

“They are always on their phones,” says Josephine, a 10-year-old who lives in Philadelphia. She wasn’t talking about her friends, the kids who belong to what savvy marketers have named “Generation Z,” also known as iGen or post-millennials, an age group roughly defined as anyone born after 1995. She’s referring to her moms, Mia and Tracey Levesque, Gen Xers who run their own web design firm. In a café downtown, Josephine (who goes by Phine) and her parents all seemed to agree that most presumptions about Gen Z are probably wrong.

“Phine’s generation is pegged as they don’t know how to play,” says Tracey. But in reality, tech plays an important part of the daily activities that most of us remember as kids – like creating fantasy worlds in our backyards and streets. Phine, a budding actress fresh out of theatre camp, uses her digital camera to shoot short videos with friends. This past summer the group hosted their own movie night, projecting the video they made onto the wall of their house where they sold snacks to neighbors who came to watch.

These kids are the most technologically literate generation yet. They reveal insights into what future generations will ultimately expect from technology. They also tell us



how older consumers will eventually evolve when it comes to adopting new devices. While Generation X may have helped to launch the internet and millennials pushed social media even further, Gen Z is making things like wearable devices, messaging and cloud computing even more entrenched in our daily lives.

Interestingly, because Gen Zers have learned to surf the web before they could even tie their shoes, they have adopted a somewhat nonchalant approach to tech. Sure, they trust sites like Uber and Venmo far more than their predecessors, but they're also quick to give up on sites or apps that don't deliver in the way they expect. Phine, for example, thinks Facebook is, like, totally boring. She prefers to search YouTube for her favorite videos (her family uses Safe Search to keep track of what she's viewing). She also loves Spotify and Instagram – apps that are also both registered to her parents until she's old enough to have her own accounts.

"She has her own profile on Netflix and Hulu," says Mia, where she likes to watch shows like *Glee* and *Buffy the Vampire Slayer*. But Phine also watches videos on YouTube way more than she watches cable TV. According to Nielsen, as many as 40 percent of Gen Zers say they plan to drop traditional pay TV service in favor of online and streaming options. As already established tastemakers with the ear of marketing pros, Gen Z's discerning opinions about technology are changing the way technology is being developed and used.

This Generation Loves Video

According to Jason Dorsey, president and co-founder of The Center for Generational Kinetics in Austin, TX, Generation Z is actually quite a bit different from previous generations like X, Y and even the much gushed about millennials when it comes to adopting new technology. As an expert on

so-called iGen, Dorsey says that this generation of tweens to early 20-year-olds can tell us a lot about everything from privacy to security.

"They cannot remember a time before mobile technology, social media and the ubiquitous Wi-Fi or internet connection," says Dorsey. And even though it can be challenging to nail down exactly what makes Generation Z tick, research suggests that Gen Z will ultimately change the way technology evolves faster than ever.

These kids are the most technologically literate generation yet.

For example, messaging apps, which are extremely popular with this demographic, are poised to become even more advanced. "What is really significant," says Dorsey, "is that texting is less significant for Gen Z relative to messaging apps themselves." These users ultimately favor tech that's real time, customized and highly visual.

According to Statista, Gen Zers admit to spending an average of six to 10 hours per day on their mobile devices where they do everything from surf the web, watch videos, take and record videos and pictures, and communicate. "This generation loves video," says Dorsey, "and frankly, expects it. They expect all technology to adapt to fit them, whether that is recognizing past preferences and purchases or predicting the best new content to enjoy."

Snapchat, which favors more intimate exchanges compared to apps like Facebook and Twitter, is by far one of the most popular apps for Gen Z.

Gen Z Focus at CES

A number of conference programs and Marketplaces at CES 2018 will focus on marketing and technology for the younger generation. The Kids & Technology Marketplace features the newest innovations that enable kids to learn while they play. At CES 2018, you can see 3D printers aimed at kids, coding kits and even coding robots. This demographic is also transforming how content is consumed, and how companies market their brands. C Space at ARIA will highlight the latest from Hollywood elite and content developers, as well as marketing execs and creative geniuses.

Snapchat is interesting in that it doesn't leave a paper trail, and messages that are sent are seen and then disappear quickly. As such, buying a smartphone for these young people is what getting a driver's license was for Baby Boomers and Gen X. It's not just a status symbol – it's critical to communication among peers and the world. Because Gen Z has much more in common with others their own age globally than they do their own grandparents and parents who may live within the same community, the world becomes a much more accessible place simply via the phone.

According to Tech.com, as many as 13 percent of Gen Zers admit to checking their phone every few seconds. Social media has given this generation a lot of reasons to be connected, and ultimately a lot of power. And like anything that offers such readily accessible influence, this

connectivity can be used for both good and the detriment of its users. It might help to explain why we see remarkable innovations in online learning and access to huge amounts of information, while we also see a rise in online bullying, according to statistics from the National Crime Prevention Council. Gen Z's self-esteem is also tied to social media. More "likes" equals more happiness for many of these kids. And that has some experts worried.

For these reasons and more, Gen Z has become an important group to watch – they are a predictor of what tech will ultimately succeed or fail, what has staying power and how the industry will need to meet the demands of this incredibly tech savvy generation of consumers who are not only invested in technology, but also emotionally manipulated by it.

Gen Z also tells us, as a society, how we will evolve in terms of entertainment and communication. Dorsey predicts that as smartphones become even more integral to basic functions in society, we will see younger and younger people outfitted with them. "It will soon be commonplace for elementary school children to have them," he says.

Siblings Talk Phones, Gaming and Apps

Lilly and Thomas Eckel are siblings living in the Garden State. Lilly, who's heading into sixth grade this year, and Thomas, who's getting ready to be a sophomore in high school, both have their own smartphones and both agreed to chat about how they use them – completely via text messaging.

"I use my phone for both fun and for school," Tom texted. "And now that my school has allowed the use of phones, I really depend on it for schoolwork." He uses apps like iMessage, Instagram and Snapchat, as well as a music app and sometimes Twitter.

Lilly, on the other hand, likes to use a lot of emojis when she communicates. Her favorite app is *Dancing Line*, a fast-paced game that has its own soundtrack and that some are calling the next *Angry Birds*. “I normally go to my Dad’s computer to play video games,” Lilly texts. Because she’s younger than her brother, her parents have enforced more rules about when and how she can be online or using the phone. Her brother has a bit more freedom, but not as much as some of his friends.

“My kids’ peers have many more socially connected apps than they do,” says Lilly and Thomas’ mother Allison. “I talk with them a lot about the dark side of it all,” and she and their father have established ground rules, like no phones at the dinner table or after they go to bed.

Because Gen Z tends to spend more time than previous generations on their smartphones, according to the *2016 National Study on Technology and the Generation After Millennials* by The Center for Generational Kinetics, peer pressure is rearing its head in vastly different forms. It’s something that parents like Allison are admittedly a little worried about.

Being tech savvy herself has made it much easier to learn about the apps the kids are using and to discuss the ramifications they have and how to use them responsibly. “I find I’m a little more tech savvy than my peers,” she says, “because I really enjoy it. I was using Twitter and Instagram before the kids knew what they were. Snapchat is a different story. I just don’t see how this fits into my life. It’s not the way I communicate with my friends. Of course, friendships of 40-somethings are drastically different than those of teens.”

While it’s clear that this burgeoning generation of consumers will have a lot of influence on things like banking, dating, learning and communicating,

it’s not as clear as to what the normalization of such deeply entrenched online communication will have on them as human beings. How susceptible will they be to bullying or viral marketing? How will they behave in person compared to on WhatsApp?



Lilly Eckel

As the rules evolve, of course, there will only be more questions, like what happens when Gen Z loses interest in an app or device. It's causing a lot of companies to want to stay as relevant as possible with new and improved features that can make the tech lifecycle that much more aggressive and competitive.

No Reference Before Amazon.com

Dan Schawbel, partner and research director at Future Branding and founder of Millennial Branding in New York City, spent a year between 2014 and 2015 traveling across the country interviewing both millennials and Gen Zers. He admits that the biggest problem researchers like him have in labeling Gen Z is coming to terms with the sheer size of this generation.

"Someone who is five years old has very different needs and wants compared to someone who is 20," Schawbel says. As such, he often narrows his research subjects to be between about 16 and 22, a more manageable demographic that can reveal much about where this generation is poised to go when it comes to tech.

For example, Gen Z has never *not* known a time before Amazon.com. They rely on YouTube to learn about things like makeup and fashion. Carrying a credit card that isn't on your smartphone or Venmo almost sounds as weird as using a checkbook. And because the oldest members of Gen Z were in middle school during our last Great Recession, they are old enough to understand the emotional connection to finances. They may have had families lose their homes to foreclosure and, as such, they are expected to be much smarter about spending than their parents or millennials ever were. No wonder 100 percent of Gen Z surveyed by The

Center for Generational Kinetics say they comparison shop online for the best price.

"The expectation of comparison shopping by iGen," says Dorsey, "is an important trend because we predict that this will only continue to increase. As iGen enters adulthood and starts spending their own hard-earned money, they're likely to spend even more time trying to make the most of it as consumers."

Schawbel of Millennial Branding says Gen Z is often seen as retaliating against the norms. Even decisions like going to college aren't quite so cut and dry as they were for Xers or millennials. "They see the older generation struggling with debt," he says, "and they don't want to have the same problems."

It's expected that Gen Z will flip notions like price and brand on its head. The more digitally empowered generation has the potential to open more doors for startups and small businesses that can satisfy their expectations about both price and brand. Much like Etsy, business is no longer constrained to location based on geography. As such, walking through a store may become less of a pastime for these young people. We already see the impact that e-tailing has on brick-and-mortar as more stores close or rethink their branding.

The Bureau of Labor Statistics has been reporting a swift decline in employment in retail for several years in a row, while we see an increase in jobs related to warehousing where companies like Amazon.com employ people to pack and ship merchandise. This August, a new Amazon warehouse in the Philadelphia/New Jersey area attracted thousands of

The Impact of “Screen Time” *The Atlantic* Tackles the Smartphone Effect

In the September 2017 issue of *The Atlantic*, author Jean M. Twenge takes on the smartphone debate as seen through the eyes of Generation Z. In the story, “Have Smartphones Destroyed a Generation,” Twenge argues that while this youngest, most tech literate generation is far more comfortable online than they are partying or going out on dates, they may also be on the brink of a mental health crisis.

“Typically, the characteristics that come to define a generation appear gradually, and along a continuum,” Twenge reports. “Beliefs and behaviors that were already rising simply continue to do so.” Using experience as a doctoral student in psychology, Twenge documents noticeable shifts in behaviors and emotional states based on the use of technology among Gen Z. It’s no secret that Gen Z’s sense of self is more radically plugged into social media than any other generation. “The experiences they have every day are radically different from those generations that came of age just a few years before them,” writes Twenge.

SOURCE: *THE ATLANTIC*, “HAVE SMARTPHONES DESTROYED A GENERATION,” SEPTEMBER 2017

A FEW KEY TAKEAWAYS FROM THIS ARTICLE MAY BE SURPRISING:

- Users who owned smartphones surpassed the 50 percent mark around the time of the Great Recession between 2007 and 2009.
- Most Gen Zers have an Instagram account before they start high school.
- Gen Z’s oldest members were early adolescents when the iPhone was introduced.
- A 2017 survey of 5,000 American teens found that three of four use an iPhone.
- Rates of teen depression have increased since 2011. Experts believe that Gen Z may be on the brink of the worst mental health crisis in decades.
- Seniors in high school in 2015 were going out less than eighth graders in 2009. Only a bit more than half of this generation went out on dates compared to almost 90 percent of Gen Xers.
- Eighth graders who spend six to nine hours a week on social media are 47 times more likely to say they are unhappy than those who use it less.

How Social Media Impacts How You Feel

20% Boomers

23% Gen X

31% Millennials

42% Gen Z

SOURCE: THE CENTER FOR GENERATIONAL KINETICS

job applicants alone. Consumers' habits are driving everything from economics to employment to where people are living to access the most opportunity.

Consuming Information in Short Bites

At Lighthouse 3 in the San Francisco Bay area, CEO Mia Dand helps clients innovate their digital presence, including social media. With clients that include Fortune 1000s and startups, Dand is paying very close attention to Gen Z these days.

"We are looking closely at their communication preferences and preferred platforms," says Dand, things like Snapchat and Musical.ly, for starters. She's also studying their influencers on YouTube and social media, the online-made "celebrities" that inspire Gen Zers to buy a particular brand or subscribe to a belief system.

"Unlike previous generations," Dand admits, "technology is as ubiquitous as air to Gen Z. This generation is coming of age in a world where free Wi-Fi is the norm, their favorite brand of shoes can be delivered to their doorsteps within hours, and they can video chat with anyone across the planet with a smartphone." Understanding the nitty gritty about this generation's desired online and mobile experiences – like the appeal of more visual, streamlined, mobile-friendly UX – is fast becoming a cash cow for businesses who want to reach them.

"We've found that this is the most super-connected and influential generation," says Dand. "Because of easy access to information and interconnectedness, they are better informed, savvy consumers and can share feedback with other peers instantaneously, unlike previous generations."

Online shopping and video streaming both appeal to Zers. This generation is also much more open to technology that may not yet have gained wide acceptance among older consumers, such as virtual reality and artificial intelligence. They are also super smart about messaging and voice controls. “My friend’s 6-year-old was explaining Alexa, Amazon’s voice-activated digital assistant, to her grandfather,” says Dand. She described Alexa “as someone who lives in the speaker and orders pizza for her.” Gen Z, says Dand, is very, very comfortable with new technology. Their level of comfort is “off the charts,” she says.

It’s no wonder. Gen Z is growing up with the expectation that gadgets, devices and even cars will respond to their voice commands. “We will see voice activation becoming a standard feature for new consumer technology products,” she predicts.

And though she says this generation “has the attention span of a fruit fly,” that “they are usually flitting between screens and consume information in short bites,” technology will be designed for them, it will be designed for “quick consumption and maximum interaction to grab and hold their attention.”

It’s likely that virtual reality will become the next game-changing technology that Gen Z adapts in new ways, according to the Center for Generational Kinetics. Though they may become more conservative in their spending, Gen Z will use engaging tools to communicate and make purchases like never before.

“My teenager and I were online,” says Dand, “browsing for a new messenger bag and had a bunch of tabs open for sites. This is when I noticed something bizarre. My child was barely on a site for a few seconds before

shutting it down and repeated the same with every other site. By the time we got to the fourth site, I had to ask, ‘What are you doing?’ The response? ‘These sites are horrible. I refuse to look at badly designed sites.’ That’s quintessentially Gen Z. This generation is hugely influential and drives millions of dollars in indirect and direct purchases. They can be very loyal consumers, but if the experience doesn’t deliver exactly what they want, they’ll move on before brands can figure out what went wrong.”

Dorsey of the Center for Generational Kinetics, predicts that Gen Z will change how many people view hardware precisely because they are focused on software and the user experience. “In fact, they don’t even think of software in a traditional sense,” Dorsey explains, “but rather, just a screen through which they accomplish tasks or interact.”

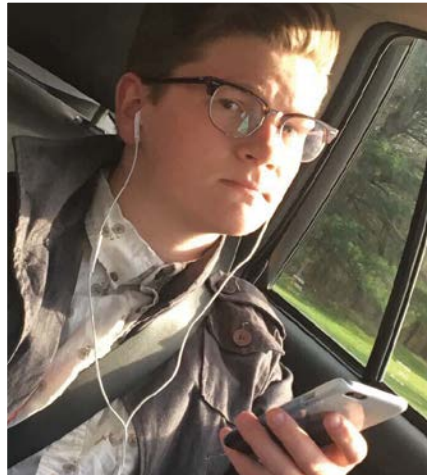
He says the emphasis on UI and UX creates tremendous pressure on the entire tech marketplace to continually adapt or risk falling behind rapidly. With Z, there’s underlying expectation for machine learning to constantly improve the experience.

“No industry, no matter how large, small, antiquated, or brand new, will be immune to the changes this generation drives,” Dorsey says. “The good news is that if you missed out on millennials, you get a full reboot when it comes to winning Gen Z who are just now entering adulthood and establishing their loyalty in many categories.”

If Schawbel of Millennial Branding had to summarize this complicated generation of tweens, teens and young adults into a few words, he says that Generation Z is A) Loyal, and B) Infused with technology. Tech is not just a tool for these kids, it’s akin to breathing. Tech is used to do just



Josephine Levesque



Thomas Eckel

about every task in life. And it's only going to become even more entrenched in our lives as the technology evolves to meet the demands of this youngest generation of users.

"They grew up with phones that could take pictures," Schawbel says. "They are more into 'selfie' culture than even millennials." He also says they can be narcissistic. They draw a lot of social comparisons online that determine their happiness, and they can readily adopt new tools that may seem foreign to their older counterparts.

"Technology," says Schawbel, "more so than my generation, [millennials] have changed their worldview in a unique way. They are highly connected and yet that has made them very isolated."

They are more likely to shop online, he says. They have a stronger desire to have an immersive experience when they are doing so. It puts a lot of pressure on retailers to not be boring. "And similar to millennials," explains Schawbel, "they don't want to work for a paycheck. They want a job that's meaningful." And they have embraced a similar social consciousness as millennials, including interests in issues like terrorism and climate change.

Social media will continue to have an enormous influence over what Gen Zers buy, what they think, how they communicate and if they are happy. According to Dorsey, 39 percent of Gen Zers admits that social media affects their self esteem. "This impact will likely only grow as iGen gets older and has more freedom when it comes to their social media experience," Dorsey adds. "In short, if you think social media is important to iGen now, just wait another five years." ■



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