Deloitte Review

Engaging workers like consumers

Banking's digital transformation

Measuring the social impact of corporate spending

EXCLUSIVE: An Augmented Reality experience of automotive and mobility trends

Issue 24 | January 2019

Silence the noise

Insights into operating, regulating, working, and playing

Industry 4.0 | Future of Mobility | Future of Work | Human capital

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LEADER

Silencing the noise

JOLYON BARKER
Global managing principal of Clients & Industries, Deloitte UK

THRIVING IN BUSINESS has never been simple, and it's today arguably more difficult than ever. The sheer scale of changes confronting leaders—from disruptive competitors to coping with emerging technologies, a shifting economic and geopolitical environment, and evolving consumer and employee expectations—is increasingly daunting, as is the volume of information that must be processed on a daily basis. Everything seems to be changing at once, and the decision leaders face is not whether to be involved, but how. And where. And when. And with whom. This issue of *Deloitte Review* seeks to cut through the noise, providing fresh insight into big challenges and critical issues we've been examining through our comprehensive understanding of the Fourth Industrial Revolution, the Future of Mobility, the Future of Work, and human capital.

In *How leaders are navigating the Fourth Industrial Revolution*, Deloitte Global CEO Punit Renjen provides a preview of our latest survey on Industry 4.0 (the full results will be released at this month's World Economic Forum in Davos). In short, while the technologies that drive Industry 4.0 have the potential to spur a new global operating system—socially as well as economically—we find many senior executives remain less prepared than they think they are. That said, some companies are successfully embracing Industry 4.0—and we reveal their secrets. *The Industry 4.0 paradox* provides deep dives on strategy, supply chain, talent, and innovation. *Tax governance in the world of Industry 4.0* explains how regulators and business leaders can work together to facilitate faster investment decisions.

One area where disruption seems the norm and the future looms large is mobility—how people and goods get from A to B. *Regulating the future of mobility* sees Derek M. Pankratz, William D. Eggers, Kellie Nuttall, and Mike Turley examine the central role of government in balancing innovation with the public good when it comes to autonomous vehicles, shared mobility, and beyond. Craig Giffi, Kevin Westcott, Ryan Robinson, and Steve Schmith provide a tangible glimpse into the future in *Picturing how advanced technologies are*

reshaping mobility, using augmented reality to allow you to explore how emerging technologies are changing the way we buy cars, drive (or not), and what it all means. And we venture to a metropolis synonymous with traffic for *To live and drive in LA*, where the general manager of the Los Angeles Department of Transportation, Seleta Reynolds, reveals how a city built for cars is seeking to become a model of 21st century mobility.

What is work? proposes redefining work itself. The head of Deloitte's Center for the Edge, John Hagel, and colleague Maggie Wooll argue that the age of artificial intelligence demands rethinking not only what we do but also how we do it, especially given our long-held belief that machines and humans are partners, not rivals. That's a view echoed by the founding director of the Massachusetts Institute of Technology's Center for Collective Intelligence, Thomas Malone, who tells Jim Guszcza and Jeff Schwartz how groups—both of humans, and of humans and machines—can combine to create "superminds," where the collective sum is vastly greater than the parts.

Of course, organizations are critical to determining whether individuals work together effectively. In *Are you having fun yet?*, Tiffany McDowell, Sheba Ehteshami, and Kyle Sandell examine the benefits—and competitive advantage—of merging work with play. Carolyn O'Boyle and Susan K. Hogan ask, in *Engaging workers like consumers*, why companies whose relationship with consumers have been transformed by technology aren't similarly forging better, deeper engagement with their employees. And ten years after the financial crisis, economists Rumki Majumdar and Patricia Buckley explain how global labor markets have shifted, and what that means for organizations struggling to bridge skills gaps in *How the financial crisis reshaped the world's workforce*.

With additional articles on everything from the digital transformation in banking to how companies can measure the social impact of corporate investment and a new way for marketers to categorize consumers, this issue of *Deloitte Review* provides a roadmap to help navigate challenges that will occupy many of us in the year ahead. We hope you find it insightful, useful, and provocative—that's our view of the role of global thought leadership, and we're proud to be on this journey together.

on the

TMT PREDICTIONS

What does the future hold for technology, media, and telecommunications? From familiar phenomena like radio and TV to the cutting edge of quantum computing, this year's predictions describe a landscape of continuity amid rapid change.

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ALL IN A DAY'S WORK: HOW DO YOU SPEND YOUR TIME?

What do people do all day? Broadly speaking: work, sleep, or watch TV. Data from the American Time Use Survey illuminates what we tend to do with our time, offering valuable insights to policymakers, economists, and businesses.

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WOULD YOU HAIL A FLYING TAXI?

A world with flying cars is closer than you think. Yet psychological barriers may be the biggest challenge to overcome. Creators and operators will have to convince consumers that airborne vehicles are both useful and safe in order to realize an elevated future of mobility.

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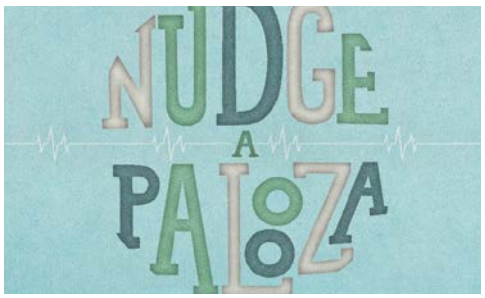

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THE FUTURE(S) OF HIGHER EDUCATION

Can universities meet growing demands for relevance even as they face a funding squeeze? Here are five innovative ways stakeholders can collaborate to deliver an effective yet affordable educational experience.

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Accelerating digital transformation in banking

FINDINGS FROM THE GLOBAL CONSUMER SURVEY ON DIGITAL BANKING

by Val Srinivas and Angus Ross

ILLUSTRATION BY HEIDI SCHMIDT

THE BANKING INDUSTRY is in a digital arms race. In 2018, banks globally plan to invest US$12.3 billion to enhance their digital banking capabilities in the front office alone.[1] For many retail banks, online and mobile channels have become as important—if not more important—than branches and ATMs.

Banks around the world are already realizing how investments in digital technologies could benefit customer acquisition and satisfaction. For example, Bank of America currently receives more deposits from its mobile channel than it does from its branches.[2] The bank's CEO, Brian Moynihan, recently stated that investing in digital banking capabilities has helped improve customer satisfaction.[3]

But satisfaction is relative. As leading technology brands, such as Apple, Amazon, and Google, have become the gold standard for digital engagement, many consumers now have a stronger emotional connection with these brands than they have with their primary banks. If banks want to keep up, they have to engineer the digital experience they offer to make these emotional connections, which, ultimately, could translate into sticky interactions and more profitable customers.

The Deloitte Center for Financial Services surveyed 17,100 banking consumers across 17 countries to measure the current state of banks' digital engagement. We asked respondents how frequently they use different channels and services, with an eye on digital transactions. We also captured consumers' expectations and perceptions of digital banking capabilities, and their likelihood of using additional digital banking services in the future.

The survey results support Deloitte's belief that *restructuring organizations around different stages of customer interaction* will be the next frontier for digital banking. Specifically, this will require integrating digital services across five stages—adoption, consideration, application, onboarding, and servicing—to drive holistic engagement. We believe the results clearly show that banks need to expand their focus beyond increasing and enhancing digital service offerings to transform themselves into truly effective digital organizations.

Satisfaction with banking is relative

The Deloitte Center for Financial Services' global survey of banking consumers confirmed a finding that we have observed in other Deloitte studies: Consumers' overall satisfaction with their primary banks is generally high.[4] Nearly two-thirds of consumers in our global sample are either *completely satisfied* or *very satisfied* with their primary bank. However, satisfaction varies country by country (figure 1).

Within the Asia Pacific region, for example, consumers in India and Indonesia are more satisfied with their banks than are those in Singapore,

ABOUT THE STUDY AND METHODOLOGY

The Deloitte Center for Financial Services fielded a global digital survey in May 2018, querying 17,100 respondents in 17 countries. We set minimum quotas for age and gender for each of the 17 countries. The survey emphasized consumers' digital engagement, including their channel preferences for various banking activities and buying new products, their emotional connection to their banks, and other attitudes and perceptions about their primary banks.

To understand whether there were different segments with unique characteristics within our global sample, we performed cluster analyses of channel usage data for 13,912 eligible respondents.[5] We found that one algorithm in particular yielded the most statistically significant and meaningful results. The input data for the cluster analysis was:

- How frequently the respondents use bank channels: bank branch, ATM, contact center, online banking service, and mobile banking app
- Which channels they prefer to access a range of services: transactional (withdraw money, pay bills), informational (inquire about bank balance, inquire about a bank product, update account details), problem resolution (dispute a transaction, report lost or stolen debit/credit card), and product application (apply for a loan)

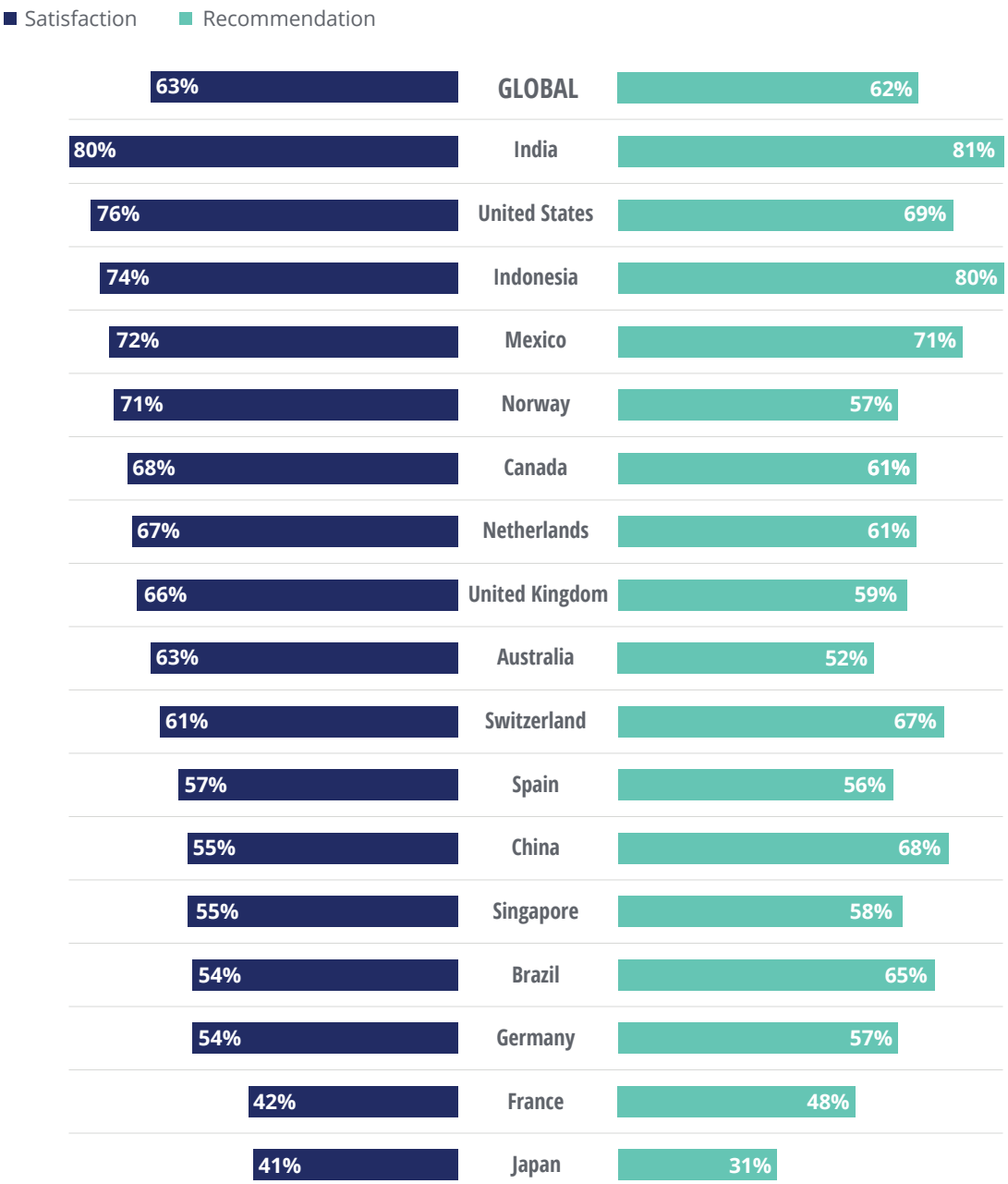
The results revealed clear differences regarding digital attitudes and behaviors among consumers. Across the globe, consumers fell into one of three distinct segments: *traditionalists*, *online embracers*, or *digital adventurers*. Please read more about the segment characteristics in "The digital-emotional connection" section later in the article.

The survey data reported are unweighted, and we caution that the interpretations may be limited to the samples we included in the study.

FIGURE 1

Although satisfaction and advocacy rates are high, they are not uniform across countries

Respondents who indicated they were "extremely/very satisfied" and "very likely/likely to recommend" (respectively)



Australia, or Japan. In Europe, consumers in Norway and the Netherlands are more satisfied with their banks than are those in Germany, France, or Spain. Comparing satisfaction levels across the Atlantic, consumers in the United States and Canada are generally more satisfied with their banks than their European counterparts are.

These patterns are mirrored when determining whether consumers would advocate for their banks. Nearly two-thirds of consumers in our survey said they would recommend their primary bank to friends and family. A higher proportion of consumers in India and Indonesia are likely to recommend their banks than in Japan, Singapore, or the United States.

But these questions measure emotional engagement with broad strokes; they do not paint a full picture of customer satisfaction. As banks embrace varied strategies to differentiate themselves, they need to pay close attention to how they make their customers feel so they can build sticky relationships.[6] Emotionally connected consumers are 35 percent more valuable than highly satisfied consumers.[7] In our study, the top 25 percent of respondents who ranked their bank the highest using six positive descriptors also have a higher number of products with their primary bank.

Importantly, though, our survey also showed that banks trail other brands in building these emotional connections. Best-in-class digital service providers, including Apple, Google, Amazon, Samsung, and Microsoft, topped the list. Consumers feel these favorite brands outperform their banks in providing quality, convenience, and value via an exceptional digitally driven consumer experience.

Consumers feel these favorite brands outperform their banks in providing quality, convenience, and value via an exceptional digitally driven consumer experience.

The rate of digital adoption is encouraging, though transactional in nature

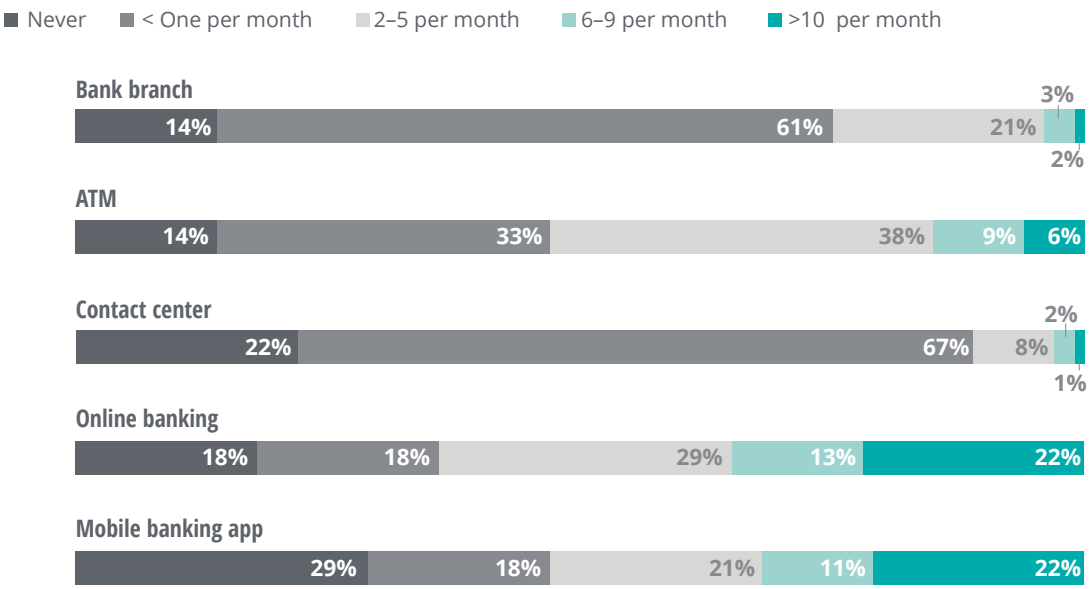
Our survey also indicates that consumers are ready for a higher level of digital engagement from their banks. Many consumers already interact with digital banking channels quite frequently, which is a highly positive development. Although branches and ATMs are still used by slightly more banking customers, online and mobile channels are not far behind. Eighty-six percent of consumers use branches or ATMs to access their primary bank; 82 percent use online banking, and 71 percent use mobile apps to access their primary bank. But, more tellingly, digital channels are used more frequently than branches and ATMs across all generations, and in all countries (figure 2). This clearly presents an opportunity for banks; if they can improve their digital offerings, they could increase customer engagement.

However, a country-by-country breakdown reveals some curious exceptions. Japan, in particular, stands out from the crowd with only 7 percent using online and 6 percent using mobile banking more than five times a month. This result is not completely surprising, however: A 2016 study revealed 70 percent of internet users in Japan used cash to pay at a physical store.[8] China and Singapore, both known for populations that are digitally savvy,[9] also fall into this category, but not to the same extent.

Among the other countries surveyed, though, the general trend is that many more banking interactions are made online and via mobile devices than through ATMs and branches. This is a good start.

FIGURE 2

Respondents used mobile and online channels most frequently



Note: Percentages may not total 100% due to rounding.

The first step toward improved brand recognition is to get in front of the customer as often as possible.

While the frequency of digital channel usage is a positive sign, there is an important distinction to make here regarding quantity versus quality of interactions. Our survey showed that digital channels are mostly limited to informational and transactional services that have been available through online banking for at least 15 years, such as transferring money, updating account details, and checking account balances.

Many consumers still prefer traditional channels over digital channels for complex or advisory services, however. Of the respondents who filed a complaint with their bank, 42 percent used contact centers, 26 percent used branches, and only 32 percent used digital channels (online or mobile). The trend is also true for applying for new products, especially loans that require multiple verification and documentation steps (figure 3). Interestingly, consumers were split in their preference to use online and mobile channels versus branches when applying for payment cards (debit and credit cards) and basic transactional products (payment and savings accounts).

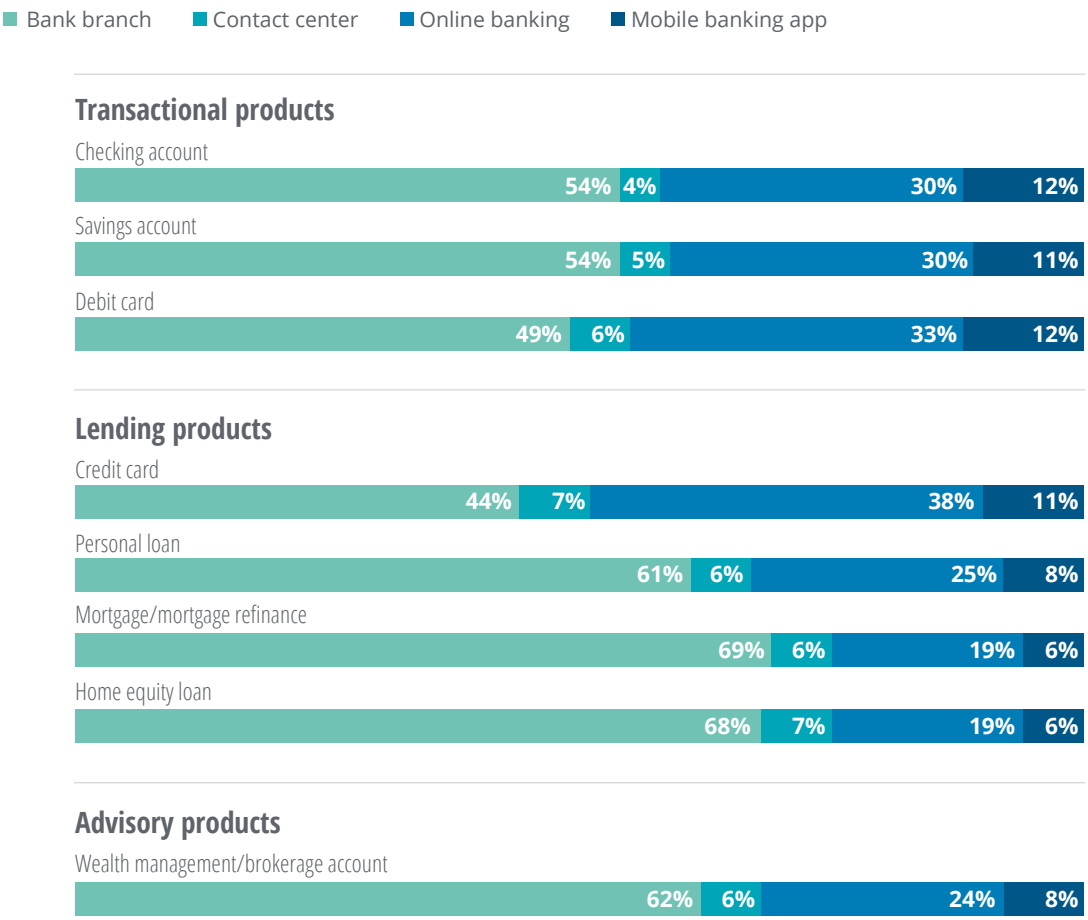
And although few banks allow their customers to apply for a consumer unsecured term loan or small business loan through digital means, nonbank fintechs have been allowing this for almost a decade, and some banks have followed suit.[10] Yet, for the most part, retail banks still require human intermediaries and cumbersome nondigital documents to process loan applications.[11]

Further, banks' "pull" approach versus a "push" approach to digital service could be standing in the way of creating emotionally engaging digital interactions. Today's consumers still come to the bank's platform to meet their needs—be it monitoring account details or understanding their spending patterns—and banks tend to react to their needs. Meanwhile, fintechs have shown a better way to digitally engage consumers through a "push"

FIGURE 3

Most respondents prefer traditional channels to handle complex or advisory services

Where respondents go to buy new products



strategy that includes sending them intelligent, tailored insights based on their spending behavior or notifying them about discounts or loyalty offers at nearby retailers.[12] Although banks have made the important step of making the login process easier by having mobile devices remember information in a secure manner, they can invoke more push strategies, such as providing customers with alerts regarding unusual movement in their accounts.[13]

The digital-emotional connection

To dig deeper into digital engagement, and understand how it varied across customer segments, we ran a cluster analysis. This examination of nearly 14,000 global respondents[14] confirmed a positive relationship between digital usage and emotional engagement in three distinct consumer segments. We've named these groups *traditionalists*, *online embracers*, and *digital adventurers*.

- *Traditionalists* comprised 28 percent of the sample. They are light digital users who do most of their banking in branches and through ATMs. Nearly one-half of these respondents who check their bank balances used ATMs; a fifth used branches. Of the traditionalists who transferred money from one account to another, one-third used ATMs while another one-third used branches.

  Nearly one-quarter of traditionalists have never used online banking to access their primary bank. Their reluctance to use mobile apps is even higher—44 percent have never used mobile apps to access their primary bank. Even among users of online and mobile banking in this segment, only one-tenth have used these channels 10 or more times in a month. Traditionalists also hold fewer products, such as debit and credit cards, than the other segments.

- *Online embracers* comprise the largest segment, at 43 percent. They are more digitally engaged with their banks than are traditionalists, but prefer online over the mobile app channel for types of transactions that banks have spent years perfecting online, such as balance and transaction inquiries, transferring funds, and paying bills. They have higher product holdings than traditionalists and transact with their banks more frequently, but not all the time; about 20 percent of online embracers accessed their bank online more than 10 times a month, and 25 percent accessed their mobile apps more than 10 times per month.

- *Digital adventurers* comprised 28 percent of the sample; millennials comprised the highest share of adventurers compared to the other segments. Like online embracers, this group exclusively uses mobile and online channels to inquire about their account, transfer funds, and pay bills; however, many more adventurers are comfortable, and prefer, to perform them on their mobile devices. As an example, 48 percent of digital adventurers transfer money person-to-person (P2P) online and 44 percent do so on mobile apps, while 52 percent of online embracers make P2P transfers online and 37 percent prefer to do so on mobile apps.

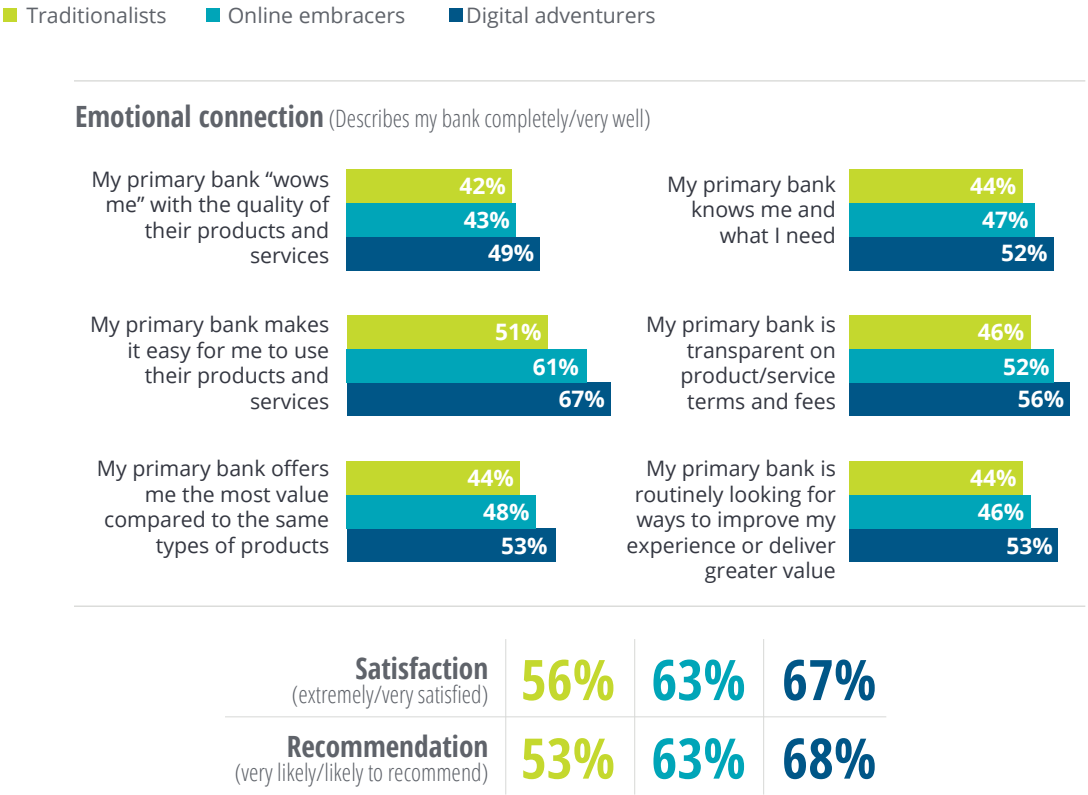
  Digital adventurers also own many products, but they transact much more frequently than online embracers do. Over half of users of online and mobile banking in this segment have accessed these channels 10 or more times a month. A significant proportion of digital adventurers prefer to use online and mobile channels combined more than visiting a branch to apply for simple products such as debit cards and checking accounts. And although just under 32 percent and 11 percent would prefer to apply for a personal loan online and on their mobile app, respectively, this compares to 25 percent and 7 percent for online embracers and only 17 percent and 6 percent for traditionalists.

Digital adventurers demonstrate the highest levels of satisfaction and advocacy for (are most likely to recommend) their primary banks.

FIGURE 4

How emotional engagement varies by consumer segment

Percentage of respondents who agreed or strongly agreed



Most tellingly, digital adventurers demonstrate the highest levels of satisfaction and advocacy for (are most likely to recommend) their primary banks. And they also generally express a deeper emotional engagement with their primary banks compared to online embracers and traditionalists (figure 4), at least in absolute terms.

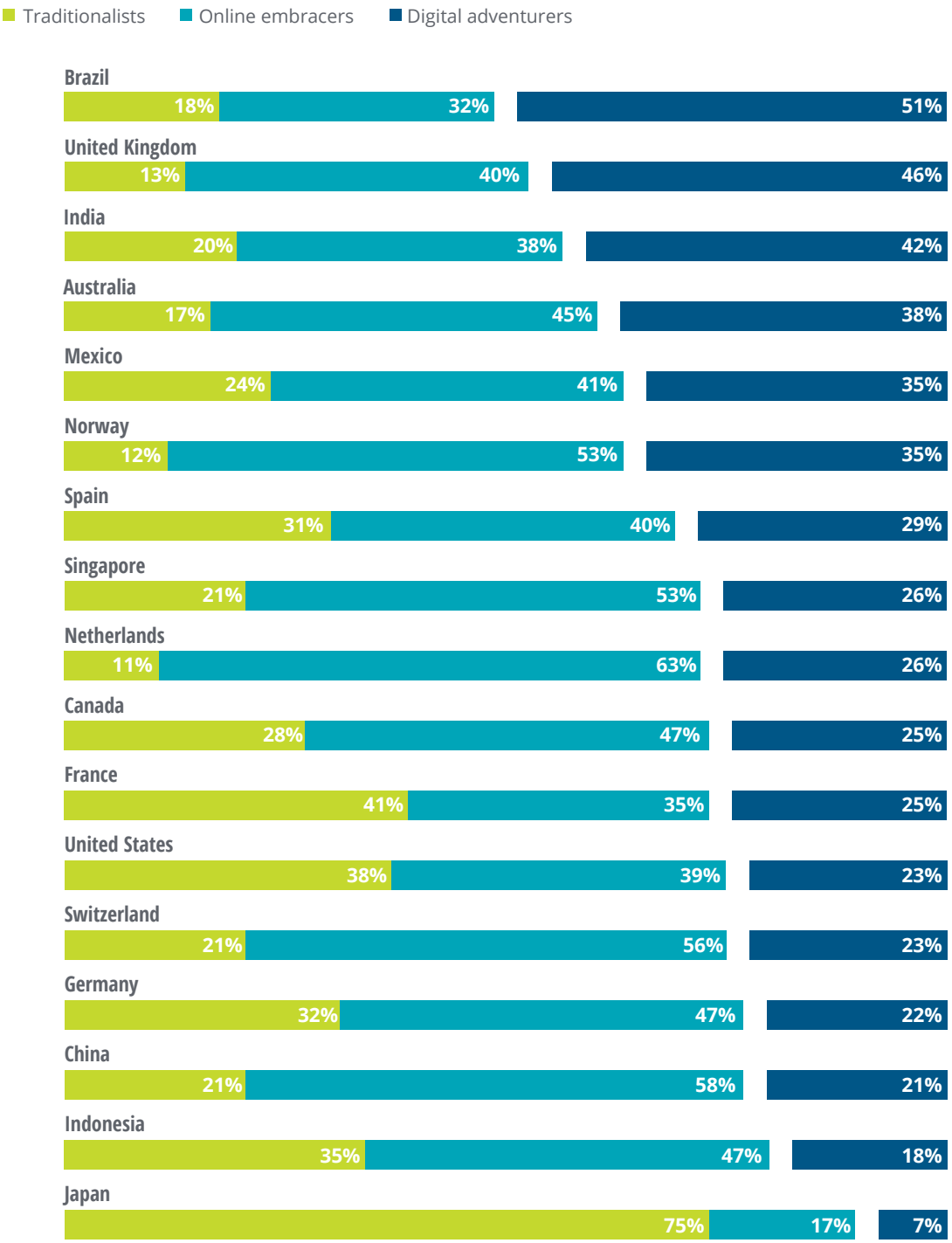
When looking at digital adventurers' emotional engagement with their banks compared with their favorite brands, an interesting twist emerges. Although digital adventurers are the most emotionally engaged banking consumers in absolute terms, the gap between engagement with their favorite brands and primary bank is higher for five of the six parameters. Banks have some road to travel if their most satisfied, seemingly more engaged consumers are not as "wowed" by banking services as they are with their favorite brands.[15] This is where we ask ourselves, "Are banking consumer relationships truly sticky? If these favorite brands become financial services providers, then what?"

Segment characteristics are not uniform by country

We also analyzed how the segments we described above are distributed across the 17 countries included in our study (figure 5).

FIGURE 5

Country-by-country comparison of customer segments



Note: Percentages may not total 100% due to rounding.

Predictably, when looking at clustering by country, 75 percent of respondents in Japan, a digital banking laggard, are traditionalists. Next in line are France, the United States, and Indonesia, with 41 percent, 38 percent, and 35 percent of their samples, respectively, falling into the traditionalist category. The decades-old and resilient branch infrastructure could potentially explain the high composition of traditionalists in developed economies. However, the case of a developing country like Indonesia featuring a higher composition of traditionalists compared to the global average merits additional analysis.

The Netherlands boasted the highest composition of online embracers (63 percent), followed by China (58 percent), Switzerland (56 percent), Singapore (53 percent), and Norway (53 percent). High internet connectivity in most of these countries potentially explains their reliance on digital. For instance, the Netherlands ranked among the top four countries in the 2017 Digital Economy and Society Index, which measures digital performance and competitiveness in Europe.[16]

Of the 17 countries studied, Brazil has the highest representation of digital adventurers compared to the global average. Meanwhile, the United Kingdom and India, comprising 46 percent and 42 percent of digital adventurers in their samples, respectively, mirror the global story more closely with higher satisfaction and high digital use.

More real in digital and digital in real

Digital channels can provide an effective gateway to emotionally connect an organization to its consumers. Technology companies that are consumers' favorite brands not only have best-in-class digital capabilities; they also do a superior job integrating digital and physical environments and integrating both strategically to foster an emotional connection.[17] Amazon's digital prowess allows customers to discover, research, and buy products in minutes, while enabling its physical supply chain to deliver the goods most efficiently. Merging the physical with the virtual/digital is key to superior customer experience: putting the "real in digital and digital in real."

According to our survey, consumers are more likely to increase use of digital channels (both online and mobile) if banks increase security, provide more real-time problem resolution, and allow for more regular banking transactions to be handled digitally. On the other side, adding digital self-service screens at brick-and-mortar locations, or being able to connect with a bank representative virtually, will increase consumers' likelihood to use branches (figure 6). Putting the real in digital and the digital in real is clearly a route that banks must take in their digital transformation efforts. Following are some suggestions:

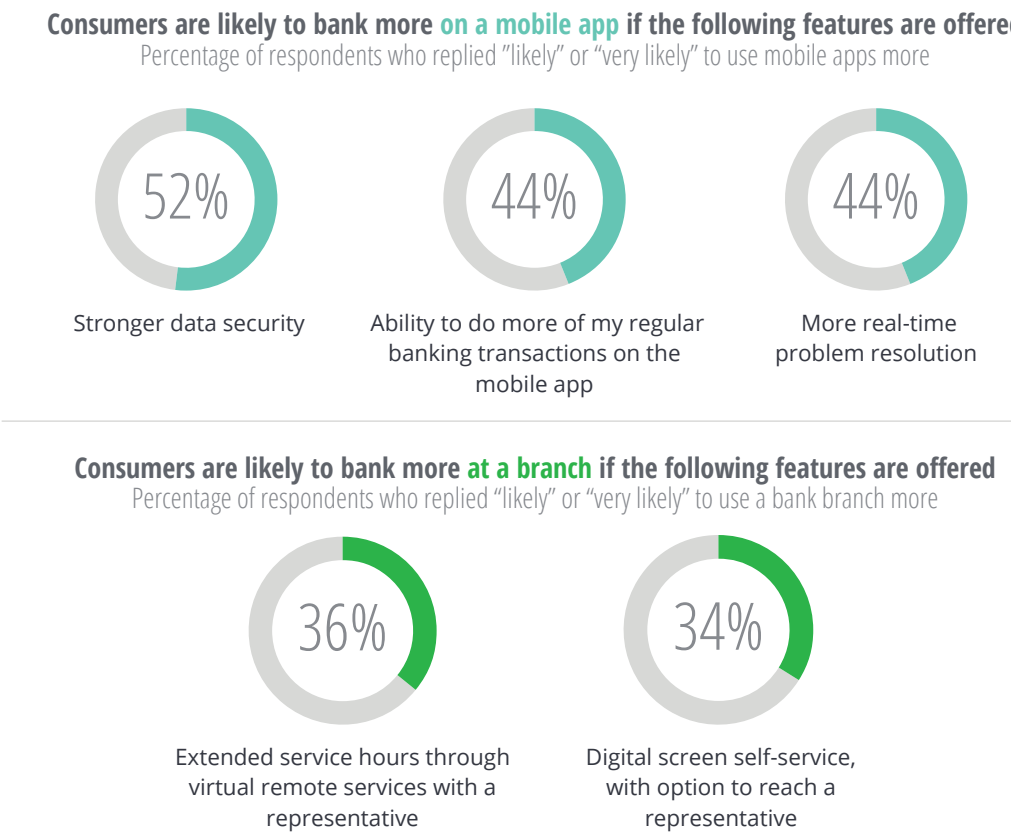
Bolster security measures for all consumers. With all three segments, stronger digital security will likely increase the likelihood that customers will use digital channels in the future. Security concerns are especially acute for traditionalists; in fact, this is why some traditionalists have never used online or mobile banking to access their primary banks.

Bolstering security using tools such as biometrics is paramount. These are already being widely used. For example, ANZ bank customers can make payments of more than $1,000 via mobile app using Voice ID technology and no additional authentication.[18] Banks should advertise such security features more prominently and differentiate messaging for different segments.

Emphasize the convenience of digital with traditionalists. A big reason many traditionalists do not use digital channels is that they simply do not see their merit. Therefore, raising awareness around the convenience of banking on the go (mobile) or banking from anywhere (online) is pivotal. Consider boomers and seniors who may be hesitant to use digital channels. In 2016, Capital One bank in the United States partnered with Older Adults Technology Services, a nonprofit, and Grovo, a digital learning platform, to develop a training program, "Ready, Set, and Bank."[19] The program consists of short online videos and live classes to

FIGURE 6

Digital vs. physical: What's important to consumers?



educate seniors on the basics of online banking, such as setting account alerts.

As banks add more digital features in branches (digital in real), branch professionals should step up a campaign to demonstrate to these consumers how easy it is to use a digital screen or a tablet for simple transactions, including paying bills, transferring money, or even applying for a debit card. (More than 50 percent of traditionalists reported not owning one!) Once traditionalists become more comfortable with using branch-based digital tools, representatives should then familiarize them with mobile banking. Helping them download the bank's mobile app should be easy to do, considering 92 percent of traditionalists already own a smartphone.

Expand mobile apps' capabilities to simplify its user interface to engage online embracers. Last year, we predicted that mobile devices would replace branches as the central channel around which other channels revolve.[20] Now, online embracers are much more comfortable with online banking than they are using mobile banking apps. Banks should seek to encourage this segment's engagement on mobile apps.

Among other reasons, a factor limiting embracers' mobile banking usage could be the app's limited functionalities compared to online banking portals. To increase online embracers' willingness to use mobile banking, banks should focus on making mobile apps more intuitive and

more comprehensive. Here, a good example is the iPhone.[21] For more than a decade, each iPhone iteration has achieved massive market share by providing an intuitive and elegant user experience, coupled with comprehensive functionalities.[22] In addition, while some banks may fear cannibalization, cross-promoting mobile apps on online portals could help create a richer, more versatile consumer experience.

Transform mobile as an experiential channel for digital adventurers. Digital adventurers are already avid users of banks' digital channels. They expect more from their primary banks, which can be seen in the gap in emotional connection between their favorite brands and primary bank. With this segment, banks should use mobile as a differentiator to build sticky experiences. Though digital adventurers choose mobile apps as much as online websites for bank interactions, they primarily use mobile for transactional services, such as paying bills or checking balances, and basic product applications.

Here, banks could position chatbots as the go-to help tool or let consumers directly connect to a bank representative in the mobile app. These are good starting points, as this segment expects more real-time problem resolution in digital banking channels. In fact, enthusiasm among adventurers could be dampened by apps that lack customer service avenues.[23]

Consider the launch of digital-only banks. JPMorgan Chase rolled out a mobile-only bank, Finn, which targets millennials.[24] Marketed as an independent brand, Finn lets consumers make deposits, transfer payments using the Zelle payment system, and activate a Finn debit card using the app. It provides multiple features to help consumers manage their money in a simple and convenient way. For example, its "Pocket Your Pennies" feature transfers any change left from consumers' checking account purchases to their savings accounts.[25] Further, the rule-based "Autosave" feature gives a new dimension to banks' traditional recurring deposit service. A consumer hoping to fund a weekend trip with friends can create a rule to save US$5 for every US$30 spent until the savings reach US$1,000.

Moreover, banks can encourage digital adventurers to step up their use of digital channels by simply providing smarter account opening features. Options such as prepopulating forms on websites and apps, making authentication easier, and allowing e-signatures or fingerprint scanning will likely simplify and enrich consumers' product buying experiences.

Lastly, break the channel silos. Branch, ATMs, online, mobile, and call centers all need to be connected, along with third-party digital assistants such as Google Home and Amazon Alexa. Consumers' fascination for omnichannel experiences is real. Seventy percent of consumers in our study consider a consistent experience across channels to be *extremely important* or in selecting their primary bank. Therefore, banks must have a seamless flow of data across all channels. Having a 360-degree view of consumer interactions across channels, products, and systems will pay off by building stickier emotional engagement.

The case for accelerating digital transformation

Of course, these are broad recommendations, and as such, they will not uniformly fit the different consumer banking systems, experiences, and cultures of every country.

However, despite these differences and nuances across geographies, we noticed a common key theme: There needs to be an evolution in how consumers interact with their banks, and customers are expecting that progression to begin now. Picture these scenarios: Consumers hanging out at or working from café-resembling bank branches, interacting with their bank's mobile apps as integrally and joyfully as they do with social media apps, or reporting lost/stolen cards using the bank's app instead of dialing the call center. These are not mere

possibilities of distant future; they are the kinds of experiences many customers already expect—and have come to know—from the brands they most trust.

As the progression unfolds, human interactions will likely remain important, especially for milestone decisions in consumers' financial journeys. However, digital will be at the heart of personalizing consumers' day-to-day interactions to enhance their emotional connection to bank brands. And in many countries, mobile will likely become the epicenter of banks' digital transformation strategies.

Further, branches, ATMs, online banking portals, and mobile apps will likely take different avatars in the coming years, infusing more real life in digital and more digital in real life. And as this happens, perhaps some channels could become more prominent than others. For instance, if mobile apps evolve as the go-to help tool for consumers, this could minimize the need for call centers.

Perhaps the key takeaway we gleaned from the survey is that customer satisfaction is *relative*. In the end, to capture the hearts, minds, and wallets of customers, banks will need to accelerate their digital transformation and reconfigure each channel to serve every need customers have. Only this level of transformation is likely to strengthen banks' emotional ties with consumers and earn them a top spot in the list of consumers' favorite brands.

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Read more on www.deloitte.com/insights

Funding takes center stage for nonbank online lenders

Nonbank online lenders have become growing participants in the lending ecosystem. But this growth hasn't come without challenges. A Deloitte-LendIt survey found that cost of funding is a major concern for these lenders.

Visit www.deloitte.com/insights/nonbank-lenders

Millennial behavior: Making sense of hidden influences

A HOST OF BIASES CREATED BY TECHNOLOGICAL AND SOCIAL CHANGE MAY INFLUENCE THE GENERATION'S LIFESTYLE CHOICES

BUSINESSES SEEMINGLY NEVER tire of analyzing millennials: what they like, how they buy, where they spend. After all, there are 66 million people born between 1980 and 1995 in the United States alone, comprising a sizable part of the population, workforce, and economy.[1] And while all individuals are unique—and uniquely different—there are certain characteristics that make millennials who they are, shaping how they think and behave. The question is: what do we know about millennials that allows us to more accurately predict their choices and behaviors? Viewing them through the lens of behavioral economics may help.

One millennial trait is their comfort with—and reliance on—technology. After all, it's a generation that had technology in their lives for the majority of their existence, and thus may view this as something their lives would be incomplete without, rather than something merely "nice to have." The decision-making bias explaining this likely persistence of technology in millennials' lives is known as the **endowment effect**, which suggests individuals have the tendency to overvalue something that they already possess.[2]

Millennials have also often been considered key drivers of the sharing economy, preferring to rent or share, instead of buying.[3] A couple of economic factors may drive this trend. First, this is a generation on which the Great Recession may have left a significant impression, instilling an aversion to making big-ticket purchases that entail long-term commitment.[4] Second, millennials in the United States are also often burdened with significant student debt.[5] All factors considered, it shouldn't be surprising that the behavioral bias of

While all individuals are unique—and uniquely different—there are certain characteristics that make millennials who they are, shaping how they think and behave. The question is: What do we know about millennials that allows us to more accurately predict their choices and behaviors? Viewing them through the lens of behavioral economics may help.

loss aversion—the propensity to avoid losses at the expense of missing out on similar or even slightly greater gains—may play a significant role in their decision-making.[6]

They are also typically enthusiastic participants of the "review economy." Be it a restaurant or a date, millennials seem to rely on **social proof** to guide their decision-making.[7] While other generations have done it as well, what helps set this generation apart is the ease and transparency with which technology provides them this real-time data. And, far from being burdened by choice overload, many millennials rely on technology to learn the "most popular" or "most highly rated" option—in other words, **the default option**.[8] And, of course, it's often social media they turn to for these reviews.

One thing that some millennials have been accused of is their need for "immediate gratification."[9] In behavioral economics terms, this is closely associated with the concept of **present bias**, which refers to the tendency of focusing more on a payoff closer to the present time when considering two future events.[10] They've also been called "**experience seekers**"—that is, their immediate gratification may come in the form of spending on "experiences" such as entertainment, eating out, and travel—goods and services consumed immediately, rather than, say, durable goods that last for a longer time.[11] However, a closer look at spending data reveals that this is not really the case—they are in fact saving on health care, insurance, and pensions as part of their total expenditure, which suggests they are saving for tomorrow, rather than just spending on today.[12] And just because they say they *prefer* experiences, it doesn't mean they are actually doing so.[13]

Clearly, a mix of factors—technological, economic, situational, and behavioral—have shaped many millennials' minds and spending decisions. Nevertheless, like every generation before it, millennials are defined by certain characteristics that are a byproduct of the times they live in. Understanding these traits can provide valuable insight into how they think and behave.

For the full article explaining how economic and behavioral insights can help companies better understand millennials, read Akrur Barua and Susan K. Hogan's *What weighs on millennials' minds ... and wallets?* on www.deloitte.com/insights.

Five steps to scaling a flexible consumption model

MANY INCUMBENT TECHNOLOGY companies are scrambling to adopt in part or all of their business flexible consumption models (FCMs), which offer customers delivery and payment options to purchase access to products "as a service." It's not hard to see why. Besides providing greater value to customers, who pay only for what they consume, FCMs' potential business benefits include predictable, renewable revenue streams; deeper insights into customer consumption patterns to help inform add-on sales; and lower operational costs through the ability to serve customers at scale through a common platform.

Yet converting a traditional organization into an FCM requires a radical transformation of its operating model as well as its business model. Why? Unlike traditional, product-centric business models, FCMs organize activities around customer

needs and opportunities rather than the product life cycle. FCMs' value chains are not sequential, but interconnected: The company may engage with customers at any stage at any time, requiring an operating model that can support multiple concurrent customer interactions and that includes mechanisms for teams to work together to deliver an end-to-end customer experience.

One approach for companies seeking to implement an FCM is to adopt a "services operating model," which involves treating as "services" delivered to internal or external stakeholders not only the company's market-facing offerings, but its enabling internal operations. The following five steps can help companies make this shift:

Establish a transformation office with executive sponsorship. Companies should identify a senior leader with direct access to the C-suite to lead the transformation. This leader should head up a dedicated group to carry out the effort, supported by a cross-functional panel of subject-matter experts who understand the dependencies between, and the services operating model's impact on, different areas of the company.

Disaggregate the operating model into a set of services. The next, critical step is to decompose the company's operating model into a set of services in a way that allows each service to be independently managed and tracked. The complete set of enabling services should be identified for each of the company's marketplace offerings.

Determine the level of standardization for each service. Here, the temptation to take a blanket approach to standardization must be resisted. It is imperative to consider each service separately in the context of the offerings it supports when deciding on its level of standardization.

Operationalize each service. We suggest companies start by appointing a service owner for each service who will act as its general manager. The service owner should work with the central transformation team to identify the service's components, its consumer(s), the necessary inputs and requirements, the expected outcome(s), and its performance metrics. He or she should also determine whether the service should be placed within the legacy organization or housed within a separate structure specifically created to contain services supporting the FCM business(es).

Establish service life cycle management. Once a service is established, the service owner should work with the service's consumers to understand their requirements, and identify and prioritize the development of any new needed capabilities. Similarly, capabilities that a service's consumers no longer need can be eventually retired.

Organizing operations to support the delivery of FCM offerings is very different from the operational needs of a traditional business model. If the strategic decision is to go forward with an FCM, applying a services operating model can enable a company to execute the FCM(s) effectively in the marketplace.

For more, read the article by Abhi Arora, Gopal Srinivasan, and Isaac Khan, *The shift to flexible consumption: How to make an "as a service" business model work*, on www.deloitte.com/insights.

Social capital: Measuring the community impact of corporate spending

CITIES CLAMOR FOR CORPORATE INVESTMENT, EVEN AS THE SOCIAL IMPACT OF SUCH SPENDING REMAINS UNCERTAIN. OUR NEW MEASUREMENT MODEL SEEKS TO CHANGE THAT

By Steven Ellis, Tony Siesfeld, and Darin Buelow

ILLUSTRATION BY ANDREA COBB

A LARGE CORPORATION plans to open a manufacturing and distribution center outside a midsize, rural city in the United States. The county in which the center will be located hopes the investment will provide economic opportunity, and it has won the company over, in part, by offering multimillion-dollar tax incentives because models show the local economy will benefit from several thousand new jobs the center will introduce. Yet beyond new jobs, the center's social impact—on community concerns such as poverty, homeownership, educational attainment, public health, and civic engagement—remains unknown. Will the investment pay positive social dividends? There's no clear way to tell.

It's not hard to imagine the value to companies, communities, and social-impact stakeholders of being able to forecast the likely social consequences—for specific locations, using defined metrics—of corporate investment. Our Social Impact Measurement Model (SIMM) accurately predicts what could result from a large capital investment—or what may or may not happen in its absence. This machine-learning model estimates the social impact of investments at the US county level for the four years following the investment, analyzing 142 social measures ranging from child poverty and reading proficiency to carpooling and population migration (see sidebar, "Inferring causality: How the SIMM works"). The SIMM helps people better understand what a specific investment's impact might be, as well as why certain locations would see greater or lesser improvements than others. This can support more informed decision-making by companies, community leaders, and policymakers—and enable greater coordination among them to help further the public good.

Shedding light on heated debates

Businesses make many large capital investments each year throughout the United States—investments that many local governments bid fiercely to attract through economic credits and incentives. Often, the tacit assumption is economic growth will support additional social and community benefits. Many argue economic investments directly help communities through mechanisms such as reducing poverty and growing the tax base, enabling the community to better fund police, fire, schools, and public works. But not everyone always agrees corporate investment is an unalloyed good. Opposing citizens may argue a given investment will drive up the cost of housing, harm educational outcomes by creating more crowded classrooms, lead to "urbanization" with a rise in its attendant challenges (such as property crime), and speed environmental degradation.

Both sides typically take strong positions, and communities may become sharply divided. To some degree, public hearings can provide a venue for citizens to express their hopes and concerns, but there is no easy way to resolve people's concerns or validate their hopes except by either moving forward or blocking the investment. Regardless of the ultimate decision, some parties will likely be aggrieved, and the divide in the community may linger.

The ability to quantify the social impacts of a capital investment allows citizens, corporations, governments, and other interested parties to bring data to the debate. This can not only put discussions on an evidence-based footing, but also illuminate opportunities to put in place efforts to accentuate the positives and mitigate the potential negatives. For corporations, it can guide decisions around where to consider making capital investments in the first place, help them evaluate the alignment between their investments and their social impact goals, and allow them to calibrate those goals against realistic expected outcomes. Governments, for their part, can use the information to help determine whether and where to offer incentives for economic development, as well as how much a particular investment proposal is "worth" in terms of incentives, taking into account both social and economic metrics.

INFERRING CAUSALITY: HOW THE SIMM WORKS

While the SIMM does not isolate an investment as the sole cause of a change to a social measure, it does create a causal link between the investment and other contributing factors. The model starts with a database of county-level socioeconomic indicators, combining Deloitte proprietary data on corporate investments in each county with publicly available data on 142 socioeconomic attributes. These attributes are then used to find matched pairs of counties—counties with and without economic investments—over a four-year period, selecting the paired counties to be as similar as possible at the outset of that time frame. Because of the paired counties' baseline similarity, any differences in the change in social measures can be directly attributed to the economic investment. The underlying inference is while many factors will affect social measures, these factors will act similarly in both counties except as they are influenced by investment.

For example, in 2010, Wayne and Baltimore counties showed a high degree of statistical similarity across all 142 socioeconomic attributes. In the absence of investment in either county, it would be expected both would experience the same rate of change in these social measures. However, investment in Baltimore County all but dried up in 2010, while investments continued in Wayne County. Therefore, any difference in the change in social measures in Baltimore and Wayne counties between 2010 and 2014 may be inferred to come directly from the investment in Wayne County.

To be clear, the SIMM estimate is just that—an estimate. It is meant to supplement established methods of gathering information, conducting analyses, and bringing the derived insights into the capital allocation and planning process. What it offers is a quantitative and statistically rigorous way of linking financial inputs to social outcomes in a way that has not been done effectively before.

Generating insights to drive decision-making

Applying the SIMM has already shed light on the ways investments can affect certain communities. Investments of the same amount in the same industry can have different impacts in different locations. For instance, population density often matters: A US$500 million investment in a rural, wealthy county such as Travis County, Texas, is forecast to have less overall social impact than the same level of investment in a more densely populated, wealthy county such as Orange County, California. Similarly, investments can create meaningful change in childhood poverty levels in urban, poorer counties such as Orleans Parish, Louisiana; the poorest children in these counties can also benefit in educational attainment for reading and math scores. On the other hand, perhaps counterintuitively, the same amount of investment in more-rural counties with the same low-income level tends to drive little to no change in math or reading scores or childhood poverty rates—even though the investment would be higher per capita. However, in these same rural, poor counties, investment would likely decrease the adult poverty rate and adult dependence on government assistance more than the same amount of investment in denser, poor counties. In other words, all else being equal, capital investments tend to see children do better in dense populations, and adults do better in rural populations, when poverty rates are about equal.

Differences exist not just among different types of counties, but among different investment types and amounts for certain subsets of the population regardless of location. Larger investments made anywhere in the United States tend to attract younger, more educated, and more migratory singles, thus changing county demographics, family composition, and job mix. Likewise, our model shows larger investments made in any county at the intersection of the information and communications technology, electronics, and business services industries increase the percentage of the population working in professional, scientific, and technical service jobs by 11–35 percent. Investments at the

intersection of environmental technology and recycling, meanwhile, increase the percentage of the population working in manufacturing jobs by only 2–16 percent.

The model also shows that, despite some concerns to the contrary, the social effects of capital investments do not appear to be zero-sum—that is, improvements in one county's social outcomes do not come at the expense of social outcomes in neighboring counties. In fact, when distance to neighboring counties is taken into account, only 7 out of 142 (or 4.9 percent) of the model's social impact variables are affected by corporate investments in a neighboring county.

Encapsulating information for a broad range of people

It is easy to see that these types of forecasts may better inform decision-makers of all stripes. In addition to corporate executives making capital allocation decisions and local government officials considering economic incentives, those who are involved in community development, urban planning, or policymaking could benefit from anticipating how a community might absorb and "translate" financial investments into social outcomes. Stakeholders could also use the information to determine what types of social outcomes the community should prioritize to amplify the potential benefits of a large capital investments (see sidebar, "Questions to ask—and answer—about investments"). This kind of insight could be particularly valuable to nonprofits and foundations with a strong place-based focus.

Moreover, in addition to future investments, the SIMM can be applied to investments made in the recent past (up to five years ago) to help businesses evaluate their prior decisions and to help refine targets for their social impact goals in upcoming

QUESTIONS TO ASK—AND ANSWER—ABOUT INVESTMENTS

COMMUNITY DEVELOPERS, URBAN PLANNERS, AND POLICYMAKERS

- In absence of any outside investments, how will the social "health" of a community change in three to four years' time?
- To what extent would capital investments change this outlook? How does the size of the investment affect the change in social indicators?
- What is a county's apparent capacity to benefit from capital investment? Are there some places that would benefit more from a similar investment than others? And what are the conditions that create this varied capacity to "metabolize" investments?

A COMPANY TRYING TO DETERMINE SITE SELECTION

- Assuming equal economic returns for the various counties under consideration, in which community would the positive social benefits be the greatest?
- Are the company's capital investments consistent with its expressed mission and statement of social purpose?
- We have made a series of community-specific investments over the past five years. What has been the social "payoff" of these investments? Was the payoff greater, equal to, or less than what would be expected?

LOCAL GOVERNMENTS CONSIDERING THE IMPLICATIONS OF INVESTMENTS

- What are some of the benefits my community can expect from this investment?
- What would it be worth to this community to offer incentives to bring the investment to it? At what point are incentives no longer worth it?
- What might we anticipate as some of the social challenges that might come with such an investment? What could we do to limit these risks?

investments. In this way, the model can help businesses balance the past with the future. Further, should reporting requirements on certain environmental, social, and governance measures change (as they are in the European Union and in some places in Asia), businesses could use the model to help set reasonable and measurable goals. These kinds of analyses may also be useful to impact investors, especially to those with a location focus.

What's next

In its current incarnation, the SIMM establishes a link between capital investments in a county and social outcomes in that county for 142 social measures. However, there are many more dimensions to social data than are currently available in the data used to build the SIMM. While the initial findings are encouraging, they point to the potential benefits of further developing this approach to include other indicators of community well-being, such as measures of public health or civic engagement. Expanding the analysis to include more years of data as they become available to explore potential variations across time would provide significant additional informative power. This is important because the lag between an investment and some types of indicators are expected to be much longer than four years. For instance, educational attainment measures likely peak on a different time frame from poverty reduction or employment measures.

Nonetheless, the SIMM demonstrates a strong linkage between economic and social outcomes despite limited data. Better data—a wider array of factors, more granular local information, greater timeliness, the development of more common data standards across jurisdictions—will lead to even better insights, and better business and civic decision-making. Those with a strong interest in community development and place-based change now have a powerful tool to help them build coalitions and plan action, as well as a new way to enlist business interests into civic actions. That said, we have only just uncovered the potential for analysis in this area. With more work, more can be done.

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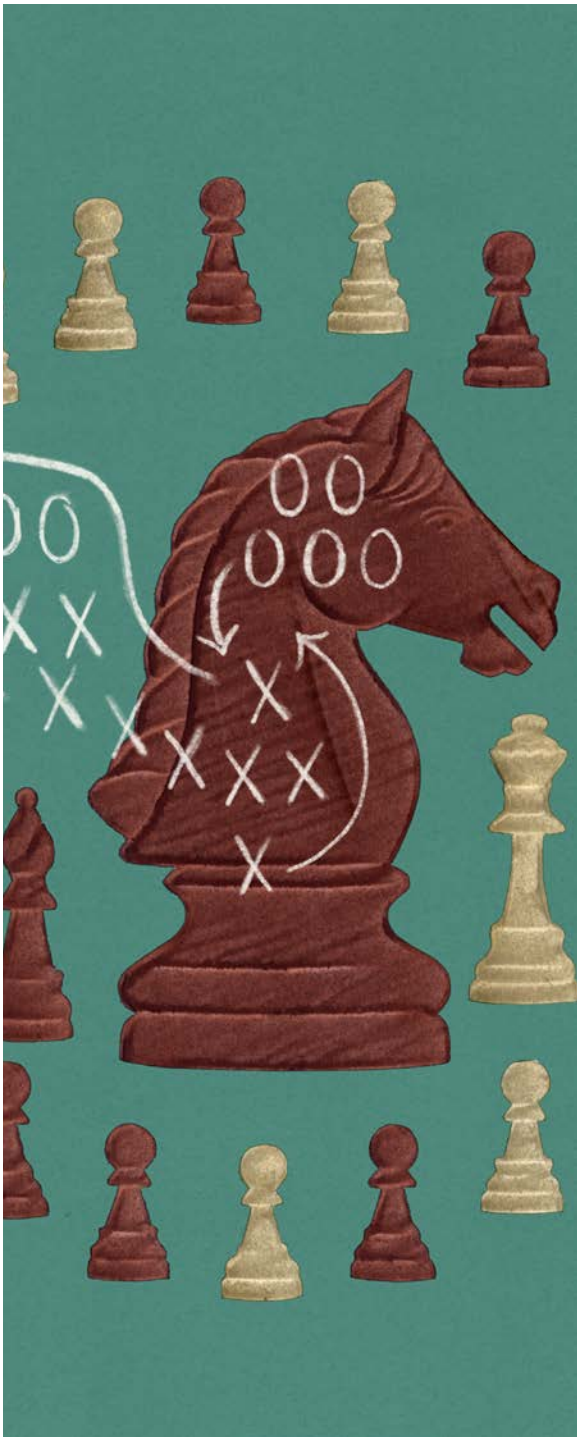


Crisis management for the resilient enterprise

ORGANIZATIONS FACE CRISES more often today than they did a decade ago, and those crises are increasing in magnitude. That's the consensus of more than 500 crisis management executives we surveyed last year, whose job it is to manage the organizational impact of extreme events ranging from leadership scandals to natural disasters. Our survey found 80 percent of organizations worldwide have had to mobilize their crisis management teams at least once in the past two years, with cyber and safety incidents topping the list of events requiring intervention. And while the vast majority

of respondents (84 percent) said their organizations have crisis management plans in place, many companies still could be doing more. The survey results generated five key insights:

1. **Experiencing a crisis teaches organizations to avoid them**. Nearly 90 percent of surveyed organizations conducted reviews, mostly internally, following a crisis. The major insight from these examinations was organizations can help themselves avoid crises by examining their preparedness across the entire lifecycle: Understanding the risk landscape, working to prevent issues from spiraling into crises, responding to and recovering from crises that do materialize, and learning from the experience to emerge stronger than before.
2. **Leaders need more development for crisis management**. Helping leaders display their full range of competencies under the extreme pressures of a crisis can support effective decision-making and communication when they are most needed. Senior leaders should determine, if a crisis occurs, how they want to organize themselves and allocate various roles and responsibilities. Simple but effective crisis management tools, such as agendas and checklists, can also help leaders to focus on the challenges ahead rather than worrying about whether they have covered the basics. And techniques needed for effective crisis leadership, such as communicating with stakeholders, should be practiced and honed.
3. **Confidence outstrips preparedness**. A company's confidence in its crisis management capabilities doesn't always match its level of preparedness. For example, nearly 90 percent of respondents were confident in their organization's ability to deal with a corporate scandal—yet only 17 percent had tested that assumption through a simulation exercise. Our recommendation is straightforward: Running crisis simulations, which will quickly reveal an organization's strengths and where it needs to improve, should be a standard part of a crisis management program.
4. **Readiness significantly reduces the negative impact of a crisis**. This is especially true if senior management and board members have been involved in creating a crisis plan and participate in crisis simulations. To secure their participation, it is important to keep the plan relevant to them so that it addresses the things that "keep them awake at night"; to track crises in the media; and to create case studies outlining the impact on finances and reputation should one hit. In addition, organizations should have a crisis management plan specifically for the board, which may need to play a very different role from management.
5. **Third parties are part of the problem—and the solution**. A number of companies are including partners and other outside organizations in crisis planning. Companies can start by determining which outside organizations need to be in the fold when managing a crisis. These could include advisors such as lawyers, public relations firms, specialist cyber defense organizations, or crisis advisors. In addition, critical service providers, joint venture partners, resellers, distributors, and any other entity that could trigger a crisis or be affected by it should be involved in crisis preparations.

Though many companies may overestimate their crisis management capabilities, this is not a time for hubris. As one survey respondent succinctly pointed out: "The world has become more global, but not more secure. And that trend cannot be reversed."

For more, read the article by Peter Dent, Rhoda Woo, and Rick Cudworth, *Stronger, fitter, better: Crisis management for the resilient enterprise*, on www.deloitte.com/insights.

Looking beyond age to understand consumers

MANY MARKETING STRATEGIES are aligned to broad generational consumer segments: baby boomers, Generation X, millennials, and now Generation Z. Yet consumers perceive themselves uniquely, and they spend money based on a range of factors beyond when they were born. That means marketers who take a stereotypical view of consumers may risk not only wasted marketing dollars, but potentially poor consumer-brand engagement and missed opportunities. And the risk can be particularly notable at a time when all generations are exposed to the same disruptive forces of globalization, innovation, technology, and the social-media revolution, which are causing a melding of attitudes and behavior.

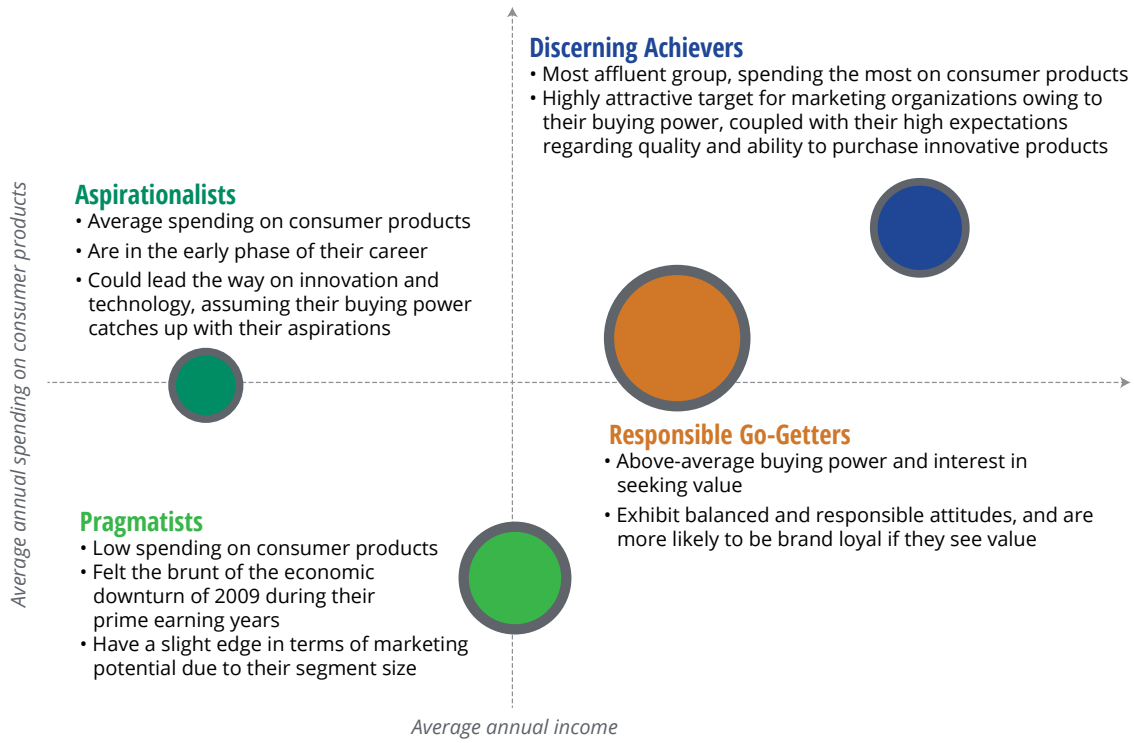
Our research shows that when it comes to buyers of consumer products, age is indeed just a number. The average consumer makes purchase decisions based on a combination of multiple factors including shopping behavior; channel preferences; technology preferences; and attitudes toward innovation, brand, convenience, and health and wellness. That's why we advise consumer products marketers to recognize consumer behaviors and tendencies and develop plans for different consumer segments accordingly.

But what are the most profitable segments and which consumer tendencies, or commonalities, are most important? We propose four segments as potential categories consumer products companies should be mindful of for inclusive brand growth (see figure). These segments cut across generations, indicating that attitudes are not hardwired by age. They may help marketers gain a deeper understanding of customer preferences to make the most of the available opportunities in a crowded market.

Responsible Go-Getters account for 46 percent of the population, and primarily comprise millennials and Generation X. They are the most valuable segment for consumer product companies, given their balanced and responsible attitude, higher-than-average income, general enthusiasm, purchasing behavior, and positive attitude toward technology. When Responsible Go-Getters see value in a product or brand, they are more likely

Putting it together: Buying potential by consumer segment

Bubbles show segment size as a percentage of the total population



to be brand loyal. Their above-average buying power and interest in seeking value make them an appealing target for marketing organizations.

Discerning Achievers represent 19 percent of the population and predominately comprise baby boomers. They spend the most on consumer products perhaps because they are the most affluent group. They have high expectations regarding quality, nutrition, and environmental friendliness of products. Notably, they are also the group that actually can afford to purchase innovative products. Marketers able to address these attitudes in their strategies could potentially capitalize on this lucrative segment.

The final two segments, **Aspirationalists** (13 percent of population and below-average income) and **Pragmatists** (22 percent of population and average income), are similar in terms of their average-to-low spend on consumer products. Even though Aspirationalists are eager to try innovative products, they aren't in a position to do so. Pragmatists are conservative, price-sensitive, and somewhat complacent with the status quo.

A one-size-fits-all marketing strategy isn't likely to capture all opportunities. While marketers would likely benefit from developing their own proprietary target segments, our proposed categories offer one approach companies can follow to help refine their marketing strategies to achieve brand growth, potentially driving profitability and increased customer engagement. It's in this way that they help make a case for expanding into untapped consumer segments companies ordinarily may not target based solely on generational marketing.

For more, read the article by Curt Fedder, Shweta Joshi, and Jagadish Upadhyaya, *Millennials and beyond*, on www.deloitte.com/insights.

SILENCE THE NOISE

INDUSTRY 4.0

FUTURE OF MOBILITY

FUTURE OF WORK

HUMAN CAPITAL

How leaders are navigating the Fourth Industrial Revolution

INDUSTRY 4.0 HOLDS THE PROMISE OF A NEW ERA OF GLOBALIZATION. YET WHILE OUR LATEST SURVEY IDENTIFIES COMPANIES SUCCESSFULLY IMPLEMENTING INDUSTRY 4.0 TECHNOLOGIES, MANY SENIOR EXECUTIVES REMAIN LESS PREPARED THAN THEY THINK THEY ARE

by Punit Renjen

ILLUSTRATION BY LIVIA CIVES

A YEAR AGO, Deloitte's inaugural survey assessing private and public sector readiness for the Fourth Industrial Revolution observed a "tension between hope and ambiguity." We found while executives conceptually understood the profound business and societal changes Industry 4.0 may bring, they were less certain how they could take action to benefit. The Fourth Industrial Revolution enables an increasingly globalized world, one in which advanced technologies can drive new opportunities, diverse ideas can be heard, and new forms of communication may come to the fore (for a detailed definition of Industry 4.0, see *What is Industry 4.0?* on page 63). But how are leaders adjusting? Our new survey suggests many who think they are ready may still not be as prepared as they need to be. But the good news is leaders seem to be gaining a much deeper understanding of Industry 4.0, are increasingly aware of the challenges before them, and are viewing the actions needed to succeed more realistically.

Our latest survey polled more than 2,000 C-suite executives across 19 countries, coupled with select interviews. The goal was to uncover how leaders are taking effective action, where they are making the most progress, and what sets the most effective leaders apart. Among our findings:

1. Executives express a genuine commitment to improving the world

Leaders rated "societal impact" as the most important factor when evaluating their organizations' annual performance, ahead of financial performance and customer or employee satisfaction. In the past year, three-quarters of respondents said their organizations took steps to make or change products or services with societal impact in mind. Many are motivated by the promise of new revenue and growth, but leaders are split on whether such initiatives can and will generate profit.

2. Executives are struggling to develop effective strategies in today's rapidly changing markets

Faced with an ever-increasing array of new technologies, leaders acknowledged they have too many options from which to choose and, in some cases, they lack the strategic vision to help guide their efforts. Organizational influences also challenge leaders as they seek to navigate Industry 4.0. Many leaders reported their companies don't follow clearly defined decision-making processes, and

organizational silos limit their ability to develop and share knowledge to determine effective strategies.

3. Leaders continue to focus more on using advanced technologies to protect their positions rather than make bold investments to drive disruption

Although many of the businesses that have made investments in technology are seeing payoffs, others are finding it difficult to take the step toward investing—even as digital technologies are engendering more global connections and creating new opportunities within new markets and localized economies. Challenges include being too focused on short-term results and lacking understanding, business cases, and leadership vision. Leaders acknowledge the ethical implications inherent with new technology, but few companies are even talking about how to manage those challenges, let alone actively putting policies in place to do so. Further, business leaders and governments continue to wrestle with how to regulate Industry 4.0 technologies.

4. The skills challenge becomes clearer, but so do differences between executives and their millennial workforces

Last year, most leaders (86 percent) thought their organizations were doing enough to create a workforce for Industry 4.0. This year, as more leaders recognize the growing skills gap, only 47 percent are as confident in their efforts. On the bright side, twice as many leaders indicate their organizations will do what they can to train their existing employees rather than hire new ones. And they're more optimistic than last year that autonomous tech will augment, rather than replace, humans. But research from Deloitte Global's annual millennial survey suggests leaders and employees (particularly younger ones) differ on which skills are most needed and who is responsible for developing them.

Four types of leaders

The general ambiguity expressed in last year's survey has subsided into a clearer, more tempered perspective in which leaders better recognize the many dimensions—and ensuing challenges—the Fourth Industrial Revolution brings. These include societal and ethical implications, the importance of clear vision and collaborative organizations, the tradeoffs of investing in technology for the short term rather than the long term, and addressing the talent gap. Yet, among these myriad issues, we see a subset of leaders forging a path forward. They include:

1. **Social Supers:** Some leaders have figured out how to do well by doing good, generating new revenue streams by developing or changing products and/or services to be more socially or environmentally conscious. *Social Supers* believe societal initiatives, more often than not, contribute to profitability and those initiatives

The general ambiguity expressed in last year's survey has subsided into a clearer, more tempered perspective in which leaders better recognize the many dimensions—and ensuing challenges—the Fourth Industrial Revolution brings.

These personas are contagious. While leaders may start on any one of these paths, they often embody a number of characteristics that might offer lessons for those still trying to define their approaches.

are fundamental to their business models. *Social Supers* also exhibit greater rigor around decision-making and believe their workforces are ready for the Fourth Industrial Revolution.

2. **Data-Driven Decisives**: Certain executives are far more likely to say they have clear decision-making processes and use data-driven insights. They're almost twice as likely as other surveyed leaders to say they are ready to lead their organizations in capitalizing on the opportunities associated with Industry 4.0. *Data-Driven Decisives* are also more likely to invest in disruptive technologies, to be concerned about the ethical use of new tech, and to train their current employees to access the skills required for Industry 4.0.

3. **Disruption Drivers**: We call executives who reported both investing in technologies to upend their markets and competitors, and making technology investments that have achieved or exceeded their intended business outcomes, *Disruption Drivers*. These leaders are more confident they can lead in the Industry 4.0 era (45 percent versus 32 percent) and more assured their organizations are prepared to capitalize on the opportunities associated with Industry 4.0, and they take a more holistic approach to decision-making.

4. **Talent Champions**: Leaders who are further along in preparing their workforces for the future than the rest of the field are *Talent Champions*. They believe they know which skill sets their companies need and that they have the correct workforce composition, and they embrace their responsibilities to train their employees for the future of work. About two-thirds have been able to generate new revenue streams through socially driven initiatives, versus half of all others surveyed.

Encouragingly, this research shows that these personas are contagious. While leaders may start on any one of these paths, they often embody a number

of characteristics that might offer lessons for those still trying to define their approaches. These leaders share a commitment to doing good, with a clear vision of the path forward. They take a long-term view of technology investments and are leading with regard to workforce development. Finally, their organizations are growing faster (that is, more than 5 percent annually) than their counterparts', and they're more confident in their ability to lead their companies in the Industry 4.0 world.

While leaders with these characteristics stand apart, over the past year leaders generally seem to better recognize the many dimensions—and ensuing challenges—of the Fourth Industrial Revolution. Our hope is this clarity will now give rise to progress.

This is an exclusive preview of Deloitte Global's second annual survey assessing business and government readiness for the Fourth Industrial Revolution. The full results will be released at the World Economic Forum Annual Meeting 2019, held January 22 to 25 in Davos-Klosters, Switzerland. To read our full report upon release, visit **www.deloitte.com/insights/industry-4-0-survey**.

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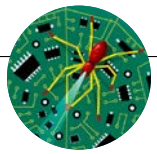

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The Industry 4.0 paradox

OVERCOMING DISCONNECTS ON THE PATH TO DIGITAL TRANSFORMATION

by Mark Cotteleer, Andy Daecher, Tim Hanley, Jonathan Holdowsky, Monika Mahto, Timothy Murphy, Vincent Rutgers, and Brenna Sniderman

ILLUSTRATIONS BY KEVIN WEIER

INDUSTRY 4.0 HAS both expanded the possibilities of digital transformation and increased its importance to the organization. Industry 4.0 combines and connects digital and physical technologies—artificial intelligence, the Internet of Things (IoT), additive manufacturing, robotics, cloud computing, and others—to drive more flexible, responsive, and interconnected enterprises capable of making more informed decisions.[1]

This Fourth Industrial Revolution carries with it seemingly limitless opportunity—*and* seemingly limitless options for technology investments. As organizations seek digital transformation, they should consider multiple questions to help narrow their choices: what, precisely, they hope to transform; where to invest their resources; and which advanced technologies can best serve their strategic needs. Further, digital transformation cannot happen in a vacuum; it does not end simply with implementing new technologies and letting them run. Rather, true digital transformation typically has profound implications for an organization—affecting strategy, talent, business models, and even the way the company is organized.[2]

As Deloitte sought to understand how companies are investing in Industry 4.0 to enable digital transformation, we fielded a global survey of 361 executives across 11 countries. While its definition has expanded, Industry 4.0 has its roots in manufacturing (for a detailed definition of Industry 4.0, see *What is Industry 4.0?* on page 63). As such, our global survey focused on manufacturing, power, oil and gas, and mining companies and examined how and where they are investing—or planning to invest—in digital transformation; some of the key challenges they face in making such investments; and how they are forming their technical and organizational strategy around digital transformation.

The survey revealed a mix of enthusiasm and ambitious plans for future investment—as well as a series of disconnects between companies' plans and actions, which we explore in the following sections. While digital transformation is taking shape in nearly every organization, paradoxes can be observed around strategy, supply chain transformation, talent readiness, and drivers for investment. This suggests that the will for digital transformation remains strong but organizations are largely still finding a path that balances improving current operations with the opportunities afforded by Industry 4.0 technologies for innovation and business model transformation.

The strategy paradox. Nearly all respondents (94 percent) indicated that digital transformation is a top strategic objective for their organization. Just because respondents appear to understand its strategic *importance*, however, doesn't necessarily mean they are fully exploring the realm of strategic *possibilities* made possible by digital transformation. In fact, many fewer (68 percent) see it as an avenue for profitability.

The supply chain paradox. Executives identified the supply chain as a top area for both current and prospective digital transformation investments, indicating that supply chain initiatives are a top priority. However, supply chain executives and those outside of the C-suite who direct actual day-to-day business operations—i.e., those with presumably the most "touch and feel" involvement with the implementation of digital technologies—do not appear to have a seat at the table when it comes to decisions about digital transformation investments.

The talent paradox. In keeping with Deloitte's previous research on Industry 4.0,[3] executives report feeling quite confident that they have the right talent in place to support digital transformations—but also seem to admit that talent poses a vexing challenge. Indeed, only 15 percent of respondents indicated they need to dramatically alter the composition of employee skill sets. At the same time, however, executives point to finding, training, and retaining the right talent as their top organizational and cultural challenge.

The innovation paradox. Executives report their digital transformation initiatives are driven largely by productivity improvement and operational goals—essentially, leveraging advanced technologies primarily to do the same things better. This finding has been borne out in previous Deloitte studies, suggesting a wider pattern around using advanced technologies for near-term business operations—at least initially—rather than truly transformative opportunities.[4] Yet innovative opportunities abound—and should not be discounted. Organizations driven by other factors, such as an increased desire for innovation and internal strategy focus, reported an equally positive return on investment.

Around the physical-digital-physical loop. The ability to fully harness information from connected assets and use it to drive informed decisions is important to the full realization of Industry 4.0, and many organizations may not yet be able to fully execute this in practice.

Our research suggests that executives in manufacturing, oil and gas, power and utilities, and mining are aware of the opportunities the Fourth Industrial Revolution creates—and that they prize digital transformation as a way to harness that growth. At the same time, however, disconnects in different areas suggest that executives aren't quite sure how to get there—even as they plan more significant investments in the future. As they seek to transform their organizations into interconnected enterprises capable of operating in an increasingly digital age, executives have many opportunities to build more connected, responsive, and intelligent operations—and find a path that truly embodies the promise of the Fourth Industrial Revolution.

ABOUT THE RESEARCH

To understand how companies are investing in Industry 4.0 to enable digital transformation, Deloitte fielded a global survey of 361 executives in 11 countries in the Americas, Asia, and Europe. The survey was fielded in association with GE Digital in the spring of 2018 by Forbes Insights, and captured insights from respondents in aerospace and defense, automotive, chemicals and specialty materials, industrial manufacturing, metals and mining, oil and gas, and power and utilities. All survey respondents were director level or higher, including CEOs (4 percent), CFOs (13 percent), COOs (9 percent), CDOs (5 percent), CIOs (7 percent), CTOs (5 percent), CSCOs (4 percent), business unit presidents (5 percent), EVPs/SVPs (7 percent), vice presidents (11 percent), executive directors/senior directors (9 percent), and directors (21 percent). All executives represented organizations with revenue of US$500 million or more, with more than half (57 percent) coming from organizations with more than US$1 billion in revenue.

INDUSTRY 4.0 TECHNOLOGIES continue to evolve both in technical capability and organizational reach. Simultaneously, many of these technologies, such as cloud computing and big data platforms, are becoming more affordable and therefore more accessible to organizations of all sizes.[5]

This combination of greater capability and lower cost has contributed to an environment that is perhaps more hospitable to digital transformation. And, in fact, our study reflects executives' positive view of the position digital transformation occupies within their organizations. For example, when asked to indicate which statements best aligned to their perspective, 94 percent of respondents agreed that digital transformation is a top strategic priority for their organizations.

Just because respondents appear to understand its strategic importance, however, doesn't necessarily mean they are fully exploring the realm of strategic possibilities made possible by digital transformation. Our survey suggests that some leaders may be finding it difficult to keep up with the rapid pace of technological change, as well as the new rules and challenges that go along with it. We see this evidenced in a couple of ways:

- **Budgeting for today.** When it comes to digital transformation, most respondents reported investing a significantly higher percentage of their operational and IT budgets, while spending a relatively lower proportion of the future R&D budget. On average, companies plan to invest a median of 30 percent of their operational/IT budget on digital transformation initiatives—and only 11 percent of their R&D budgets on the same.

- **Relatively lower emphasis on profitability.** When we asked respondents if these technologies are critical to maintaining profitability, only 68 percent agreed. In fact, this was the lowest-rated response of any of the statements presented. CEOs had an even more sobering view; only 50 percent indicated the importance of digital transformation to maintaining profitability.

This mindset—a focus on digital transformation for operational investments, coupled with a relatively smaller emphasis on profitability—suggests that, while most leaders may associate operational improvements with *strategic* growth, they do not necessarily associate them with *revenue* growth resulting from R&D-driven new products or business models. Even when executives are implementing digital transformations that result in significant time and cost savings through operational improvements, they may not intellectually translate that into higher profits. Instead, these may be viewed as "defensive" investments intended to protect, rather than grow, the business. Deloitte's study *The Fourth Industrial Revolution is here—are you ready?* reinforces this mindset, as many look to digital technologies to "avoid" disruption rather than be the "cause" of it.[6]

The challenges to transcending a defensive mindset

A little over a decade ago, analytics was an emerging trend.[7] Now big data, robotic process automation, and sensor technology are a bigger part of an ever-proliferating list of technologies and capabilities organizations are seeking to adopt.[8] In this environment, it can be challenging to determine, prioritize, and invest in the tools that can best help organizations meet their strategic objectives.

As such, many organizations remain frozen in place, fending off competitive pressures by isolating their technology usage to defending and maintaining their current positions. The behavioral concept of *choice overload* gives credence to this mindset.[9] That is, when we are faced with too many paths to choose from, oftentimes we defer making any new choices at all. To move past the defensive mindset, executives may face several key challenges:

Trapped in organizational inertia. Our recent study, *The Fourth Industrial Revolution is here—are you ready?*, also showed that many organizations remain mired in inertia, wherein their future plans for digital transformation closely mirror their current objectives.[10] That is, they regard advanced technologies largely as a means of protecting their current offerings rather than deploying them to build new business models and products (we explore this notion further in *The innovation paradox*). In our analysis, we see that many organizations are investing to enhance legacy systems. For instance, most organizations are using desktop productivity tools (87 percent) and enterprise resource planning (ERP) software analytics (85 percent) to analyze and leverage their data. These are typically familiar and longstanding organizational tools that are enhanced by digital technologies. Other tools, such as physical robotics (24 percent) and sensor technologies (26 percent), are both newer—and leveraged considerably less.

While certainly a practical approach to implementation, over-indexing on legacy improvements comes with risk. Cloud computing capabilities and big data platforms appear to be used by a large portion of respondents (with 60 percent or more indicating they currently apply the technologies). This suggests a real opportunity to integrate newer, future state technologies (such as cloud computing) into legacy platforms (such as ERP and desktop tools) to leverage those capabilities.

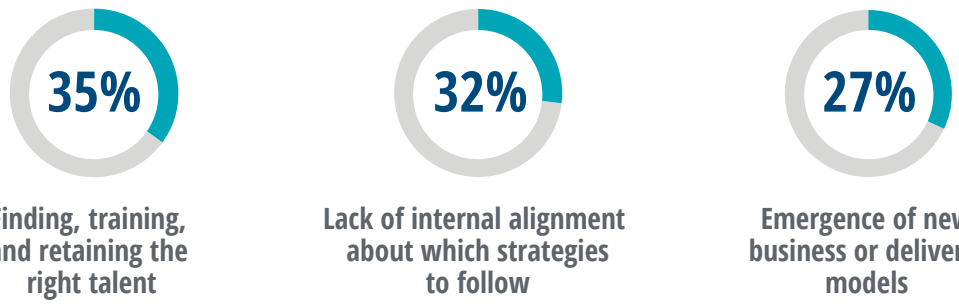
In addition, the rise of disruptive competitors with fresh approaches to applying digital technologies can leave older, more accomplished organizations behind.[11] As such, organizations may want to transition from these defensive positions to more proactive, offensive uses that integrate future state technologies into legacy tools and applications.

Still searching for a common focus. When we asked respondents to identify their top three organizational challenges, "finding, training, and retaining the right talent" topped the list (figure 1). It can understandably be difficult for any individual to keep up with the pace of technological change (see *The talent paradox* for a detailed discussion); building a deep bench of adequately prepared talent can be more difficult still. Further, adapting to

FIGURE 1

The top three operational, cultural, and environmental challenges organizations face in their pursuit of digital transformation are closely interlinked

Which of the following are the most common operational, culture-related, and environmental challenges your organization faces as it seeks to pursue digital transformation initiatives?



It can be difficult, if not impossible, to pursue new, unfamiliar business models without the right people in place—or a clear consensus on which strategies are the right ones.

changes in the marketplace and reaching consensus on the best path forward constitute significant hurdles. The second most cited challenge is "lack of internal alignment" about which strategies to pursue, closely followed by the "emergence of new business models." These three concepts are linked: It can be difficult, if not impossible, to pursue new, unfamiliar business models without the right people in place—or a clear consensus on which strategies are the right ones.

Technical complexity brings risks. The shift to Industry 4.0 connectivity requires many organizations to confront unfamiliar, more nuanced risks. When polled about technology-related challenges, respondents highlighted cybersecurity (37 percent) and intellectual property risks (27 percent) as the top two issues. Absent a thorough understanding of these issues, many may feel it simply does not pay to pursue alternative uses of technology that can lead to new revenue streams—and new potential threats to face.

Thinking strategically about digital transformation

These are exciting times. To quickly arrive at an era in which organizations are embracing digital transformation as a top strategic objective is no small feat. However, with this come both increased complexity and opportunity. While organizations most certainly can benefit from deploying Industry 4.0 technologies for legacy operations, there are myriad paths to drive strategy and realize the full breadth of opportunities that digital transformation can bring. To move beyond a "defensive" approach to digital transformation strategy, organizations can consider the following steps:

1. **Incrementally move beyond operational upgrades.** Digital transformation can lead to revenue growth in the form of improved products or services.[12] This does not require an immediate overhaul of business models but rather an evolution of current offerings.
2. **Invest in the long run.** Don't neglect longer-term opportunities in pursuit of shorter-term objectives. This mindset shift requires a willingness to enact change whose impact may not be felt immediately—a challenge for many organizations. In fact, a large portion of digital transformation efforts start out well, plateau, and then fall flat; business is back to usual with only incremental improvements, even though research suggests that transformative benefits often take time to accrue.[13]
3. **Consider increasing time spent on R&D initiatives—as well as budget.** One area where this could be most prevalent is supply chain, where we see an increased future focus for organizations (see *The supply chain paradox* for a more detailed discussion). Here, opportunities exist to pilot a number of digital technologies.

Starting small and expanding beyond "defensive" spending can unlock new organizational capabilities and move an organization along the path toward innovation. Keeping implementations simple and building upon successes can pave the way for future business models—while also allowing your organization to grow with the technologies.

THE SUPPLY CHAIN PARADOX
HIGH PRIORITY, LOW STAKEHOLDER ENGAGEMENT

LONG BEFORE THE digital era that we commonly associate with Industry 4.0, the supply chain has served as the lifeblood of the industrial organization. In recent decades, however, supply chains have grown increasingly global and complex, enabled in large part by advanced digital and physical technologies. These technologies have also allowed the supply chain to evolve into something less linear, more interconnected, and more responsive to change. Known as the digital supply network (DSN), this new, networked supply chain has reshaped how stakeholders communicate and transact with each other. The emergence of the DSN allows the supply chain to become a more strategically critical component of the organization—one that enables more informed decision-making and a more flexible, responsive organization.[14]

However, the question remains whether the reality of the organization has caught up with the new strategic role of the digitally connected supply chain and its potential to drive innovation. On the one hand, our survey results appear to affirm the strategic imperative of investment in the digital supply chain; on the other, results also show that the supply chain is not seen as a particularly strong driver of innovation. Further, our survey results reveal that the chief supply chain officer (CSCO)—the ostensible leader of supply chain strategy and day-to-day operations—typically plays a relatively small role in shaping digital transformation investment decisions.

Thus a striking gap may exist: Organizations may consider the supply chain as relatively important in digital transformation efforts and yet not view it as a driver of digital innovation—nor involve its leaders in strategic decisions.

The role of the supply chain in the digital organization

Our survey results suggest that the supply chain plays an important role in the digital organization. When asked, "What functions are you prioritizing for future [digital] investment?," the supply chain emerged as the top overall answer, with 62 percent among overall respondents—ahead of planning, product design, and substantially ahead of smart factories. Among only C-suite executives, that gap was even wider.[15]

Another indication that the supply chain plays an important role in the discussion on digital transformation resides in where most organizations *actually* have digital transformation efforts underway. In this metric, the supply chain received the highest response among C-suite respondents and third-highest overall (table 1).

Organizations may consider the supply chain as relatively important in digital transformation efforts and yet not view it as a driver of digital innovation—nor involve its leaders in strategic decisions.

TABLE 1

Supply chain is one of the top areas in which digital transformation efforts are underway

Where do you currently have digital transformation efforts underway?

	Total respondents
Planning	67%
Sales	64%
Supply chain	**63%**
Marketing	62%
Shop floor production	60%
Inbound/outbound logistics	60%
Product design	58%
Customer/field asset support	58%
Smart facilities	58%
Talent/HR	58%

Note: Above percentages based on highest two response choices ("4" and "5," combined, on a 1-to-5 scale).

The supply chain is not seen as a driver of innovation

Despite its high standing for current and planned deployment of digital transformation capital, the supply chain does not appear to be perceived as a center of innovation. When asked what functions respondents believe are driving the most digital innovation, supply chain ranked in the middle of the pack at 34 percent—far behind information technology and operations/production. This response is especially surprising given the close functional relationship that exists between the supply chain and operations/production within the overarching manufacturing value chain.

While only 34 percent of overall respondents see the supply chain as a driver of innovation, it is worth noting that of the respondents who are prioritizing the supply chain for future digital investment, only a slightly higher 38 percent say the same. One might have expected an even higher share given that this subgroup already places emphasis on the future supply chain digital investment. Further, those that prioritize the supply chain for future digital investment seem just as likely as overall respondents to view operations and production as leading drivers of innovation (59 percent versus 57 percent, respectively).

So why does this gap exist between the high priority placed on supply chain digital transformation investments and the rather middling status of supply chains as a source of innovation? While most organizations appear to prioritize the supply chain as a critical component of digital transformation initiatives, they may not yet fully appreciate its potential for digital innovation, a finding we explore in greater depth in *The innovation paradox*. This suggests a missed opportunity, as the advent of the DSN enables innovative opportunities in a broad range of areas.[16]

The curious case of the CSCO

The increasingly strategic role of the modern supply chain has spawned a new addition to the executive suite. This new role may go by slightly different names, but is often known as the chief supply chain officer (CSCO). The presumed charge of the supply chain leader includes both tactical oversight of day-to-day supply chain operations and the strategic vision of how the supply chain fits into the larger digital organization.

The presence of the CSCO (or its equivalent) in the senior ranks of the organization has risen commensurately with the growth in advanced, connected technologies. According to one survey, only 8 percent of *Fortune* 500 companies had a single executive in charge of the entirety of the supply chain in 2004. By 2016, that figure had risen to 68 percent.[17]

The DSN opens new opportunities for truly innovative—and transformative—uses of technology to guide end-to-end supply chain transparency, intelligent optimization, and flexible, intelligent decision-making.

Given this seeming evidence that the supply chain figures prominently in respondents' digital transformation priorities and activities, it would stand to reason that the CSCO should also figure prominently in any decision to invest in digital transformation technologies. However, the survey responses suggest otherwise.

Only 22 percent of the overall respondents said that the CSCO was either a key decision-maker or highly involved in the decision-making process. In fact, respondents ranked the CSCO lower than any other C-suite officer, and comparable with non-C-suite leaders of each business area. Significantly, supply chain executives themselves also appear to perceive themselves as outside the decision-making process; *none* of the 15 respondents who identified as a CSCO said that the CSCO was either a key decision-maker or highly involved in the decision-making process.

Further, when asked to evaluate their respective *personal* involvement in digital transformation investment decisions, CSCOs ranked themselves far lower than other C-suite executives. Slightly more than 90 percent of C-suite respondents (excluding CSCO respondents) said that they personally were either highly involved or key decision-makers; 37 percent of non-C-suite respondents said the same. However, not one CSCO responded as such.

The supply chain paradox

Herein lies the supply chain paradox: On the one hand, the supply chain appears to play an important role in future digital investment priorities, and represents a top choice for where respondents have digital deployment initiatives already underway. But on the other hand, the supply chain is not widely perceived as a strong driver of innovation. And the CSCO—the single executive in charge of the entire supply chain—is by far the C-suite executive with the *least* involvement in the digital acquisition decision, and among the least overall.

So, why does this seeming paradox exist? A few possibilities come to the fore:

- **CSCO is a new role.** As a relatively new member of the C-suite, the CSCO may not yet have the profile that other, more established roles enjoy—even if the role is increasingly common and supply chain digital investments are a top priority. To this end, some executives, including the CSCO, may not yet understand or otherwise appreciate what the CSCO role is or what its purview should be.
- **Supply chain may have an image problem.** In the digital era, the supply chain has never been more integrated into the organization's overall business strategy.[18] But image often lags reality, and some in the C-suite may not yet

fully accept how the supply chain has evolved in recent years into an area riper for innovation, as the middling status of the supply chain makes clear. Such an image problem—to the extent it exists—may also make it more difficult for the CSCO to be heard on matters related to the organization's strategic planning.

- **Like CSCO, like non-C-suite.** The CSCO does not appear to be perceived as critical to the decision to invest in digital technologies, despite her day-to-day involvement in an area considered key to future digital investments. This may be part of an even larger paradox: Those with presumably the most touch and feel involvement with the implementation of digital technologies—i.e., those outside of the C-suite who direct the actual day-to-day business operations—reported being the least involved in making technology investment decisions.

Elevating the supply chain and shrinking the paradox

Our survey results underscore the importance of the supply chain in future digital investment priorities, but also that the supply chain is not perceived as a strong driver of innovation, and the CSCO gets little say in the matter. Organizations can take several steps to help reconcile this disconnect:

- **Validate the increasing strategic importance of the supply chain—and, by extension, those who run it.** Our survey suggests that the supply chain figures prominently in the implementation of digital technologies—both now and going forward. The company should say so, unambiguously. And, in so doing, the organization should formally elevate the status of the CSCO and give her—and those outside of the C-suite with day-to-day, touch-and-feel oversight of the implementation and operation of digital technologies—a seat at the decision-making table.
- **Train future CSCOs to think strategically.** The CSCO focuses on the care and feeding of the supply chain organization. If the company wants a strategic CSCO, it should train its supply chain organization to think strategically. Such action could translate to a supply chain culture in which professionals understand the bigger strategic implications of the decisions they make, and whose goals align with the broader strategic objectives of the organization.
- **Leverage the opportunities for digitally driven innovation inherent in a digital supply network.** While most organizations prioritize the supply chain as a top area for digital transformation investments, they are far less likely to recognize it as an area for innovation. Yet the DSN opens new opportunities for truly innovative—and transformative—uses of technology to guide end-to-end supply chain transparency, intelligent optimization, and flexible, intelligent decision-making.[19] Indeed, such uses extend beyond mere opportunities. In the digital era, they are imperatives.

These and other steps may go a long way in helping an organization diminish the inconsistencies that the supply chain paradox presents and, in so doing, realize so much more from its investment in supply chain connectivity.

THE INNOVATION PARADOX
A BALANCE BETWEEN OPTIMIZATION AND UNCHARTED WATERS

AS ORGANIZATIONS SEEK to invest in digital transformation initiatives, they can find themselves at something of a crossroads. Focused first on pursuing greater efficiencies in their current processes, most organizations are largely using Industry 4.0 technologies to improve what they're already doing. This is to say, organizations' digital transformation initiatives are primarily driven by productivity and operations goals: fulfilling current goals, but faster, and better.

This makes sense: Before blazing trails through uncharted terrain to seek Industry 4.0-driven innovation, organizations may first want to build a firm foundation and find and train the right talent to propel them forward. *However*, opportunities also exist in innovation. Our survey found that high ROI is almost as likely to result from investments in innovation as from investments in productivity—suggesting many organizations may be leaving innovation-driven digital transformation opportunities untapped even as they benefit from productivity- and operations-driven initiatives. Further, the self-reported maturity levels of respondents—coupled with the specific investments they are making, or considering making, in new, Industry 4.0-driven capabilities—suggest that executives are preparing for a more digitally advanced future. Making innovation a part of that future may be an important component of success. Not doing so may mean being left behind.

Organizations' digital transformation initiatives are primarily driven by productivity and operations goals: fulfilling current goals, but faster, and better.

Drivers for digital transformation investment

When it comes to digital transformation, most respondents report that their companies are driven largely by improving their current processes, rather than innovating (table 2). In fact, roughly twice as many respondents reported being driven by productivity and operations goals rather than by the desire for innovation, by competitive pressure, or even by customer requirements. Further, this trend shows no signs of slowing: Those who plan to significantly increase digital transformation investments in the next year are driven more by operational goals, at 52 percent, than those who plan to only moderately increase investments (45 percent) or keep them the same (36 percent).

This approach—starting with streamlining current efforts before moving on to innovation—is one that appears to hold true across industries and does not appear to be limited solely to those specific industries surveyed for this study. In fact, Deloitte's global, cross-industry study *The Fourth Industrial Revolution is here—are you ready?* showed that many executives continue to focus on traditional business operations with respect to Industry 4.0 transformation, rather than focusing on new opportunities to create value.[20]

Even those whose organizations have realized significant ROI from digital transformation report

TABLE 2

Digital transformation is more likely to be driven by the desire to improve current processes than by the desire for innovation

What are the top factors driving digital transformation initiatives within your organization?

Productivity goals (e.g., improved efficiency)	**50%**
Operational goals (e.g., reduced risk)	**47%**
Customer requirements	36%
Internal strategy focus	29%
Competitive pressures	29%
Increased desire for innovation	**23%**
Employee demand	19%
Shareholder engagement/demand	19%
Supplier requirements	19%
Partner requirements	15%
Regulatory pressure	13%

Note: Respondents were asked to select up to three factors as driving digital transformation initiatives.

being driven by productivity and operational goals—even more so than general respondents, suggesting that perhaps focusing on those initial areas for digital transformation can yield significant returns that encourage further investment.

However, changing the lens appears to reveal a new insight: Those driven by innovation are nearly as likely to report recognizing significant ROI from digital transformations as those who are driven by operations and production goals Realizing significant ROI was reported by 57 percent of those driven by productivity goals, 56 percent of those driven by operational goals, and 51 percent of those driven by innovation.

This suggests that the innovation opportunities that exist may be as likely to result in significant ROI as operations- and productivity-driven initiatives. To be sure, starting the shift to Industry 4.0 with improving current processes is a sound approach and can create a firm foundation for future innovations. Moreover, doing so can illuminate key opportunities for innovation by creating a clear map of what the organization currently does, highlighting adjacencies, and thus creating an

informed, more targeted path for innovation.

We can see the success of this sort of progression already, as some manufacturers choose to begin a smart factory transformation by first understanding and analyzing the data their assets are already generating to ascertain what data they will need and, by extension, where white spaces are for new investments and opportunities.[21] However, innovation should be a priority, as it can help organizations differentiate themselves in ways that are often difficult for competitors to respond to.[22]

Within the next three years, 57 percent of respondents plan to implement sensorization, 56 percent physical robotics, and 50 percent robotic process automation.

Maturity and future innovation

Organizations are in different stages of building and scaling digital capabilities across their businesses. Respondents report the highest levels of maturity around operations-driven functions: supply chain (32 percent), planning (31 percent), and marketing (30 percent) report the highest levels of multiplant, scaled solutions.

Functions that tend to drive productivity or innovation, however, are relatively less mature: shop floor production, product design, smart facilities, and customer/fielded asset support. These are areas that typically tend to leverage advanced technologies and capabilities on a broad scale. Further, they require that data be generated from many diverse physical assets and systems that may not have been connected in the past.[23]

Current use of technologies—and future investment plans

When it comes to how organizations are using technologies, most of their focus tends to rest on more "traditional" technologies, which reiterates the theme of building a strong foundation for digital transformation before moving into uncharted territory. At the same time, however, investment in more advanced, connected capabilities looks to ramp up in the future,: Within the next three years, for example, 57 percent of respondents plan to implement sensorization, 56 percent physical robotics, and 50 percent robotic process automation. This suggests the move toward innovation is on the horizon as part of a continued evolution, rather than a revolution, with respondents preparing for an ever-more-connected future.

Preparing for increased data loads. Computerized maintenance management systems (CMMS) and cloud computing capabilities are used by two-thirds of respondents but are likely to be used by nearly all within the next one to three years. The same is true for mobile field management, data visualization, and big data platforms for managing volumes of data. This suggests a move toward connectivity and ongoing preparation for handling increased loads of data.

Making the data user-friendly—and more usable. Advanced technologies remain an investment priority. As noted in *The talent paradox*, however, the high prioritization in hiring for user-experience and user-interface positions suggests a shift of focus toward technology usability as well. Thus, most organizations may not only be preparing to offer digitally transformative capabilities but also to ensure people will be able to use them.

High plans to invest in advanced technologies. While some newer technologies remain relatively low on the list—advanced simulation and modeling, visual scanning, robotic process automation (RPA), sensors, and physical robotics—plans to invest in them are high, suggesting that a goal of digital transformation may be waiting in the future.

Industry-level differences in adoption. Examining the data by industry revealed some noteworthy differences. Manufacturing respondents, for example, reported lower current use of many technologies than their counterparts in other industries: Eighty-one percent report using desktop productivity tools, compared with more than 94 percent of both mining and oil and gas respondents, while 61 percent report using CMMS, compared with more than 75 percent of mining and power and utilities respondents. Manufacturers, however, report significantly higher use of sensors. Power and utilities respondents reported higher current use of big data platforms (68 percent), advanced simulation and modeling (62 percent), cloud computing (72 percent), and mobile field management (72 percent). Use of these technologies is perhaps reflective of each industry's various complexities, whether the distributed nature of manufacturing or the remote monitoring needs of mining and oil and gas. In this way, a single path to digitally transformative innovation does not exist; organizations can adopt the technologies that best suit the complex needs of their industry.

Conquering the innovation paradox

As organizations seek to adopt digitally transformative technologies within their organizations, the potential for innovation has never been greater. Respondents note that their companies are driven by—and currently prioritize—efforts intended to improve current operations and processes and build a strong foundation for future developments. As they continue to digitally transform, however, organizations should recognize that using technology to drive innovation, rather than just improve current processes, offers strong prospects for growth.

To make innovation a part of a digital transformation strategy, organizations can:

- **Get comfortable with the unknown.** While operations and processes are important, know that innovation-driven uses of digitally transformative technologies are equally likely to yield a strong ROI. Opportunities can exist in the innovations space. Organizations can focus not only on building out the strong foundation of technologies but also include truly innovative new approaches and priorities.
- **Recognize the (perhaps reflexive) tendency to invest in productivity and operations.** This is not necessarily a bad thing, given the high satisfaction observed. While operations-driven digital transformation can yield success, sticking with the continued evolution of the tried-and-true can leave opportunities untapped.
- **Think about how foundational investment could lead to opportunities for true innovation.** A strong foundation of digital transformation for fundamental operational purposes can in turn help pinpoint key white space opportunities for innovation. Use the insight gained from these foundational investments to create a more informed, targeted path for innovation.
- **Get moving—because others are planning to.** Relatively lower maturity in more innovative areas, coupled with higher planned investments in tools to harness advanced technologies, suggests that many organizations are planning to invest in capabilities that they expect will help them move further along on the digital transformation maturity curve. Those that fail to invest risk being left behind.
- **Build a road map to greater ROI.** Consider not only the context of digital transformation and uses of Industry 4.0 technologies within your industry, but also the technology investments you have already made, to drive your organization toward a high-ROI future.

Leaders have many choices as they seek to grow their organizations. In considering the multitude of digital transformation options at their fingertips, innovation should hold a place at the top of the list.

IN AN AGE of digital transformation, it probably comes as little surprise that individuals are constantly challenged to evolve or, at minimum, keep pace with the technologies their organizations look to implement. *Sloan Management Review* and Deloitte's 2018 Digital Business Global Executive Study and Research Project reinforces this sentiment, as 90 percent of those surveyed see the need to update their skills at least annually—of which half see development as a year-round, continuous exercise.[24]

Operating in this "development-focused" climate makes our first talent finding so surprising: Of the 361 respondents, 85 percent are more likely to agree that their organization has "exactly the workforce and skill set it needs to support digital transformation." Yet, when we dig a bit deeper and ask participants what operational and cultural challenges are most commonly faced by their organizations, finding, training, and retaining the right talent is cited as the No. 1 challenge (by 35 percent of respondents).[25]

The perceived accessibility of digital technologies seems to continually influence talent perceptions.

Juxtaposing these responses presents an interesting paradox. How can individuals overwhelmingly state they have the exact workforce and skill sets they need in place but simultaneously recognize that finding and training the *right* talent as their number one challenge?

The answer may lie in the *perceived* accessibility of these digital technologies: How individuals view their personal interactions and ability to navigate these technologies carries significant weight in their organizational talent assessments. Whether differentiating between "power users" and novices or comparing high ROI organizations with the rest of the field, the perceived accessibility of these technologies seems to continually influence talent perceptions.

Extending the reach of the "power user"

In the mid-1970s, the personal computer (PC) was reserved for hobbyists who enjoyed the technical nuances of hardware and coding. This was a technically savvy, niche group of enthusiasts. When computers began to feature more intuitive graphical user interfaces (GUI), the PC became a bit more personable.[26] From small businesses to classrooms, adoption skyrocketed.

The story of today's digital technologies may parallel the early journey of the computer. In our analysis, we isolated talent views by self-perceived interaction with these digital technologies (figure 2). The results revealed, quite drastically, that the more respondents use these technologies, the more likely they are to be satisfied with their organization's current state of talent. At its most polarizing, those who interact with these technologies on a daily basis (indicated by a "5" in figure 2) believe their organization has the proper talent in place 92 percent of the time, while those who have little to no interaction with digital technology (a "1" or "2" in figure 2) see the greatest gap in talent and development (only 43 percent believe the right talent is currently in place).[27]

Through their own engagement with the technology, executives may perceive these technologies as something "regular people" can handle and implement on their own—perhaps with a little help from a more intuitive design. We see this manifest when assessing the greatest talent needs within the organization. When asking respondents where talent is required the most, overwhelmingly, people point to user interface design. Specifically, almost 17 percent of respondents recognize that user interface design talent is needed but not budgeted for (1.85 times higher than the next-highest need, machine-level controllers). In fact, only a third of respondents believe their organization is already equipped with enough user interface design talent. This is comparatively lower than the other three forms of talent: data science, software development, and machine-level controllers, where respondents indicated they have enough talent on hand, at minimum, 46 percent of the time.

Beyond talent, it appears that individuals yearn for more accessible technology investments as well. For instance, in our discussion in *The innovation paradox*, we see that many of the respondents are increasingly looking to invest in data visualization technologies and big data platforms—that is, digital technologies that make comprehending and acting upon insights easier. Coupled with the emphasis on user design talent, we see a relatively clear shift toward technology usability as an area of focus. Research shows that technology implementations rarely fail because the technology did not work but rather because people are not willing, or find it too difficult, to use them.[28] Thus, organizations could offer digitally transformative capabilities across a broader swath of their operations—and ensure people will be able, and willing, to use them.

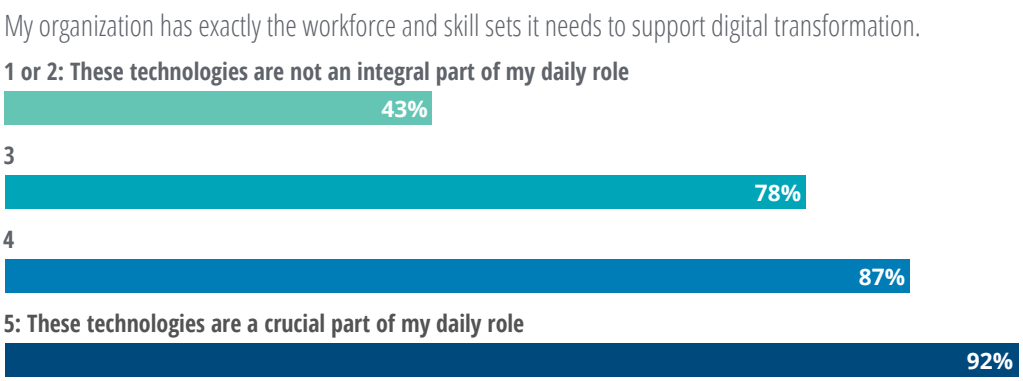
It takes talent to sustain success

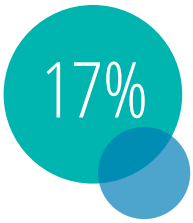
Conventional thinking might suggest that the more successful organizations have been at implementing digital technologies, the more likely they are to have the right talent in place. However, when we assess organizations that have achieved significant ROI through digital transformation against the rest of the field, we observe that talent concerns seem to rise with success: Of respondents indicating that finding, training, and retaining the right talent is a challenge, 39 percent reported significant

FIGURE 2

Respondents who consider technology to be a crucial part of their daily role are also more confident that their organization has the right talent in place

How involved are you personally in using or overseeing the use of digital transformation/ Industry 4.0–driven technologies on a day-to-day basis?





Nearly 17 percent of respondents recognize user interface design talent is needed but not budgeted for—**1.85x higher** than the next-highest need.

ROI through digital transformation, compared with 31 percent who reported moderate or lower ROI.

If higher ROI signals greater digital transformation maturity, the next evolution could be accessibility for the user. In fact, a growing body of literature suggests that better, more intuitive design is the "last mile" to unlocking these capabilities.[29] Consider Deloitte's 2018 *The Fourth Industrial Revolution is here—are you ready?*, in which executives indicated that they mostly apply these technologies for operational goals, but that building an Industry 4.0 society—and ensuing workforce—requires a broader approach that facilitates better, more user-friendly collaboration between humans and machines.[30]

These high-ROI organizations may see talent as the means to both sustain and elevate their digital technologies to new levels of sophistication. As during the formative years of the PC, better design can unlock the technical capabilities already in place. Recently, GE has placed a premium on design as products such as jet engines and magnetic resonance imaging (MRI) machines are now part of digital ecosystems, and ease of assimilation and usage are paramount to successful adoption.[31]

A clearer talent picture

Indeed, the ever-present need for better, more skilled talent isn't going away. Instead, the increased appetite for digital technologies is fueling a demand for greater accessibility to these capabilities throughout the organization.

There is good news: Executives can help unlock these digital capabilities by collaborating directly with frontline leadership. In discussing your digital technology needs, consider these three facets of talent:

- **Build these capabilities *with*, not *for*, your employees.** These technologies tend to work best when they are built collaboratively with their business users rather than for them.[32] Employees that are not fully immersed in the digital integration process may react with a level of skepticism (or confusion) to its benefits.
- **Hire for design.** Better user interface design can act as the channel to greater employee engagement with these digital technologies. Further, the more intuitive the design, typically the less need for finding new talent with greater technical skills. This is especially important as many of our respondents indicated that user design talent is an unbudgeted need.
- **Sustaining success requires continual investment in talent development.** If accessibility is the linchpin to adoption, leaders may need to continually ensure that their people have the right tools in place to use and interact with these enhanced features. Encouragingly, these trends in accessibility and design suggest that organizations may be better suited in investing in training and talent that make these technologies more engaging rather than opting for a wholesale change in personnel and skill sets. These upfront investments can extend the reach of these technologies throughout the organization—in a more sustainable manner.

With a focus on accessibility, organizations can better use and upskill their existing employee talent to interact with and unlock the full capabilities of Industry 4.0 technologies.

AROUND THE PHYSICAL-DIGITAL-PHYSICAL LOOP
A LOOK AT CURRENT INDUSTRY 4.0 CAPABILITIES

WHEN BUSINESS LEADERS talk about digital transformation, they often use the term "Industry 4.0" in the same breath. In fact, it can be argued that these two concepts go hand in hand. Deloitte has described Industry 4.0 as the integration of digital information from many different sources and locations to drive the physical act of doing business, in an ongoing cycle. Throughout this cycle, real-time access to data is driven by the continuous and cyclical flow of information and action between the physical and digital worlds. This flow occurs through an iterative series of three steps, collectively known as the physical-digital-physical (PDP) loop[33] (figure 3).

In the first stage, *physical-to-digital*, information is captured from the physical world to create a digital record. That data is then analyzed in the *digital-to-digital* stage to draw meaningful insights. In the final stage, *digital-to-physical*, those insights spur action and change in the physical world. The result is a more flexible system capable of adapting to and learning from changes in the environment.

Our digital transformation survey reveals both insights into what drives organizations to seek digital transformation and a deeper story about how they are navigating this loop: the actual creation, use of, and—most importantly—ability to act upon data derived from connected technologies. This ability to fully harness each stage of the physical-digital-physical loop is crucial to the full realization of Industry 4.0—and many organizations may not yet be able to execute this fully in practice.

Traveling the loop—but not always finishing the journey

While most respondents have the first stage of the PDP loop in place, and many have the second, far fewer are yet able to harness the last, most important stage—the ability to act on the data they have analyzed.

Physical-to-digital. More than 90 percent of respondents report gathering at least some data from the physical world via enterprise resource planning (ERP), customer relationship management (CRM), or product lifecycle management (PLM) systems, or nontransactional internal systems such as email. More than half of respondents also report collecting data from some form of IoT) whether field-based (57 percent) or facility-based (58 percent), while 51 percent utilize predictive model outputs.

Digital-to-digital. When it comes to being able to analyze and extract value from the data—the digital-to-digital stage—confidence among respondents abounds. Those who have access to data report feeling fairly confident in how well they are able to use it. Seventy percent believe they use nontransactional systems extremely effectively.

Making that last leap back into the physical world is perhaps the most important step, and the one that truly classifies a process as "Industry 4.0." In this regard, slightly more than half of respondents—54 percent—rated themselves as capable.

WHAT IS INDUSTRY 4.0?

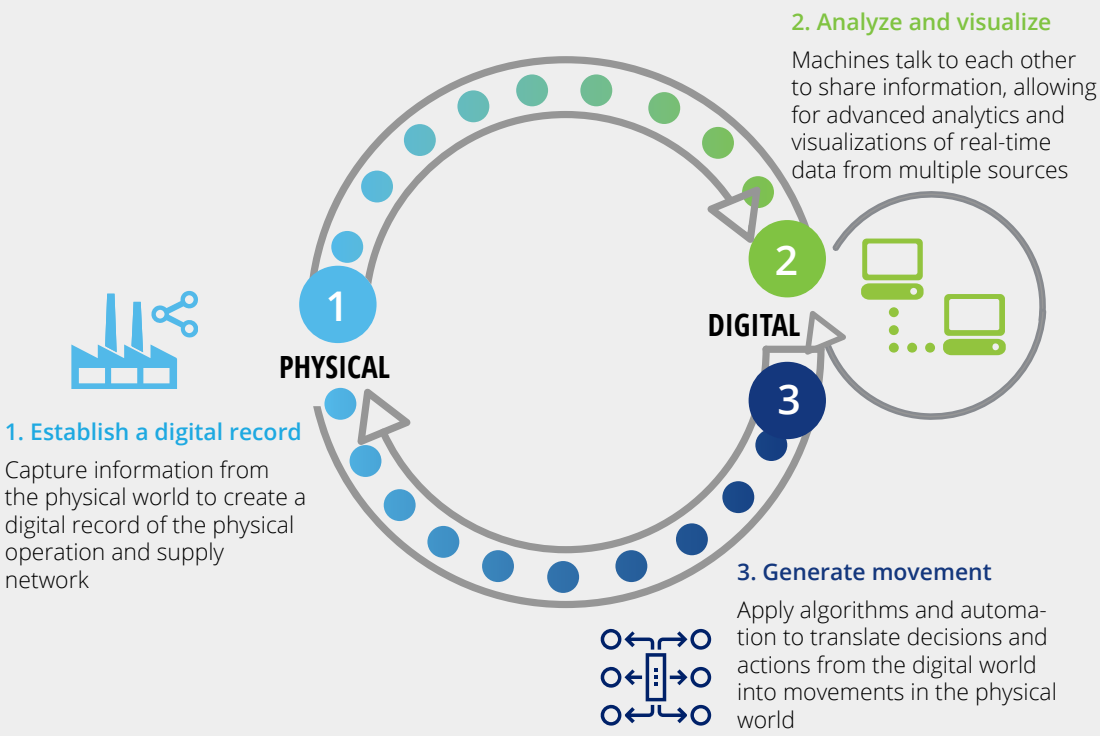
The concept of Industry 4.0 incorporates and extends digital connectivity within the context of the physical world in digital enterprises and digital supply networks. This drives the physical act of manufacturing, distribution, and performance in an ongoing cycle known as the physical-digital-physical (PDP) loop (figure 3).

Industry 4.0 technologies combine information from many different physical and digital sources and locations, including the IoT and analytics, additive manufacturing, robotics, high-performance computing, AI and cognitive technologies, advanced materials, and augmented reality.

Throughout this cycle, real-time access to data and intelligence is driven by the continuous and cyclical flow of information and actions between the physical and digital worlds. Many manufacturing and supply chain organizations already have some portions of the PDP loop in place, namely, the physical-digital, and digital-digital processes. However, it is the leap from digital back to physical—from connected, digital technologies to action in the physical world—that constitutes the essence of Industry 4.0.

FIGURE 3

The physical-digital-physical loop and the technologies used



Source: Center for Integrated Research.

For further information, see *Forces of change: Industry 4.0* and *Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises*.

At the same time, however, just 50 percent believe they use ERP and PLM systems extremely effectively—a noteworthy drop from the 91 percent who use these tools.

However, as capabilities grow more advanced and expand to include connected assets, confidence declines: Forty-one percent report using facility-based IoT extremely effectively, while 40 percent say the same for field-based IoT, and 39 percent for predictive models. Respondents who rated their effectiveness in using the data "somewhat effectively" were at 41 percent, 39 percent, and 38 percent, respectively, for these three capabilities—suggesting that many executives are still gaining familiarity with and ability to effectively use data from connected systems.

Digital-to-physical. Making that last leap back into the physical world is perhaps the most important step, and the one that truly classifies a process as "Industry 4.0." In this regard, slightly more than half of respondents—54 percent—rated themselves as capable of using data to make decisions in real time, while 45 percent said that they don't currently have that capability but are building it. This suggests that many organizations recognize that this capability is important and harbor an active desire to be able to fulfill that last mile of the Industry 4.0 journey.

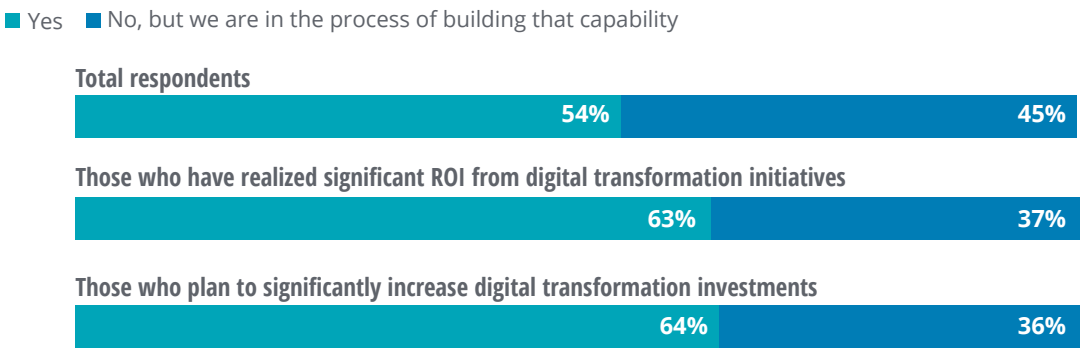
Interestingly, respondents who reported significant ROI from digital transformation initiatives, as well as those who noted that they plan to significantly increase their investments in digital transformation, were likelier to note that they are already capable of using data to make decisions, suggesting that those who invest in digital transformation can benefit from more informed decision-making (figure 4).

This suggests that, as companies become more involved in digital transformation and build their capabilities, they are likelier to realize its benefits—and keep investing to further grow their expertise.

FIGURE 4

Respondents who reported realizing significant ROI from digital transformation initiatives and those who plan to significantly increase transformation investments were likelier to be able to use data to inform decision-making

Does your organization have digital technology in place that enables insights from data to be used to inform decision-making in real time?



Note: Fewer than 1 percent of respondents selected "No, and we are not in the process of building that capability."

Getting around the loop

The impact of digitally transformative technologies on organizations will likely only continue to grow. These connected technologies make it possible for organizations to access data to drive action throughout their business. To do so, however, they should first be able to not only create information, but be able to derive insights from it—and act on those insights. To fully leverage Industry 4.0, organizations can:

- **Focus on completing the PDP loop as a roadmap for technology investments**—particularly that last, most important step of being able to act upon the data generated by connected systems. The result can be a more flexible, adaptive organization. To be sure, the ability to generate and analyze data is highly valuable, but organizations should explore and invest in technologies, talent, and capabilities that can enable them to use it to drive their businesses forward.
- **Recognize that investment begets Industry 4.0 success and increases the risk that those who haven't gotten started could be left behind.** Executives who report seeing significant ROI on their digital transformation investments are much likelier to report the ability to act on information and complete the PDP loop. Those who plan to significantly increase their investments responded similarly, suggesting that success begets success. But what this also means is that the gap between those organizations that have gotten started and those that are waiting to do so will likely only widen in the future, as those that see success continue to build upon it.
- **Consider the talent you'll need**—both to drive the loop and understand how to leverage the information it generates. Leading talent will be needed not only to implement Industry 4.0 technologies but also to produce data and drive responsive action.
- **At the same time, realize you may already have more tools than you think.** More than half of respondents already have tools at their disposal: IoT data collation, ERP systems, social media listening, and predictive modeling. Organizations may want to first build on their existing capabilities, enabling them to identify and make more targeted investments in what they actually need.

It can be difficult to keep pace with the changes brought about by the emergence of Industry 4.0. But by understanding and leveraging the PDP loop as a guidepost, leaders can better understand how to use connected technologies to drive value for their organizations.

INDUSTRY 4.0 IS real and increasingly inhabits nearly every corner of the modern industrial organization. Our survey results appear to confirm the faith that leaders are placing in the promise of digital transformation—both in terms of human and financial capital. But any undertaking as profound as digital transformation may uncover what is often unforeseen (or unforeseeable), once the initial wave of investment activity takes hold and enthusiasm somewhat recedes.

In the preceding chapters, we aimed to highlight some disconnects, or paradoxes, that can emerge as organizations pursue digital transformation initiatives. Each of these paradoxes lays bare some of the gaps between where a digital organization currently is and where it may want to be. But these paradoxes can also be seen as opportunities for organizations to recognize the white space within their operations and potentially derive more value from their digital transformation investments.

These paradoxes can be seen as opportunities for organizations to recognize the white space within their operations and potentially derive more value from their digital transformation investments.

There is no single way to successfully traverse the path of Industry 4.0, and no single paradox is necessarily more immediately pressing than any other. But the findings from our research suggest a few final high-level observations:

- **Digital transformation is not some abstract endeavor separate from core organizational strategy and purpose.** Once it is undertaken, it becomes central to the organization, touching upon every aspect of the company—from profitability to supply chain management to the very ethos of the organization itself. Digital transformation is potentially so much more than simply a means to do something faster or more cheaply.
- **Digital transformation does not have a single definition.** It is, ultimately, what a given company uniquely makes of it and hopes to achieve from it. Digital transformation serves the needs of the organization; no two digital transformation initiatives are identical.
- **Digital transformation may profoundly affect talent.** It is imperative that the newly digital organization thoroughly understands and responds to its talent needs, including helping legacy talent understand how their roles may be reshaped.
- **The culture of the digital organization should be inclusive.** A full array of people throughout the organization—at all levels—drive digital transformation and ensure its viability on a daily basis. Their voices should matter.

The changes digital transformation may bring about in organizations will evolve, perhaps in ways no one could have anticipated. This is to be expected as the foundational technologies that comprise Industry 4.0 and drive digital transformation, themselves, evolve at an ever-faster pace. But it seems almost certain that, however that evolution unfolds, the era of Industry 4.0 is here.

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Tax governance in the world of Industry 4.0

ADAPTING GLOBAL TAX REGULATION FOR CONNECTED ENTERPRISES

by Gianmarco Monsellato, Gareth Pritchard, Debbie Hatherell, and Lorraine Young

ILLUSTRATION BY TRACI DABERKO

INDUSTRY 4.0 HAS rapidly become a global priority for enterprises and governments alike due to multiple benefits: It can enable developed nations to reindustrialize, and it can lower the barriers to entry for developing nations. Realizing these benefits, however, necessitates a profound transformation in business models: from economies of scale to on-demand manufacturing; from standardization to mass customization; from a linear, reactive supply chain to an agile, connected organization that can anticipate and respond to changes in the market.[1]

While we are beginning to understand the economic, business, and social impacts of these changes,[2] the impact of Industry 4.0 on tax policies is still largely ignored. The foundations of the current international tax system were built a century ago to address the changes of the Second Industrial Revolution, and have been updated only slightly to address the changes brought forth by the Third. Historically, tax systems have been developed to reflect the cost optimization strategies defining industries during the 20th century.[3] Examples vary, from tax incentives for investment to transfer pricing regulations targeting complex supply chains.

The Fourth Industrial Revolution, however, brings with it profound change. New industrial strategies are based on revenue, not cost. And that revenue comes from multiple sources, with supply chains growing leaner, more customized, and flexible in the face of an on-demand economy. Our international tax system is simply no longer fit for an age where predictive maintenance, artificial intelligence (AI), and smart factories rule the day.

How can an international tax system built around the traditional model of manufacturing cost-saving strategies deal with a data-driven, connected, and self-adaptive network? It can be challenging for regulators to adapt the tax system to adjust to—and foster the growth of—Industry 4.0. This gap between what the new industrial model needs and the ability of tax policymakers to keep pace with change triggers substantial risks of multiple taxation that will be detrimental to industrial companies.[4]

This article examines three different Industry 4.0 scenarios that reflect the magnitude of the challenges ahead:

- The shift from just-in-time to on-demand manufacturing;
- The rise of aftermarket support; and
- The shift from products to data-driven services.

While each Industry 4.0 scenario described in this article brings with it a set of unique tax challenges for both business executives and policymakers, certain policy questions remain consistent across all, as described below:

- **Direct tax.** Historically, current transfer pricing regulations and approaches have been developed to address traditional linear supply chains, with clearly defined roles for entities and the sale of goods between them. As supply networks become less centralized and more interconnected, it will be vital to consider where value is generated in a supply chain, how or where the value should be taxed, and which entity should be liable for the tax.
- **Indirect tax.** Organizations must consider whether new establishments (i.e., fixed places of business) will be created globally, the nature of what is being supplied (i.e., goods or services), and what this means for their global value-added tax (VAT) compliance. For VAT purposes, most services are treated as supplied where the recipient is located, which can be a challenge when data generation and data analysis are performed in separate locations. Similarly, the rules regarding the supply of both goods and services create different compliance and reporting obligations.
- **Employment tax.** As workers find new roles and new ways of working in an Industry 4.0

ecosystem,[5] tax considerations will vary by use case.

Tax regulation will adapt, eventually. The shift will likely be slow and inconsistent from one region to another. But by understanding the specific ways in which Industry 4.0 technologies shift the way businesses operate, policymakers and executives alike can begin to consider ways tax policy will need to adapt to the Fourth Industrial Revolution.

Shifting from "just-in-time" to "on-demand"

Inventory management has, for many years, been a key determining factor in the success of manufacturing businesses. In the 1980s, the Kanban method[6] of lean manufacturing was developed in the automotive industry to optimize inventory costs and manage risks of obsolescence. This methodology tied manufacturing and distribution strategy to the anticipated delivery date, with the aim of delivering on time while reducing inventory stock. The use of this scheduling system for just-in-time manufacturing became widespread and resulted in businesses holding stock on a regional basis for both finished and partly manufactured goods.

In this approach, supply chain management became a key success factor. The process required regional centralization of inventory for both semi-finished and finished goods, as well as centralized order processing and centralization of financial flows, and triggered successive intercompany sales linked to sophisticated transfer pricing. In this linear process, taxation followed the successive intercompany sales from plants to clients, passing through centralized purchases centers and distributors near the client. Our current international tax system still lives in this world, where transfer prices of goods are an essential part of tax policies and tax audits.

On-demand manufacturing leads to sourcing complexity. Industry 4.0 does not conform to this predictable, linear supply chain, however. Rather, it encourages and rewards on-demand manufacturing and connected systems that produce goods based on data about clients' preferences, behaviors, and demands. As such, supply chains, production, and demand have become more complex and fragmented; products can be sourced from a variety of different suppliers, goods can be shipped to and from a variety of different countries, and customization is increasingly expected at the local or even individual level.[7]

Vendor sources may not always be known in advance, and may be selected at the last moment from a qualified pool of vendors, each of which may be located in different countries and subject to different indirect tax rules. Further, some transactions and flows of goods may be liable to customs duties, while others are not. As vendors may not be selected until the last moment, each must have a tax profile *ab initio*.[8] As such, enterprise resource planning (ERP) systems must be able to account for a much larger diversity of tax profiles for vendors—and those profiles must be audited regularly.

Direct from the source. Even as they grow more complex in some instances, supply chains are also simplifying and shedding layers on others, as consumers find they may go directly to the factory or supplier for goods. This is already prevalent in the consumer business sector, with products such as coffee capsules, whiskey, and cookies available directly from the manufacturer.[9] This suggests that manufacturers may make deliveries to countries where they have no physical presence, increasing VAT liabilities. Procedures for nonresident VAT payers are complex, and can represent a cash flow burden.

The perils of double taxation in the aftermarket

Industry 4.0 allows manufacturers to shift their focus away from the initial sale of a physical product to a recurring revenue model, in the form of aftermarket support and maintenance.[13] Connected products provide a constant stream of data back to the manufacturer, and by analyzing this data,

One of the most profound characteristics of Industry 4.0 is the evolution from selling physical goods, often expensive assets, to selling data-driven services.

manufacturers can begin to anticipate demand and enable capabilities such as predictive maintenance.[14] In this way, the data provides opportunities to create additional value—and recurring streams of revenue—through complementary products and services. Concluding the sale is therefore no longer the end of a commercial process, but the first step toward a recurring flow of business.[15]

However, current international tax systems mainly address commercial development cycles of an earlier era. Historically, companies have tended to research new markets or revenue opportunities through preliminary studies and have tested the scale of the market through an agent before deciding to create a sales subsidiary. Traditionally, direct taxation has usually followed a similar, linear breakdown: starting with nontaxation for exploratory activities because they do not generate material revenue; continuing with partial taxation that is limited to the agent margin; and ending with full taxation of the distribution activities.

Industry 4.0 technologies enable businesses to focus more on the aftermarket than prospection. Indeed, tax regulators have acknowledged that the digital economy does not follow this traditional standard anymore, with resulting issues such as defining the tax jurisdiction and attributing value to data.[16] The tax authorities in each user's country want to ensure taxation in their territories, which can limit their perspective vis-à-vis Industry 4.0 capabilities.

From products to services: A complex valuation

One of the most profound characteristics of Industry 4.0 is the evolution from selling physical goods, often expensive assets, to selling data-driven services.[19] This is different from the aftermarket, in that organizations can offer wholly new services and explore entirely new service-driven business models rather than simply adding services to the sale of a product.

In past decades, the manufacturing service chain was relatively binary: Manufacturers made physical products, and service companies provided services. This is no longer the case. Industry 4.0 shifts the marketplace in which manufacturers play: Technology, applications, business processes,

and infrastructure can now be linked in new ways to enable businesses to remodel their supply chains so that once-expensive products can now be sold through a service model. One such example of this approach has been the Power-by-the-Hour structure offered by Rolls-Royce. In this model, the supplier generally does not make a supply of goods, but essentially leases the assets to its customer instead, monitoring the assets' performance and providing proactive servicing and maintenance—and, in some cases, providing corresponding access to data systems so customers can monitor status to make operational decisions.[21] In the age of Industry 4.0 connectivity, those types of models may only increase—both in the scope of service capabilities and corresponding offerings, and in the scale of data that can be generated and analyzed.

Generally speaking, in any type of service model, capital expenditure becomes operating expenditure. In these types of cases, transforming nonlinear revenue and cost functions into linear ones can bring more predictability and fewer financing

TAX IMPLICATIONS FOR ON-DEMAND MANUFACTURING: QUESTIONS AND CONSIDERATIONS

Direct tax. As they operate in more flexible and interconnected supply networks,[10] business leaders and policymakers should consider the following questions: How will jurisdictions adapt their tax and transfer pricing rules to deal with situations in which the supply chain changes as needed? As supply networks become less centralized, and data is harvested from across various entities, where is the value to be taxed? Is the value in the data itself, the monetizing of the data, or the technology that creates the data? If many parts of the group contribute to collecting and analyzing data, what method should be used to allocate profits between them? Will this even be practical when the nature, amount, and value of data changes daily?

Indirect tax. With direct-to-consumer supply chains, manufacturers may be transacting in countries where they are not established, exposing them to VAT-related interest and penalties. For additive manufacturing, is there a digital good crossing border or should one only consider the tangible product location once printed? The process for determining the correct tax treatment can become significantly more complex when a tax team is dealing with a fluid pool of suppliers, in additional jurisdictions with differing rules. On-demand manufacturing also results in the need for manufacturers to make faster decisions regarding the appropriate tax treatment.

Tax authorities have recognized and are seeking to address the challenges that arise due to on-demand manufacturing. For example, the European Commission announced that businesses selling goods online will be able to function as providers of e-services. Thus, rather than creating VAT registrations in each member state to which goods are sold, a single VAT registration can be held through which VAT is automatically accounted for to the correct authority. Along with lower compliance costs and administrative burdens for businesses, an estimated 7 billion EUR (more than US$8 billion) of additional VAT revenue will be generated across the European Union annually.[11] In the future, however, can authorities ensure that such measures apply to all direct-to-consumer sales contemplated by manufacturers?

Employment tax. Finding the right talent with the skills to use advanced technologies may be difficult, so the selection of future supply chain locations may be driven increasingly by the availability of talent.[12] At the same time, virtual and/or augmented reality technologies may facilitate remote interaction, reducing the need for staff mobility across regions and so easing associated employment tax reporting requirements.

costs. But for all its benefits, a shift toward services is associated with several challenges: operational, cultural, and financial. Manufacturers in general will have to adjust to the new reality of balance sheet management in a service world, giving rise to tax questions, such as: Where should the income be taxed? How should the income be taxed? Which tax should be applied to the income? What is the value to be taxed? and What is the tax implication on human capital?

To be sure, products and services have been foundational to tax systems for many years; Rolls-Royce has been offering its Power-by-the-Hour approach for more than five decades.[22] Industry 4.0, however, has brought about a significant expansion of service-based delivery models. While tax systems have rules for service-based transactions, it can be challenging to arrive at an appropriate classification in order to ascertain which rules to apply. Indeed, tax frameworks are still seeking to catch

TAX IMPLICATIONS FOR THE AFTERMARKET: QUESTIONS AND CONSIDERATIONS

Direct taxes. When the sale of a product today drives the sale of complementary goods or services tomorrow, how will aftermarket sales be taxed—and who will be liable for that tax? Further, is part of the product sale attributable to the aftersales service, or is the reverse true? Are aftermarket services considered accessories to the initial sale, and therefore taxable at the place of distribution? This question will be particularly relevant in situations where product sales and aftermarket sales take place in different jurisdictions, a client may be generating data in a third location, and data may be analyzed in yet another location. In these cases, where are the services taxed? Further complicating matters, how can the data itself and its analysis—both of which are critical to the aftersales service—be valued and taxed, particularly if the analysis is automated and does not require human input?

Further, if an element *is* attributable to the aftersales service, and therefore the intellectual property (IP) on which it depends, an implicit license and royalty payment may be subject to withholding tax in the country where the data is collected. In this case, a significant risk of double taxation exists, as different jurisdictions take different approaches to IP qualifications and a globally consistent approach does not exist. Double taxation treaties and the wider international tax corpus have so far failed to keep pace with these developments.

Indirect tax. A variety of factors must be considered when determining whether aftermarket supplies constitute separate supplies, making them subject to VAT. For example, some indicative factors include the number of suppliers involved, a typical customer's perception of what is being purchased, the contractual terms, and the economic reality of the transaction. Some of these considerations, such as consumer perception, can be subjective and lead to uncertainty.

From a regulatory perspective, tax authorities have recognized this dilemma and are starting to act upon it. For example, "Fair taxation of the digital economy," proposed in March 2018, proposes new rules defining how a business can create a significant digital presence in a member state for direct tax purposes.[17] However, such a distinction in establishment terms is yet to exist for indirect tax.

Employment tax. As aftermarket customer bases go global, the emergence of the "gig economy"—workers who use online platforms to source on-demand pieces of work or services such as aftermarket maintenance or support on a self-employed basis—becomes relevant.[18] From an employment tax perspective, challenges arise around individuals' employment tax status and applying the correct pay as you earn/national insurance contributions (PAYE/NIC) treatment. While still nascent, employers and tax regulators alike must consider developments as tax jurisdictions look to develop tax policies and frameworks.

up with the product-as-a-service business model within the context of Industry 4.0. In March 2018, the European Commission made two legislative proposals to address some of the challenges associated with taxing the digital economy. The first initiative aims to reform corporate tax rules so that profits are registered and taxed where businesses have significant interactions with users through digital channels. The second proposal looks to introduce a new indirect tax to capture digital services where the main value is created through user participation.[23] Despite these advances, however, challenges remain across all the main types of tax used by industrialized economies.

TAX IMPLICATIONS FOR PRODUCT-AS-A-SERVICE: QUESTIONS AND CONSIDERATIONS

Direct taxes. Services are typically correlated to the assets and goods used at the customer's location. Therefore, the question of where the *value* comes from will be key for tax. As with the aftermarket, the main dilemma will be to decide *where* to tax: at the location of the data, or where the data is enriched, analyzed, and used. Currently, no rules exist as to how to split the value to be taxed, creating more risk of double taxation.

This conundrum triggers larger questions around value, namely: What is the value of the totality of data collected from the client? This value is lower than that of the data deemed relevant to be analyzed by algorithms, but will that value change if it is processed by proprietary or third-party IP? This can mean that regulators have to allocate a value to each step of the process to enable more accurate tax planning. Further, service flows are dependent on the IP processing the data. Hence, part of all the compensation can be qualified as royalty liable to withholding tax; as with the aftermarket, double tax treaties have not kept pace with this development. Consequently, the ability to credit the withholding tax paid against tax due by the service provider is uncertain.

Additionally, with respect to services, several fundamental issues may raise questions as to whether existing transfer pricing principles are fit for these purposes. For example, as with the aftermarket, the holding and enriching of data may not require much, if any, human input. From a transfer pricing perspective, we are used to the taxable profits following the "substance," which generally means people; in the future, this substance may be data warehouses and AI software instead.

Indirect taxes. Liability to indirect tax, notably VAT, is complex. Splitting the service income between IP compensation and service compensation can trigger significant VAT and customs questions, especially when the service provider does not have a legal presence in the country of its client. Multiple and competing tax liabilities are likely to become the norm. As such, while businesses should stay abreast of their obligations, so too must tax authorities observe any significant changes in tax revenue closely to ensure that shifts in the place of supply do not adversely affect their economies. For their part, tax authorities may greet the trend toward servitization with concern given the potential exposure that may arise due to VAT fraud.[20]

Employment tax. The rise of servitization may increase not only the value and importance of the human worker but also employee mobility and nomadism, for example with engineers and salespeople. This triggers complex questions about personal income tax, social contribution levies, and compliance with labor and immigration laws, which are even more fragmented than tax law. This compliance challenge affects not only the employees but also the employers, as employees can render the employers liable to tax in the countries where they travel. Designing mobility policies that address these issues can help avoid having mobile workers hobbled by tax challenges, and employers finding themselves hit by hidden tax costs.

Designing tax governance capable of reconciling new, global business models with fragmented, often protectionist national tax rules will be critical to making Industry 4.0 successes sustainable—for both businesses and tax regulators.

Both industry and regulators need to look ahead

Industry 4.0 ushers in benefits both for society and the economy—and new exposures to double taxation. However, for its benefits to be fully realized, global tax systems and regulators must keep pace with the changes, a challenge given the level of international coordination that will be needed. Progress is beginning to be made in this regard; more than 100 countries have recently embarked on a globally coordinated effort to create minimum standards within their local tax laws.[24] The more coordinated the changes are, the greater the consistency for tax policy globally. States that can bring certainty to companies via smart regulations will be preferred locations in this Fourth Industrial Revolution. Designing tax governance capable of reconciling new, global business models with fragmented, often protectionist national tax rules will be critical to making Industry 4.0 successes sustainable—for both businesses and tax regulators.

However, companies cannot afford to wait for certainty around tax; Industry 4.0 is here, and investment decisions need to happen quickly to keep pace with the change. As such, tax regulators and business leaders need to understand and discuss the magnitude of the changes afoot as they develop and implement their regulations and strategic growth plans, and governments can work together where possible to create a unified global solution. Unlike with predictive maintenance, algorithms cannot yet predict and bring solutions to the tax challenge, but planning and quick action can help regulators and business leaders anticipate and adapt to the changes taking place.

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SILENCE THE NOISE

INDUSTRY 4.0

FUTURE OF MOBILITY

FUTURE OF WORK

HUMAN CAPITAL

Regulating the future of mobility

GOVERNMENTS PLAY A CRITICAL ROLE IN BALANCING INNOVATION WITH THE PUBLIC GOOD

by Derek M. Pankratz, William D. Eggers, Kellie Nuttall, and Mike Turley

ILLUSTRATION BY TRACI DABERKO

RIDEHAILING. BIKESHARING. ELECTRIC vehicles. Self-driving cars. Micro-transit shuttles. E-scooters. Truck platooning. Drone delivery. These developments and more are fueling some of the most disruptive changes in transportation since the invention of the automobile. The result could be a new mobility ecosystem that enables people and goods to move faster, cheaper, cleaner, and safer than today, benefiting individual travelers, governments, businesses, and society at large. Yet it could also be a world in which unproven technologies worsen, rather than improve, safety. In which congestion increases as people abandon subways for individual robo-taxis. In which communities become transportation deserts. In which some of our most sensitive personal information—where, when, and with whom we travel—could be compromised.

The onus for preventing these negative outcomes rests with many participants in the mobility sphere, including the companies developing new technologies and services. But regulators and policymakers have a unique, critical role to play. While others may have laudable intentions and strive for societal benefits, it's government that ultimately has

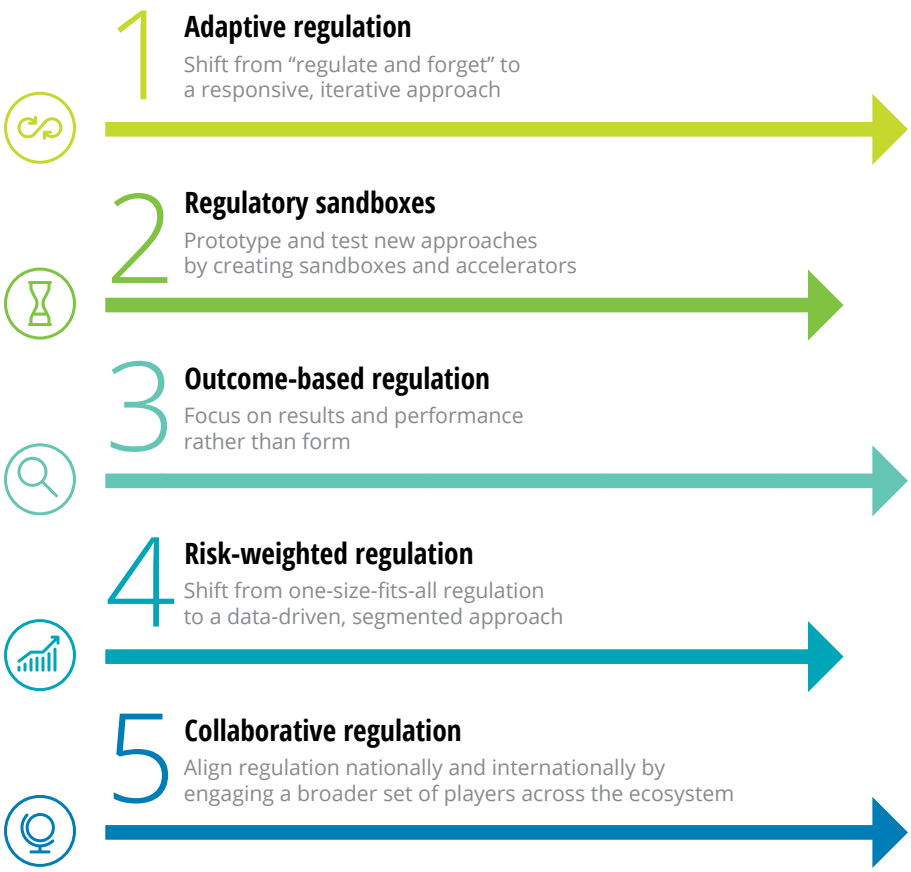
the ability—and responsibility—to safeguard and further the public good.

Regulating the future of mobility is a complex challenge and, in such an environment, it can be helpful to start with first principles. We have developed five guidelines for regulating emerging technologies (figure 1),[1] and this article applies those guiding principles to some of the core regulatory challenges posed by the future of mobility, including ensuring the safety and functionality of autonomous vehicles (AVs) and other new modes; establishing protocols for safely and securely managing data; and addressing congestion and ensuring access. These principles are not mutually exclusive—indeed, they are often complementary.

Local conditions will, of course, shape any jurisdiction's specific regulations. As with many of the issues raised by the future of mobility, one size does *not* fit all. Our intent is not to advocate for more (or less) regulation. Indeed, in some instances, applying our principles may result in a lighter regulatory footprint. Our aim is to offer tools to help regulators approach the complex issues associated with mobility in a way that can help foster innovation, engender economic prosperity, improve safety, and increase access to transportation.

FIGURE 1

Five regulatory principles to tackle emerging technologies



Getting ahead of three key mobility challenges

With some exceptions, regulatory bodies at the national, regional, and local levels have not approached the future of mobility in a way that considers its full range of potential opportunities and impacts. By focusing on today's challenges—such as coping with fast-growing ridehailing services or setting the stage for limited AV testing—governments risk missing an opportunity to proactively shape tomorrow's mobility environment. A more forward-looking and comprehensive approach to new mobility technologies and services informed by data and grounded in a set of underlying principles can help regulators craft guidance that ensures a mobility system that is more efficient, effective, and inclusive. Below, we look just over the horizon to consider the broader regulatory considerations for three critical mobility issues: AV safety and functionality, data security and privacy, and managing mobility for the public good.

1. AV SAFETY AND FUNCTIONALITY

Many regulators have focused on establishing conditions for how, where, and when autonomous vehicles can be tested and piloted in relatively small numbers, which makes perfect sense given the state of AV development and the reluctance of many to prematurely lock in a particular set of rules. Yet as self-driving technology evolves—multiple companies plan limited commercial launches in the next few years[2]—regulators will likely need to turn their attention to how these vehicles should operate at scale on public roads (figure 2).

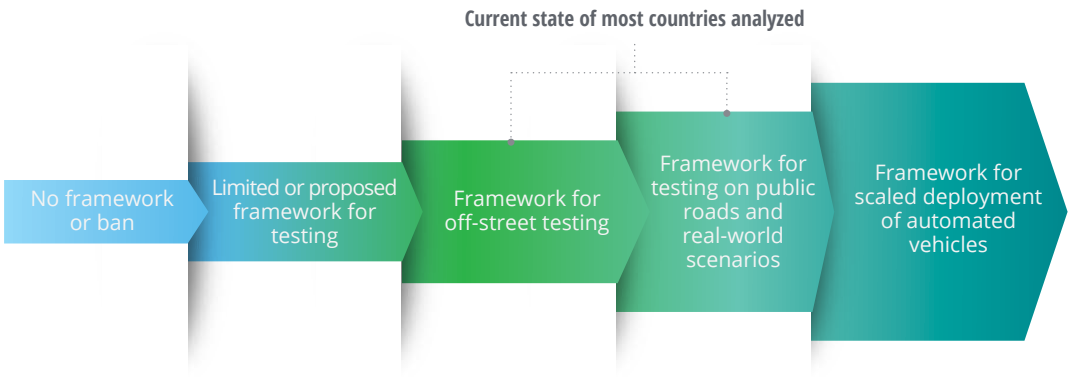
Key regulatory issues

AVs present a host of thorny potential safety issues for regulators, which may help explain the cautious approach many have taken to date. The foremost concern, of course, is ensuring vehicles are safe for both their passengers and other road users. Yet what constitutes "safe enough," and how would we know? Should such vehicles be held to the same design and engineering standards as human-driven vehicles, or something more (or less) stringent? How do policymakers weigh the risks that early-stage AVs present to today's users against the potential safety advantages that could accrue to future passengers? Perhaps it's no wonder that, to our knowledge, no agency has published a detailed set of requirements that AVs must meet to be made available to the general public (in either a personally owned or shared capacity).

Granted, the absence of such standards may not delay the development and deployment of self-driving cars on city streets. In many cases, an AV need only meet the same safety standards (such as

FIGURE 2

The evolution of autonomous vehicle regulation



crashworthiness) as conventional vehicles. France's road safety authority has suggested commercially available self-driving cars may simply need to pass a regular driver's test—a standard that seems to belie the fundamental differences between a sensor- and AI-driven vehicle and a human driver.[3] In the absence of formal guidance, numerous companies are pressing ahead with aggressive plans to bring AVs to market in the next several years,[4] which makes embracing the new set of guiding principles essential for crafting effective regulation.

Regulatory approaches

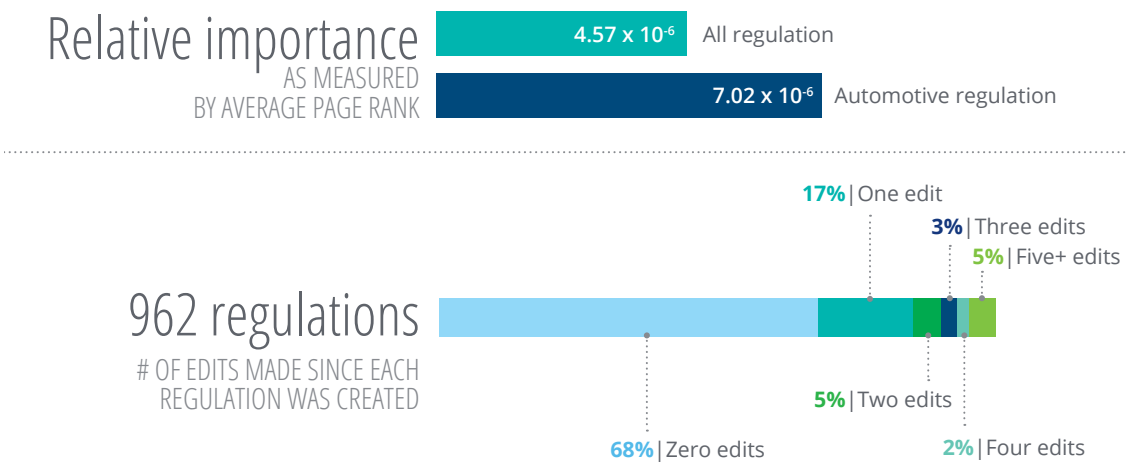
Revisit and revise often. Adaptive regulation should form the bedrock of any AV safety protocol. Given the number of variables at play in real-world driving situations, it will likely prove impossible to craft comprehensive and binding rules for AV operation for the foreseeable future. That makes it important to take an iterative, adaptive approach. Historically, this has not been the norm for automotive-related regulations. In the United States, for instance, Title 49, part 500 of the Code of Federal Regulations, which includes the Federal Motor Vehicle Safety Standards and other auto-related items, contains nearly 1,000 rules—two-thirds of which have never been edited. On average, it has been 20 years since any given rule has been created or updated (figure 3). Adding to the complexity, many of those regulations are essentially "parents" to additional rules, meaning the presence of outdated or obviated rules can cascade through the automotive regulatory framework, creating conflicts or illogical requirements.[5]

Focus on outcomes, not process. Focusing on outcomes may allow regulators to sidestep some of the trickiest issues surrounding AV policy—although it may require rethinking what constitutes an "outcome." For instance, autonomous vehicles may need to drive hundreds of millions of road miles—even billions of miles, in some scenarios—to establish statistically that they meet certain safety benchmarks.[6] (Counterintuitively, the fewer crashes AVs have, the more miles are required to demonstrate safety.) One solution is to factor in both real-world and simulated miles:[7] Waymo,

FIGURE 3

US automotive regulations have outsized importance yet are rarely updated

"Importance" is based on page rank, which captures the number of citations going into and out of each regulation.



Source: Deloitte analysis of the Code of Federal Regulations.

which is among the leaders in AV testing, compiled 2.7 *billion* miles of simulated driving in 2017 alone, more than 300 times its lifetime on-road total.[8] While there are limitations to what simulations can accomplish, regulators could work with the private sector and academia to determine how those miles might be factored (perhaps at a discounted rate) into the overall safety record for a self-driving system.

Codevelop standards with key stakeholders. Collaborative regulation will likely be key. Several AV developers have begun creating specific safety standards that aim to provide redundancy in autonomous systems, both for sensors and the decision-making algorithms (whether logic- or learning-based). Mobileye's Responsibility-Sensitive Safety model, for instance, proposes a foundation for a formal mathematical model of AV safety.[9] Building off of and refining these efforts can help regulators ensure that their standards are consistent with industry best practices. Governments at all levels are among the entities best positioned to bring stakeholders together, and gathering their input could be critical to formulating smart, agile regulation.

Governments at all levels are among the entities best positioned to bring stakeholders together, and gathering their input could be critical to formulating smart, agile regulation.

Harmonize where possible. A patchwork of potentially conflicting regulatory schemes, whether among different states or regions within a country or across international borders, could sow confusion, create additional costs for developers, and slow technological progress. Regulators should look to adopt common standards that ensure interoperability of AV systems across jurisdictions. This is likely to be particularly important in geographies with high degrees of cross-border traffic, whether in the form of interstate commerce in the United States or the movement of people and goods throughout Europe.

Test and learn. Regulatory sandboxes could play an important role, especially in the near to medium term as AV technology matures. Many regulators around the world are already deploying a sandbox approach for self-driving pilots, granting exemptions from some standards in particular geographic areas, and dozens of cities around the world are hosting AV trials.[10]

Consider relative risk. Testing environments can in turn inform a risk-weighted approach to subsequent rule-making, enabling agencies to better understand the degree of difficulty associated with particular driving conditions and "edge" cases, and to craft tailored regulations based on the circumstances. For instance, rush hour at a complex intersection where cars, pedestrians, and cyclists mix might demand a higher safety bar be cleared before AVs are permitted. Data from controlled pilots and regulatory sandboxes can help clarify what situations are most complex and risky.

AV SAFETY AND FUNCTIONALITY: LEADING BY EXAMPLE

- The US Department of Transportation's Automated Vehicles Policy offers an example of adaptive regulation, rolling out three sets of evolving guidelines in as many years.[11] By taking an iterative approach in designing policy for autonomous vehicles, the department has continued to refine its initial policy of 2017, clarifying most recently that, from a policy perspective, a "driver" need not be a human.[12]
- With high population density and limited space to expand, Singapore has adopted progressive regulations for the testing of self-driving vehicles; in 2017, the country modified its major road traffic law to accommodate "automated motor vehicles" and "automated systems." To ensure that regulations remain agile and adaptable to changing technology, existing rules remain in effect for only five years, and the government has the option to revise them even sooner. Lawmakers even made it illegal to interfere with autonomous vehicle testing.[13] Critically, further simplifying the regulatory landscape, AV testing falls under a single oversight agency, the Land Transport Authority, avoiding other countries' patchwork of national, regional, and local rules. The authority has actively partnered with research institutions and the private sector to facilitate pilots of autonomous cars and buses.[14]

2. DATA SECURITY AND PRIVACY

Vast and diverse quantities of data underpin autonomous vehicles and nearly every other significant new mobility technology. The ability to safely and securely collect, share, analyze, and act upon this data is a necessary (if not sufficient) condition for creating a seamless, intermodal mobility system that is faster, cheaper, cleaner, safer, and more accessible than today. Security and privacy loom large in the future of mobility, a fact that most global regulators acknowledge even as they struggle to articulate concrete policies to address it.

Key regulatory issues

The critical role of data in the future of mobility poses a twin set of challenges. The first is to ensure that emerging mobility technologies and services are protected from those with malicious intent.[15] There are real and increasing cyber risks associated with autonomous and connected vehicles, vehicle-to-everything communication, and greater connectivity across modes of transport. It's easy to imagine nightmare scenarios in which entire fleets of autonomous vehicles are commandeered virtually and used as rolling weapons,[16] smart traffic signals are compromised and used to bring city streets to a grinding halt,[17] or ransomware prevents your self-driving car from operating until a fee is paid.

Less attention-grabbing but no less important, regulators should also address the safe and permissible use of personal data. As technology increasingly mediates and monitors our movements, artificial intelligence can more and more easily construct an ever-more complete and intimate portrait of our lives. With transportation accessed via app, mobility providers have the potential to know not only when and to where we commute for work but also with whom we travel on weekends, or whether we have recently visited a hospital or pharmacy. Many of these issues are familiar from the broader conversation about how social media companies and technology platforms collect and use personal information. But their application to mobility could add additional complexity because of the potential to directly impact not only users' digital lives but their physical circumstances. Advertising-supported business models have been a staple of the internet age. What happens when an advertiser—recast as a (perhaps hidden) sponsor of a ride-hailing service—can route your trip past its new store, even overriding what your own data suggests would be your preferred option?[18]

Regulatory approaches

Challenge the conventional wisdom about regulatory goals. As with new mobility technologies and services more generally, most regulators are understandably reluctant to issue definitive rules in a field where the nature of the threats is still very much nascent. That makes embracing adaptive, outcome-weighted, and risk-weighted regulation especially important—and can mean reconsidering some of the widely accepted goals of a regulatory framework. For example, many industry participants and observers have lamented and sought to prevent the emergence of a patchwork of standards and systems for autonomous and connected vehicles across different geographies. In the United States, it is one of the most commonly cited reasons for pushing for regulatory or legislative action at the federal level.[19]

Yet such diversity could actually be a boon when it comes to cybersecurity. Multiple AV operating systems or geography-specific digital mobility platforms and mobility-as-a-service applications could improve an overall system's resiliency and minimize the damage from a cyberattack. Whether by design or happenstance, experts increasingly see the US power grid as benefiting from similar variability and redundancy.[20] Because regional grids operate largely independently, the ability for a single attack to create widespread blackouts appears limited.

DATA SECURITY AND PRIVACY: LEADING BY EXAMPLE

- In the United States, the NHTSA in January 2016 convened a public roundtable to facilitate a stakeholder discussion on vehicle cybersecurity topics and to define the agency's role in overseeing auto cybersecurity. Attendees included representatives of 17 automakers, 25 government entities, and 13 industry associations.[21]
- In Europe, the 15-member European Automobile Manufacturers' Association in October 2017 published six principles of automobile cybersecurity:
  1. Cultivating a cybersecurity culture
  2. Adopting a cybersecurity life cycle for vehicle development
  3. Assessing security functions through testing phases
  4. Managing a security update policy
  5. Providing incident response and recovery
  6. Improving information-sharing among industry actors[22]
- Several global initiatives are also underway. In 2015, the Automotive Information Sharing and Analysis Center formed to enhance cybersecurity awareness, share information about threats, and improve coordination across the global auto industry.[23] And the Alliance of Automobile Manufacturers and the Association of Global Automakers developed a "Framework for Automotive Cybersecurity Best Practices."[24] The global industry is also extensively engaged with universities and nonprofits to develop and test security protocols.[25]
- Israel in February 2018 hosted a smart-cities cybersecurity conference with representatives from a variety of private-sector providers and 80 global municipalities and local authorities, providing an important venue to share threat information and best practices.[26]

To be sure, applying a similar approach to mobility systems would come at great opportunity cost because many of the individual, economic, and societal gains associated with new transportation technologies and services are predicated on connecting disparate and disconnected modes and systems.[27] But as the nature and severity of cyber risks associated with autonomous vehicles and other emerging technologies grow clearer, regulators and their private-sector counterparts should at least consider how to create appropriate firewalls—physical and/or digital—to limit the potential harm. An API-based approach that employs secure design and governance principles might be one way to strike a balance between integration and data safety.

Cooperate toward a shared goal. Mobility-related cybersecurity is fertile ground for collaborative regulation, in part because governments and industry want the same thing: safe, secure transportation. Thankfully, many global regulators have embraced that collaborative approach, fostering industry-led standards-setting and reporting bodies. Some organizations have looked to codesign regulations and guidelines as a way to quickly establish frameworks for industries to follow. Public-private collaboration has—and should—cut across jurisdictions and borders as well. Government agencies can also support and take cues from the numerous industry-led groups that have sought to address cyber risk in autonomous and connected vehicles.

3. MANAGING MOBILITY FOR THE PUBLIC GOOD

The future of mobility offers tremendous promise: a world of seamless, intermodal transportation that meets all users' needs.[28] Self-driving vehicles and shared mobility could provide transportation to many millions of people who currently struggle to get around, especially the young, the old, and the disabled. They could be key to helping the roughly 15 million people in the United States who report having difficulty accessing transportation,[29] and widespread AV deployment could enable 2 million job opportunities for the US disabled community alone.[30] Energy think-tank SAFE forecasts the total annual benefit of AVs to American consumers and society reaching nearly $800 billion by 2050.[31] Yet there are darker versions of this future.

Key regulatory issues

If ridehailing and AVs offer more convenient and potentially less expensive travel, miles traveled could increase, potentially exacerbating congestion and pollution.[32] While the research on ridehailing's impact is mixed, with some studies suggesting ridesharing could significantly reduce the number of for-hire vehicles required to meet demand,[33] research indicates transportation network companies' services have already added 5.7 billion miles of driving in the nine largest US cities.[34] If commutes become less onerous, people may be willing to live further from their jobs, potentially contributing to sprawl and the "hollowing out" of urban cores.[35] Likewise, ubiquitous and inexpensive shared AVs could cannibalize public transportation—still the most efficient means of moving people in cities[36]—exacerbating the funding and infrastructure challenges that transit operators face. In New York, for example, 50 percent of ridehailing trips would have otherwise been made using transit, according to the city's surveys.[37] Discriminatory levels of service, which academic research suggests are already a challenge for ridehailing in some locations,[38] could become both more subtle and more difficult to root out if passenger pickup decisions are increasingly made by artificial intelligence. Such "algorithmic bias" can be notoriously tricky to identify and correct.[39] None of these negative outcomes is certain. But it could fall to regulators, working with private-sector partners, to help prevent their emergence.

Regulatory approaches

Introduce innovations with a systems perspective in a measured way, and carefully track impact. Regulatory sandboxes can be an important tool in that effort, especially in cities. Transportation systems are often highly complex,

with difficult-to-perceive dependencies across modes. Changes—from introducing a new fleet of shared self-driving cars to something more prosaic such as adjusting subway signaling—can create unanticipated and unwanted ripple effects.[40] Authorities should start with a system mindset that considers the entire transportation network, focused on the mobility challenges they are trying to solve. While deploying the latest app or mode of transport can be tempting, resist doing so for its own sake. Then, by introducing new mobility services into select areas in a controlled way, regulators and companies can gain critical insight about how those services interact with existing transportation patterns and infrastructure. This is the approach being adopted by many global cities currently hosting AV pilots—and has decidedly not been the experience of many cities that have experienced an influx of dockless scooters.[41]

Establish key metrics based on citizens' priorities, and govern new mobility options accordingly. An outcome-based approach to regulation can be integral to successfully deploying regulatory sandboxes, and to mitigating unwanted unintended effects more generally. As new mobility solutions are introduced, regulators should monitor their impact closely and adjust policies quickly if deleterious outcomes emerge. For many, this also could require a new set of capabilities, such as deep expertise in mobility technologies; the ability to collect, manage, and analyze large quantities of low-latency data; and the cultivation of strong, trust-based relationships with a multitude of stakeholders.

Consider new policy tools to affect results. One manifestation of an outcome-focused approach has been the deployment of usage-based charging.[42] Many countries have experience with tolling in some form, and more recently governments have explored congestion charging schemes—a fee associated with entering a particular area, typically a city center—as seen in London, Singapore, and Stockholm.[43] But policymakers could look to establish truly dynamic user-based charging systems that can adjust prices in real time based on an array of conditions. Such a system could provide transport managers with a flexible and adaptable tool that can be used to influence behavior and help manage demand by adjusting pricing to encourage people to drive at different

MANAGING MOBILITY FOR THE PUBLIC GOOD: LEADING BY EXAMPLE

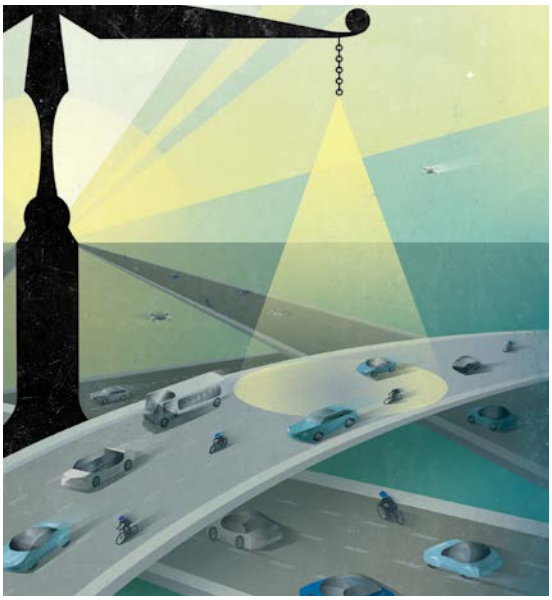
- Finland is a pioneer in enabling integrated, multimodal mobility. Through a process of "de- and re-regulation," officials streamlined and simplified the policy framework (by, for example, removing the distinction between traditional taxis and ridehailing services) while also adding new data-sharing requirements for mobility service providers.[44] This has enabled mobility-as-a-service provider MaaS Global to incorporate public transit data for the city of Helsinki to create an app that allows users to access multiple modes of transport on demand, with a goal of reducing private car ownership, emissions, and congestion.[45]
- In the United States, Boston deliberately expanded its AV test area to include South Station, a major commuter rail hub, to examine AVs' impact on public transit.[46] Off-street testing facilities, such as those at Singapore's Nanyang Technological University and Michigan's MCity and American Center for Mobility, and sophisticated simulators can also provide critical insight.[47]
- Ridesharing companies have worked with multiple public transportation agencies to serve as a first-mile/last-mile solution to get people to and from mass transit stops.[48]

times or on different roadways. It can also be used to shift usage to different modes of transport: As the cost of driving a personal vehicle alone rises, people may switch to public transport, carpooling, or cycling. And more dynamic pricing can extend beyond roads to include curbsides, with many cities revisiting their curb management plans.[49]

New technology and detailed, dynamic maps of when an area can be designated for, say, delivery vehicles and when it should be reserved for, say, buses are the first steps toward differentially charging users for their use of that space.[50] The most encompassing version could manifest as a citywide integrated mobility platform that brings together physical infrastructure (roads, rails), modes of transport (cars, public transit, ridesharing, bike-sharing), and transportation service providers (aggregators, the public transport system) and creates optimization systemwide through market-clearing mechanisms.[51] All of which would be predicated on governments utilizing more accurate, comprehensive, and lower-latency data.

Collaborate early, when and where possible. Crafting collaborative regulation may be one of the more difficult challenges agencies face when attempting to address the negative second-order effects of new mobility technologies. In some instances, the goals of the public sector and various private-sector entities may be at odds. For instance, automakers' core business is selling cars, not encouraging people to use public transportation or optimizing a city's overall transportation network. And if a shared AV ridehailing service is supported by in-vehicle advertising content, the operator's incentive would be to extend the trip and to make more of them, driving up miles traveled—and potentially exacerbating congestion and pollution.[52]

That said, many regulators may be surprised by private companies' willingness to work collaboratively with governments to craft policies that in the long run can be mutually beneficial. Uber and Lyft have both expressed support for broad-based congestion pricing on private vehicles.[53] Cooperation will vary by geography and issue, of course, and not all mobility providers have proven



to be attuned to public sector concerns. Regulators would do well to adopt the old mantra of "trust, but verify."

Destination: A better place

The new mobility ecosystem has the potential to transform daily life for millions of people and countless businesses. And every player shares responsibility for making that transformation beneficial rather than detrimental. But policymakers and regulators have a particularly critical role in furthering communication and coordination, setting standards, and ensuring new transportation modes don't worsen congestion or leave low-income people stranded. Regulators and other public authorities are particularly well-positioned to act as catalysts and conveners to shape the emerging mobility ecosystem. Companies may insist they want to make the world a better place for everyone,[54] but that's government's actual *job*.

In this case, that job is hardly an easy one, with a wide range of public- and private-sector entities looking for mobility opportunities and an even wider range of citizens likely to see real-life impacts on how they travel. The level of uncertainty is high,

particularly as the future of mobility involves self-driving vehicles: No one knows for certain when, where, and how we'll see autonomous cars on city streets. But agencies shouldn't wait for technology to get to the next level: Regulators should step up and get involved in crafting policies and establishing protocols, preferably in collaboration with companies working to create the new mobility system's hardware and software. There's a real chance to get it right for everyone.

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Picturing how advanced technologies are reshaping mobility

USING AUGMENTED REALITY TO EXPLORE HOW EMERGING TECHNOLOGIES ARE USHERING IN THE FUTURE OF MOBILITY

by Craig Giffi, Dan Littmann, Kevin Westcott, and Steve Schmith

ILLUSTRATIONS BY MOLLY SNOWBERGER
AND CHRISTOPHER SMITH

ADVANCEMENTS IN TECHNOLOGY are affecting nearly every aspect of our lives. From health care to education to retail, technology is expanding choice, lowering cost, transforming customer experiences, upending business models, and changing how we engage with and value brands. And when it comes to transportation and mobility, advancements in powertrain and battery, safety, and connected and autonomous technologies—coupled with shifting consumer preferences—are paving the way for a future of mobility that will more than likely include shared fleets of autonomous vehicles and flying cars. Perhaps more than anything, these advanced technologies will profoundly alter the customer experience.

We believe that the journey to the future of mobility is already well underway. Examples abound of electrification, autonomous drive, smart and connected infrastructure, and disruptive business models. The emergence of 5G holds the promise of delivering fast, reliable, omnipresent connectivity. And innovations in other industries such as gaming are ushering in the possibilities of entirely new, immersive customer experiences delivered through augmented, virtual, and mixed reality.

To explore how advanced technologies already are and will continue to reshape the transportation ecosystem—and redefine and reshape people's experiences as they move from one place to another—this article delivers a vision of the future enabled through augmented reality (AR). The trends that follow are ordered chronologically, beginning with how advanced technologies are today already changing how people buy cars. Each of the trends discussed is accompanied by an illustration that, when viewed through the Deloitte Digital DxR app, enables an AR experience that allows you to picture how advanced technologies will reshape mobility over the next 20 to 50 years.

Trend 1: Changing how people shop for cars

Shopping for a car isn't something many consumers look forward to. It's frustrating to invest time in researching vehicle and payment options only to find, upon arriving at a dealer's lot, that the vehicle you want is not available and the payment options aren't what you expected. And it's even more frustrating when you compare the experience you enjoy with other brands to what happens on the

ACTIVATE YOUR AUGMENTED REALITY JOURNEY

Each of the illustrations accompanying the trends below is enabled with AR technology. To activate each illustration, install the Deloitte Digital DxR app from your favorite app store on your mobile device. To activate your AR-enabled journey, open the DxR app and place your device's camera over an illustration.

Step 1
Launch the Deloitte Digital Reality app, available for iOS and Android.

DxR Deloitte.

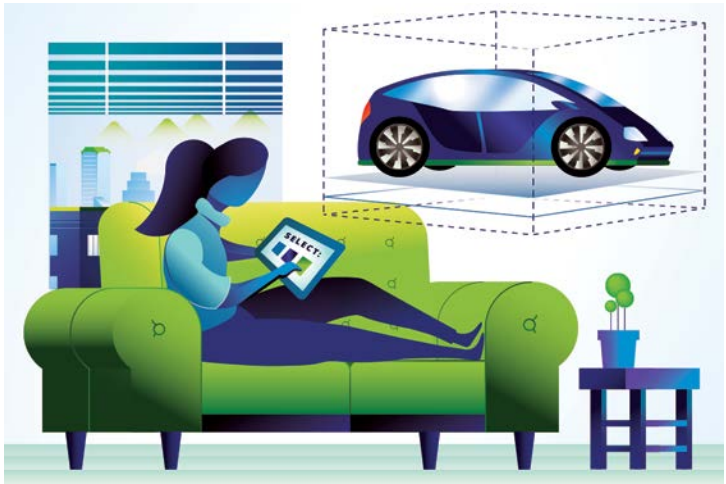
Search for "Deloitte Digital Reality" in app stores

Step 2
Look for AR content throughout the article.

Activated images are marked with this icon

Step 3
Activate AR content by pointing your camera at the image.

AR animations will play automatically



New technologies like AR and VR will make the car-buying process more personalized, convenient, and transparent.

showroom floor. Yet, according to Deloitte's Global Automotive Consumer Study, consumers view the customer experience and their relationship with salespeople as integral to their final purchase decision.[1] In fact, consumers around the world rank family, friends, and salespeople as the top sources for information when shopping for a vehicle.

So what do consumers dislike most about the process? Too much paperwork and an overall purchasing experience that just takes too much of their time. In addition, our research shows consumers are increasingly interested in buying a vehicle online without ever having to set foot inside of a dealership.

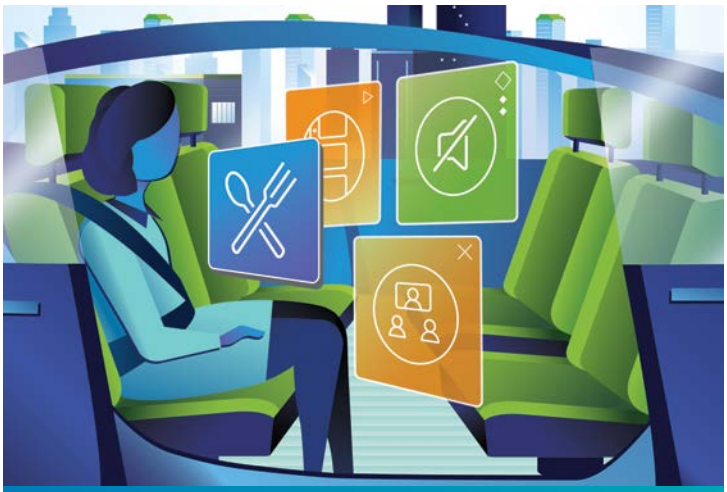
Advancements in VR technologies are poised to help both automakers and automotive dealers alleviate many of the pain points commonly associated with buying a vehicle. It also promises to create opportunities to engage consumers in entirely new ways while improving operations and the bottom line. Within the next three years, we anticipate significant growth in the use of VR technologies that allow consumers to compare models, build a vehicle and choose its features, "test drive" it, and then finance their purchase wherever and whenever they choose. That could include at shopping centers, airports, concerts, sporting events, and other attractions, as automakers and dealers create "pop-up" dealerships—VR-enabled kiosks that go where consumers are rather than requiring them to come to showrooms.

Creating a VR experience that sells cars requires mobile bandwidth intensity unmatched by today's typical consumer applications such as streaming video. VR typically requires download speeds of at least 50 megabits per second, well beyond the capabilities of today's wireless networks when they are operating at capacity. Hence, 5G will be an essential enabler of VR experiences due to its ability to support speeds 10 to 20 times greater than today's LTE networks while allowing for location flexibility.

Moreover, 5G capabilities such as network slicing enable communications service providers to provide networks on an as-a-service basis and dynamically meet the demands of pop-up dealerships. Network slicing allows multiple logical networks with different performance characteristics to run on top a common physical network infrastructure. 5G with network slicing will ensure that network performance meets the bandwidth-intensive needs of a VR dealership experience.

Trend 2: Creating opportunities to engage consumers in transit

As autonomous vehicle technology matures and scales, opportunities will emerge for companies across a wide spectrum of industries to engage consumers while they are on the go but not focused on driving. Automotive original equipment manufacturers (OEMs) and suppliers, for example, can take the lead on designing and building vehicles



Autonomy will transform the in-car experience — allowing for productivity, entertainment, and advertising.

whose interiors are modular, customizable, and embedded with screens, speakers, and other technologies that allow consumers to connect and interact with the world outside. Companies across the industry are already experimenting with innovations such as next-generation seating systems that are highly configurable; technologies that transform a vehicle's windows into video monitors; and acoustic solutions that create individualized sound zones within a vehicle, allowing passengers to personalize their listening experience. As physiological barriers break down and people become more comfortable riding in autonomous vehicles, opportunities for never-before-imagined customization within the cockpit will emerge, allowing OEMs and other manufacturers to continue driving innovation—and imagination—about what the inside of a vehicle looks like.

Today's wireless networks will need to add massive capacity to accommodate these new in-vehicle experiences. The deployment of thousands of 5G small cells in densely populated urban and suburban areas will help accommodate the additional wireless traffic. However, alternative wireless technologies and unlicensed spectrum will also play an essential role. 5G enhances a device's ability to switch seamlessly and efficiently across heterogeneous network technologies. Today, most video streaming occurs in the home, almost exclusively on unlicensed spectrum over WiFi. As more and more viewing shifts to people in transit, 5G's heterogeneous network capability will help relieve the stress on licensed networks to intelligently find capacity via other networks with sufficient capacity to serve passengers' information and entertainment needs.

Reliable connectivity will allow media and entertainment companies to discover new ways to connect with audiences within vehicles. New frontiers in retailing and advertising will emerge. We can even envision health care providers consulting with patients while they are in transit, using biometric sensors and cameras embedded throughout the vehicle.

But creating individualized experiences within the vehicle depends on more than connectivity and applications. Individual experiences are relatively simple to craft on smartphones, considering

As physiological barriers break down and people become more comfortable riding in autonomous vehicles, opportunities for never-before-imagined customization within the cockpit will emerge.

that most people own their own devices. However, cars are shared environments; shared not only with family members, but increasingly with strangers using rideshare applications. When a rider enters a vehicle, he or she will not want to deal with the time-consuming complexities of setting individual preferences. Instead, we envision a future where people's preferences will be stored on the cloud and vehicles will automatically recognize individuals when they enter, adjusting music, video, news, advertising, and other customized preferences in real time. This capability requires advances in identity and device management that will accompany future connectivity offerings.

We envision a future where people's preferences will be stored on the cloud and vehicles will automatically recognize individuals when they enter, adjusting music, video, news, advertising, and other customized preferences in real time.

Trend 3: Enabling new pathways to value creation

Outside of the vehicle, autonomous and Internet of Things (IoT) technologies will usher in new opportunities to create and capture value. After passengers exit an autonomous and connected vehicle—regardless of whether it is personally owned or shared—the vehicle will still be able to interact with the connected world, completing tasks with little to no human interaction. For example, vehicles will be able to stop by highly automated warehouses or distribution centers to pick up groceries and other goods (conceivably loaded into the vehicle by autonomous forklifts or other automated material handling technology). Vehicles will be able to automatically schedule and go to service appointments for repair, maintenance, and, in the case of electrified vehicles, recharging. And they could become shared "for hire" vehicles, offering opportunities for people who personally own vehicles to earn money versus leaving the vehicle parked. These are only a few of the possibilities that could become reality at scale by 2040.

Onboard sensors, not mobile connectivity, power most autonomous vehicle capabilities and will continue to do so for the foreseeable future. However, 5G deployment will make connectivity an increasingly complementary part of the

Instead of sitting idle, self-driving cars will be better utilized as they complete tasks on their own.

autonomous vehicle ecosystem. LTE has limits on the number of devices that can be provisioned on a mobile network. However, the massive device density 5G delivers allows for 1 million connections per square kilometer. The ability to recognize, connect, manage, and collect data from an almost unlimited number of devices on a single network allows for the machine-to-machine communications necessary for autonomous vehicles to interact in the ways described in the use cases above. This level of automation, where machines interact with one another and remove people from the equation, represents the next frontier of productivity gains for the economy across almost every industry sector.

And while autonomous vehicle operation may be self-contained,[2] the vehicles could generate an increasing range of valuable data that would need to be offloaded. On average, an autonomous car in 2030 could be embedded with some 30 sensors (compared with about 17 sensors in 2015)[3] generating hundreds of gigabytes of data every hour.[4] These sensors would be unique to autonomous vehicles, helping them interpret their surroundings, smoothly navigate roads, and avoid obstacles and pedestrians. While not all of this data would be transmitted over cellular networks, some could be used to map the environment to feed machine learning/analytics to improve the autonomous vehicle's operating system. The vehicle's onboard software—including its operating system, voice assistance, and critical driving applications—could also consume vast quantities of data.[5] Further, autonomous cars would depend on over-the-air updates for operating system software as well as high-definition 3D maps of their ever-changing surroundings to navigate to specific destinations with a higher degree of accuracy than what ride-share passengers experience today.

Trend 4: Transforming cities around the world

By mid-century, cities around the world will become massively connected ecosystems. Various elements of such "smart cities" will work in harmony to deliver a higher standard of living for residents by helping tackle issues such as congestion, pollution, public safety, and access to city services. These connected and smart urban ecosystems will be equipped with a wide variety of applications, each unique and with different purposes. As a result, citizens could see marked improvements in their standard of living, the environment, and the safety and security of, among other things, neighborhoods, workplaces, and airports.

Optimizing mobility uses data to do things like reduce traffic congestion and navigate self-driving cars.

Frictionless intermodal travel in a connected urban ecosystem will likely need to be built on a robust underlying infrastructure, both physical and digital. Traffic management systems, connected homes and devices, roadside sensors, roads and bridges, cybersecurity infrastructure, and a comprehensive telecommunications network seem necessary for this new mobility ecosystem to emerge. Connecting and conveying the status of critical components such as charging

stations, traffic, dynamic pricing for infrastructure usage, and parking will also be crucial. And nearly all of the discrete opportunities discussed above depend upon the presence of ubiquitous, high-speed, reliable connectivity.

Urban planners and city transportation managers will also be able to capture huge amounts of data as people use cars, trains, and other mobility solutions. What it will take to secure these massive data networks from hackers and protect users' privacy will expand exponentially. At the same time, the opportunities to analyze and visualize data for insights that improve decision-making related to transportation will grow significantly. For example, data related to traffic flows, vehicle locations, the movement of people, and crowd density can all be combined and harmonized so that city-wide, integrated transportation systems can be managed to meet system demands at any given time. Using this data, and with a highly networked and integrated transportation infrastructure, urban transportation managers will be able to adjust traffic-light timing to ease congestion, add or remove trains to match demand, reroute traffic patterns around large events, and clear transport lanes for first responders in the event of crisis.

Flying cars introduce a third dimension of mobility, but require new regulations and infrastructure.

Trend 5: Flying into a third dimension of travel

Between 2050 and 2080, we will likely see significant growth in a new dimension of mobility—up. The advanced technologies within and around vehicles discussed above will serve as the building blocks of a future where fleets of passenger drones and flying cars dot the skies.

Although those days are decades away, prototyping and testing of passenger drones and flying cars date back more than 30 years.[6] Moreover, a number of manufacturers have announced plans to launch and/or deploy commercially viable unmanned aerial vehicles within the next three years. Some cities have announced the launch of flying-car programs by the end of the decade.

Between 2050 and 2080, we will likely see significant growth in a new dimension of mobility—up.

Still, we see a number of barriers that need to be addressed before flying cars will reach significant scale, from consumers' psychology, safety, air traffic management, infrastructure, regulations, and the maturity of the technology itself. It may take decades to address these issues. Perfecting and proving these advanced vehicle technologies on the ground will also be a crucial stepping stone to consumer acceptance.

By the time hundreds of thousands of manned aerial drones take to the sky, communications requirements will stretch beyond today's vision of 5G. However, some current features make it easier to imagine the technology required for it to become a reality. For example, 5G's ultra-low latency theoretically allows for latencies of 1 millisecond (ms). While the difference between 100ms and 1ms isn't apparent to the human eye, such speedy response times will be an imperative for safety and reliability in autonomous aerial scenarios. Furthermore, government oversight and regulation will become increasingly important, as will the need for greater computing power across the ecosystem.

Operating and maintaining fleets of flying drones will open new business opportunities and models. For example, ridesharing companies will be able to leverage their expertise in this new medium. Rental car companies will have opportunities around fleet management. Telecommunications and other technology companies will see opportunities to operate networks, as well as to work with retailers and media services to deliver next-generation customer experiences.

Toward a disruptive future of mobility—slowly but surely

The combination of these trends will usher in a new era of mobility and fundamentally change the movement of people and goods. Granted, the pace of this transformation is up for debate, and we will likely see multiple examples of these future scenarios in the market simultaneously.[7] Unlike other rapid, exponential advancements in technology-driven innovation—such as the swift adoption of smartphones—we believe that advancements will be incremental, as will progress toward scale and mass adoption. Because the core of mobility centers around people and their safety, it may take decades to develop, test, perfect, and connect all the technologies and players. However, the potential for disruption and the emergence of opportunities is certain.

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Forces of change: The future of mobility

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To live and drive in LA

THE LOS ANGELES DEPARTMENT OF TRANSPORTATION'S SELETA REYNOLDS AIMS TO BRING 21ST-CENTURY MOBILITY TO A CITY BUILT FOR CARS

by Scott Corwin and Derek M. Pankratz

ILLUSTRATION BY TRACI DABERKO

WITH 3.8 MILLION RESIDENTS and 7,500 miles of streets crisscrossing nearly 500 square miles, the City of Los Angeles Department of Transportation (DoT) manages one of the world's largest and most complex transportation networks.[1] We spoke with DoT General Manager **Seleta Reynolds** for her thoughts on introducing new mobility services in this complicated environment, how an integrated digital platform could benefit the city, and the true purpose of transit.

DEREK PANKRATZ, SENIOR RESEARCH MANAGER, DELOITTE SERVICES LP: Maybe we could start with a bit about you and your background and how you came to be involved in transportation. It was a somewhat unconventional path.

SELETA REYNOLDS: Yes, it was. I grew up in Jackson, Mississippi, a rural state. I went to college on the East Coast and didn't have a lot of specifics about what I wanted to be when I grew up. I loved to write; I loved history; I loved acting. I was really into the arts, got my degree in American history. I felt a lot of urgency to find somewhere where I could earn a living, and got a job as the bicycle parking intern for the city of Oakland's public works agency. I worked with the city's architect and engineer, mapping out all the storm drains. I worked for the public information officer and learned how to support public officials and plan events.

And all along, I was also working in the fledgling field of bicycle and pedestrian planning and design, as the city was undertaking its very first bicycle and pedestrian master plan. The community of professionals that was doing that work was really small, and they were outsiders—they weren't part of the mainstream traffic-engineering, transportation-planning community. I fell in love with this idea of pushing back on the status quo, of transformation and change in the way that professionals thought about transportation.

So I felt like I found my family—and the area where I might be able to make a difference: While the engineers were incredibly talented analysts, they weren't always focused on solving the same problems that I was focused on solving. They would be solving for capacity or for speed or for congestion. And they struggled sometimes to communicate their findings and their work to the public and to policymakers. I felt like those were areas where I could add some value, but I also knew that I needed to learn about the broader field of transportation planning, because when you're doing bike planning in a built-out city, it's not really about the bike—it's about understanding how to fit something into a system that's already fully utilized. So you have to learn how to do a parking study if you're going to propose parking removal. You have to understand level of service if you're going to propose lane

removals. You have to understand freight and logistics if you're going to move loading zones. And you have to understand community outreach and how to make a neighborhood's worries *your* worries, so that you can credibly come in and say, "I'm going to change something."

I was very lucky to get hired by a consulting firm that gave me the opportunity to learn a bunch of those things—especially how to treat people with integrity and respect even in tough conversations, and how to be confident in your own decision-making when the future is uncertain and when it's impossible to know in the moment whether you are making the right decision. But I eventually went back to the public sector because I missed being close to where decisions were getting made.

PANKRATZ: And that ultimately brought you to the City of Los Angeles Department of Transportation. How has the transportation landscape changed in LA recently?

REYNOLDS: In cities, the only constant is change, right? In the '30s, '40s, and '50s, people, particularly in Los Angeles, thought that to build the city of the future—and Los Angeles has always been a place of big audacious goals, dreamers, thinkers—you had to take an infrastructure-heavy approach to build the city around the automobile. So we became this city of villages.

At some point that seemed to hit the wall, and many people became incredibly disillusioned with the way our city has been built. And so over the last 15 or 20 years, Los Angeles has been engaged in trying to rebuild the old network of rail that used to connect the city, because there's an acknowledgment that if the city is going to continue to grow, we have to move more people more efficiently through corridors. I don't buy into the argument that transit exists to solve congestion. I believe transit exists to enable a thriving city to keep thriving and to keep growing.

SCOTT CORWIN, MANAGING DIRECTOR, DELOITTE CONSULTING LP: But rebuilding rail lines is really expensive and takes a long time, right?

> **"I don't buy into the argument that transit exists to solve congestion. I believe transit exists to enable a thriving city to keep thriving and to keep growing."**

REYNOLDS: It is, and it does. But it has to be part of the answer. The way that we deliver infrastructure in cities is on these cycles that take years, and it's expressed in concrete and asphalt and metal and steel. That has to keep happening. And the way that happens is that we go out and we do a study and we contemplate it. And then we analyze it. And then we do public outreach. And then we do environmental review, and then we design it, and then we put it out to bid, and then we pay somebody a lot of money to build it. And then, at some point, we operate it.

Meanwhile, as the cost comes down of riding around in a vehicle-for-hire that eventually maybe becomes connected and autonomous, we're seeing people flee the public transit system to use these other, less efficient forms of transportation.

CORWIN: But don't you take that as no different than when people started to buy cars? They were voting, and they're essentially saying the public transit system is not sufficient for their needs.

REYNOLDS: That's right, because it isn't sufficient for their needs, plainly.

"How do I avoid the real mistake of the past, which is that the public and private and nonprofit and academic sectors stayed in silos and mostly acted in their own self-interest? That's how we ended up with what we have now, which is sort of a tragedy of the commons."

CORWIN: So there's this really interesting dynamic where all this innovation is catalyzing a transformation and injecting all this funding from the private sector. On the other hand, it's a bit of a free-for-all, with each service provider optimizing its own mode and its own business. And you have to think about optimizing the city.

REYNOLDS: Right. And how do I avoid the real mistake of the past, which is that the public and private and nonprofit and academic sectors stayed in silos and mostly acted in their own self-interest? That's how we ended up with what we have now, which is sort of a tragedy of the commons. That's the thing I am most interested in solving for. And there isn't a playbook, because we haven't ever done it.

CORWIN: So how do you deal with people voting with their feet? The disruption you were talking about inevitably has winners and losers. They're very real. How do you play the orchestra conductor and get the symphony to play together with all these different pieces?

REYNOLDS: Again, for me, it starts with neighborhoods and making their worries my worries. It has to start there in order to get people to come together to have tough conversations about the future and what we're going to choose to do and not to do.

CORWIN: Is it your job to defend the status quo of the public transit system?

REYNOLDS: My job has to be to focus on the people of Los Angeles. Their economic mobility is directly connected to whether they can afford to own a car. And if that status quo continues, then the city could literally grind to a halt. So I have to figure out what suite of things is needed to fix that outcome. That includes transit—but has to also include other, very strange bedfellows.

CORWIN: There are all these potential blocks in that puzzle. How do you accommodate the fact that it's a cacophony of voices and interests as well? Can you use something like dynamic pricing as a means to begin to re-equilibrate supply and demand?

SELETA REYNOLDS

REYNOLDS: I think the underlying truth, which cuts across that cacophony of voices, is that we have to manage demand for private automobile ownership and single-occupant driving on a public utility—roads—that we have provided for decades basically free of charge. There's no other public utility we deliver in that manner. And as a result, that public utility is failing to meet these higher-level outcomes that we should be concerned with, whether that's making sure that the city is affordable to everyone, making sure that people can really access opportunities here, making sure that people can take care of their loved ones and get access to services and education. That requires a whole bunch of choices that we have to introduce into the system. But it also includes managing demand. And you'll see at different levels of government that people are starting to understand and appreciate that.

CORWIN: I want to test this. What you're saying is that we've had a system that has been so configured around the privately owned passenger automobile, with all of this indirect and direct subsidization, that it's created these negative externalities. So now we're going to start pricing for the use of the infrastructure, we're going to start pricing for the carbon impact, and we're going to start pricing for its impact on our efficient movement?

REYNOLDS: Right. We are going to have to have a wholesale rethinking of how we price everything. If I give you a bus pass for free or access to a carshare, that helps with some amount of behavior change. But if I charge you—*really* charge you—for parking, or if I provide less parking, we can get real change. Thinking about the future, that discussion starts at the curb, but it also may start in the sky when we're thinking about goods delivery going airborne—or maybe urban passenger travel going airborne 10 years from now. If we start by pricing that now, then it's always there.

CORWIN: That raises an important issue around this whole idea of a digital mobility platform and pricing. One of the resistance points is potentially the perception that it's another tax. How can you introduce these kinds of things in a way where there's really truly a win-win? We can say, "We're going to increase throughput." But how do you deal with the intangibility in the minds of the citizenry?

REYNOLDS: When you look at the case studies of where it's been successful, every single time, it

has required a political champion who is willing to spend his or her personal political currency on this issue. And the second part of it is: You can't lead with pricing, and government can't be the messenger on pricing. So figuring out who are the third-party voices is key. Lyft and Uber are out there talking about pricing—are they the right voices? Is it an academic institution? Is it a coalition of citizens? And do you have somebody who has the power to go reach out beyond those folks into the other constituencies that need to at least understand?

It is not a mystery to us anymore how to do fast, cheap, high-quality, reliable, frequent transit service. You could designate lanes for bus rapid transit in and around a particular area that came frequently so you didn't have to memorize a schedule—and do that before you built a subway line. And at the same time, you roll out something like pricing. But it's about convincing people to give up a lane of traffic for a bus.

CORWIN: More broadly, we've touched on the idea of an integrated mobility platform that can serve as a digital backbone for a city's transportation. In your mind, what should that look like?

"People have to believe that the city is capable of bringing order to chaos."

REYNOLDS: When you're talking about a mobility operating system, I believe strongly that we need a Linux version. It must be open. It must be done *by* cities and *for* cities in order for it to be broadly adopted and used. It can't be something that is curated, that is expensive, or that requires a lot of ongoing investment on behalf of cities. But I think that kind of platform is the other piece that has to exist to bring credibility to what we're talking about. Because people have to believe that the city is capable of bringing order to chaos. And the only way we're going to do that is through APIs, not RFPs. That's where we have to go to provide digital infrastructure on a cycle that takes milliseconds, not years. While we have to keep building and maintaining that concrete infrastructure, we have to get really good, really fast at that digital infrastructure. Dockless scooters are just the latest example—there are 20, 30, 40, 50 business models coming after them. And we can't keep ad-hoc solving for them as though they are stand-alone regulatory challenges. It's not going to be helpful for us if we focus on these sorts of shiny objects.

CORWIN: Regulation should go hand-in-hand with the broader system perspective.

REYNOLDS: The real disruption—and the thing we have to solve for—is that we need an entirely new chapter of municipal code that lets us behave more like an app store where we say, "Here's this new business model. It is an app-enabled mobility service, and they want to sell this thing in our app store on our hardware, which is our concrete and our asphalt." How are we going to insist upon the workflows that we need and the APIs that we need and the terms of service that we need, which include things like serving low-income communities and people that don't have smartphones? How do we make sure these things are done in a safe way? We want to express our policy on technology in a way that allows us to quickly and easily say if we need to, "Operator A, you're operating electric jetpacks or something, and we're pulling you from the app store. You can't operate here anymore." The policymakers and elected officials should be able to focus on the policy so the operating agencies can focus on the technology—and how to express the policy through that technology so that we can be constantly building that digital infrastructure.

CORWIN: Overall, then, is it time for a complete rethink to a 21st-century version of transportation governance? And does that ultimately lead to the idea of a chief mobility officer who has much greater authority and span, not only within a city proper but within a region?

REYNOLDS: When I talk about a new chapter of the municipal code, that's shorthand for how we can disrupt government regulation. We're relying upon tech companies to self-police. But the choices they make and the way they behave are influenced by a whole lot of factors. And that's understandable: They are private companies. They are not trying to protect the public good as their first, highest motivator. They're in a race. And competition makes people do weird things. So government has to figure out how to disrupt regulations, and part of that means that we probably cannot have federal rules that govern the behavior of things like autonomous vehicles everywhere. There should probably be some kind of federal certification for the vehicles themselves, maybe for the technology. But when we write rules that have to work at a national level, they fall apart in cities. How do we disrupt regulation that is peculiar to the challenges of cities that actually helps? If I'm working on Los Angeles or San Francisco or Seattle or Portland or Chicago, then I actually have the systems and the knowledge of my city that make me a better manager of those public rights of way. So I think the answer is yes, we need to have 21st-century regulatory structures, and not just in transportation. ●

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What is work?

IN THE AGE OF ARTIFICIAL INTELLIGENCE, THE ANSWER TO A MORE OPTIMISTIC FUTURE MAY LIE IN REDEFINING WORK ITSELF

by John Hagel and Maggie Wooll

ILLUSTRATION BY MICHAEL HILL

WORK, AS AN idea, is both familiar and frustratingly abstract. We go to work, we finish our work, we work at something. It's a place, an entity, tasks to be done or output to achieve. It's how we spend our time and expend our mental and physical resources. It's something to pay the bills, or something that defines us. But what, really is *work*? And from a company's perspective, what is the work that needs to be done? In an age of artificial intelligence, that's not merely a philosophical question. If we can creatively answer it, we have the potential to create incredible value. And, paradoxically, these gains could come from people, not from new technology.

Since the dawn of the industrial age, work has become ever more transactional and predictable; the execution of routine, tightly defined tasks. In virtually every large public and private sector organization, that approach holds: thousands of people, each specializing in certain tasks, limited in scope, increasingly standardized and specified, which ultimately contribute to the creation and delivery of predictable products and services to customers and other stakeholders. The problem? Technology can increasingly do that work. Actually, technology *should* do that work: Machines are more accurate, they don't get tired or bored, they don't break for sleep or weekends. If it's a choice between human

or machines to do the kind of work that requires compliance and consistency, machines should win every time.

But what if *work* itself was redefined? What if we shifted all workers' day-to-day time, effort, and attention away from standardized, transactional, tick-the-box tasks to instead focus on higher-value activities, the kind machines can't readily replicate? And to let them do it in a way that engages their human capabilities to create more and more value? More to the point, why aren't many companies recognizing the opportunity to engage employees in work that creates more value, individually and operationally, and may be future-proof? The reality is that our long-held views of what constitutes work are reinforced and amplified by institutional structures far beyond the individual. Fundamentally changing the work people do is tremendously challenging.

Why aren't many companies recognizing the opportunity to engage employees in work that creates more value, individually and operationally, and may be future-proof?

The work-industrial complex

One way to measure the output of work is by the amount of value created. The problem? Many companies are stuck on a path that makes that value hard to see. Despite being lined with colorful billboards advertising "growth" and "innovation," or declaring they're "customer-centric" or that they value the "employee experience," the traditional value creation path aims inexorably toward cost-cutting and efficiency, marked along the way by quarterly signposts. And there's constant pressure to move along that path faster, since the road is getting crowded.

Most companies do this, which is understandable given the pressures they're under. But it's not enough. If you focus on efficiency, each successive round of gains becomes harder to eke out. Even with technology—*especially* with technology—it's a game of diminishing returns, and competitors are chasing the same efficiencies, often using the same technologies. Second, while companies need to keep costs under control and find ways to increase speed and reduce waste, the way we've been chasing efficiency is less and less effective. Focusing on costs, particularly through headcount, and the speed of standardized and tightly defined processes actually makes people less efficient because these routine tasks and processes are ever less relevant for helping people deal with the growing number of "exceptions"—unexpected needs and events that fall outside of existing processes and standard offerings. Finally, focusing on costs reduces the ability to address new opportunities and risks missing the biggest, and rapidly expanding, opportunity to create more value.

In addition, conversations around the *future of work* often only intensify pressure to stick to the old path of chasing efficiency and cost reduction. A typical conversation centers on a handful of options for companies: using AI and robotics to automate routine tasks and eliminate as many workers as possible; reskilling the workforce so employees can efficiently do other routine tasks that haven't yet been automated; or augmenting the workers so they can perform more of their routine tasks faster and more accurately. A fourth common conversation considers who will do the work and where, but the discussion is often couched in terms of shifting the same routine tasks to others so labor costs can

JOB OF THE FUTURE: DIGITAL TWIN ENGINEER

Faster computing power, a proliferation of sensors, and exponential growth in the ability to connect with data across the organization and beyond are fueling the rise of digital twins—virtual representations of products created with 3D design software. Digital twin engineers create these virtual representations to test how Internet of Things-connected products operate and interact within their environment throughout their life cycle. Ranging from jet engines to shop floors or even entire factories, they make it possible to virtually see inside any physical asset that could be located anywhere, helping to optimize design, monitor performance, and predict maintenance. On any given day, the digital twin engineer is responsible for creating and testing digital twins, collecting information with the help of machine learning on how products are responding. This information can then be used to design new products and business models, making the digital twin engineer a critical bridge between an organization's product and its sales and marketing teams.

For more, read the article by Paul Wellener, Ben Dollar, and Heather Ashton Manolian, *The future of work in manufacturing,* on www.deloitte.com/insights.

be reduced. It seems while executives and thought leaders are engaged in a rich conversation about the future of work,[1] few are asking the most basic, fundamental question about what work should be.

Redefining work around human capabilities

It doesn't have to be this way. The essence of *redefining* work is shifting all workers' time, effort, and attention from executing routine, tightly defined tasks to identifying and addressing unseen problems and opportunities. While automation can be a key to freeing up the capacity of the workers to do this type of work, it's not about simply automating workers away or augmenting with technology. It's not about changing the composition of the workforce, or reskilling or leveling up people to work elsewhere. It's not about adding employee suggestion boxes, 20 percent time, or innovation/entrepreneur centers to the work. Redefining work means identifying and addressing unseen problems and opportunities in the work, for everyone at all levels, at all times, including and especially at the frontline.

For three decades, the Toyota Production System has not only demonstrated how much value-creating potential resides in frontline workers, but how the "unseen" is a key aspect of redefining work. Focusing on the unseen means imagining solutions that don't yet exist for needs that haven't yet emerged. Solving "nonroutine" problems, and seeking fresh opportunities, should be a large and expanding portion of a workload, not a small piece of a larger traditional work pie. Assuming needs and aspirations are indeed limitless, every employee could be working to create more and more meaning and value. If you get this right and find ways to unleash more value creation, you might benefit from hiring more workers rather than looking to replace people with bots.

Now, you may be thinking: *What's different about this? Our employees already identify problems and develop new products. We do rapid prototyping. We do continuous improvement.* Of course, many workers today engage in some of these activities. But their primary work—what they spend most of their time doing—likely remains routine, predictable tasks. There are many examples of companies trying to give employees space for unstructured, creative work through initiatives designed to fuel passion, spur innovation, or improve engagement.

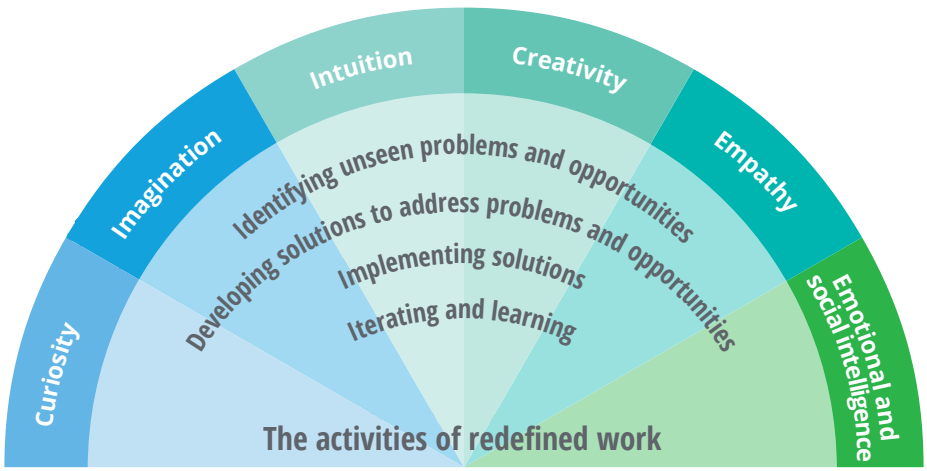
But the benefits are limited because the new work is added to the daily to-do list and often gets squeezed out by the more time-sensitive routine tasks, rather than a fundamental redefinition of the work itself.

A way for workers to effectively identify and address unseen problems and opportunities is to cultivate and use their human capabilities to do the identifying, solving, implementing, and iterating activities (see figure 1). For instance, they may employ empathy in understanding the context in which a customer uses a product and encounters problems. They may use curiosity and creativity in choosing and using tools to explore root causes and gather and analyze information. They may use imagination in drawing analogies from other domains, intuiting interactions and relationships, and seeing potential solutions that had remained obscured. They may improvise around a process, tweaking their behavior and interactions with tools to see if they can do it faster or with better results for the current conditions. Being able to address problems and opportunities in a flexible way is key. Without bringing these human capabilities to bear on the work of problem-solving and solution development, the work may change but companies won't realize the potential of this opportunity to refocus their most valuable resources.

Another key attribute of this vision of work: It will continually evolve. Problem identification and solution approaches are often used with the intent to fix a process, correct a deviation, or remove an inefficiency, with the goal of feeding back into more structured, tightly defined work, where loosening the structure is only a temporary means to move the process forward. But the future of work shouldn't simply engage employees in a one-off re-envisioning of their work and work processes and practices, moving the organization and workers from a *before* state to an *after*, at which point they return to routine execution mode. Instead, the creative, imaginative identification and solution of unseen problems/opportunities *will be their primary work*. That means sustained creative opportunity identification, problem-solving, solution development, and implementation—work focused on continuously creating more value to internal and external customers, suppliers, partners, and others.

FIGURE 1

How redefining work draws on human capabilities



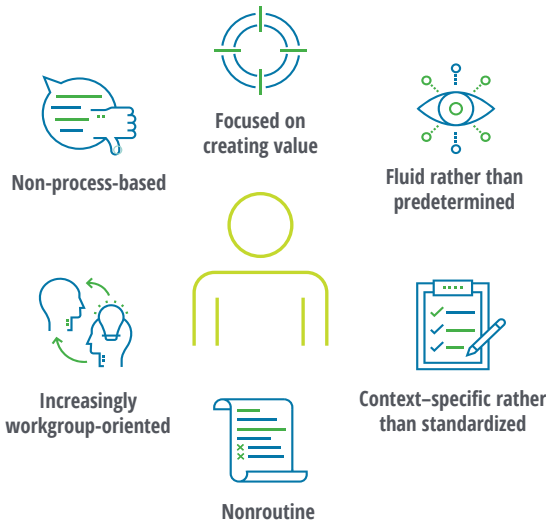
The (human) work of the future

The opportunity to redefine work isn't about skills; in our view, skills are too narrow.[2] Reskilling people to do a different type of routine task or to use a new technology to complete the same tasks doesn't fundamentally change the problem for workers or capture the potential for companies. The same can be said of moving people into an adjacent part of the organization that hasn't yet become subject to automation or moving a few standout workers into management or product design positions. Only redefining work itself has the potential to expand value for companies, customers, and workers. It requires cultivating and drawing on intrinsic human capabilities to undertake work for fundamentally different purposes (see figure 2).

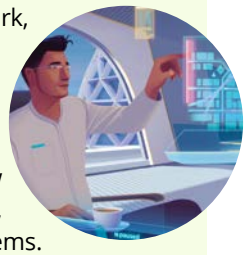
We all have these human capabilities. Unfortunately, many of our institutions generally limit our ability to exercise them so, like muscles, they atrophy with lack of use. Then again, why would workers exercise these muscles? What would motivate them to make the extra effort and potentially take on extra risk when they have been expected, even rewarded, for letting them atrophy in the past? A leader can provide context and latitude, but if workers aren't motivated, they likely won't act effectively. This is where passion comes in.[3] Workers who are passionate, who have what we call the *passion of the explorer*, are driven to take on difficult challenges and connect with others because they want to learn faster how to have more of an impact on a particular type of issue or domain. This

FIGURE 2

A new vision of (human) work



JOB OF THE FUTURE: MOBILITY PLATFORM MANAGER

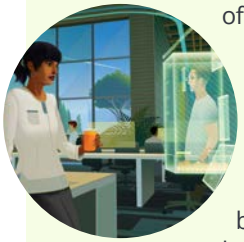


Mobility platform managers (MPMs) oversee a city's integrated transportation network, ensuring the seamless movement of people, vehicles, and goods. During daily traffic, they visualize data, monitoring demand and supply across various modes of transport, using an AI-powered system to optimize routes and pricing, intervening when human judgment is required. To prepare for disasters, they use predictive models to help plan how to allocate resources and adapt quickly to the ebb and flow of traffic. In addition to traffic efficiency and minimizing damage to the environment, MPMs are responsible for public safety, accessibility, and equity within mobility systems. They coordinate with stakeholders in the public and private sectors to conduct scenario analyses and assess the feasibility of proposals, and stay up to date on advances in their field through integrated microlearning tools and attending peer meetups and conferences.

For more, read the article by William D. Eggers, Amrita Datar, and Jenn Gustetic, *Government jobs of the future*, on www.deloitte.com/insights.

JOB OF THE FUTURE: CRIMINAL REDIRECTION OFFICER

Criminal redirection officers (CROs) help reduce prison populations by refocusing criminal justice on reformation and rehabilitation. Using enabling technologies and their knowledge of human behavior to achieve superior outcomes, CROs work with low-risk and nonviolent offenders who are allowed to live at home and go to work instead of being housed in prisons. A suite of digital tools helps CROs monitor each offender's physical location, proximity to other offenders, and drug or alcohol use, as well as ties to community, family, and employment to ensure compliance with program requirements. In addition to monitoring time served, CROs equip offenders with the necessary skills, resources, and behaviors to successfully rejoin society and prevent recidivism, and use historical and real-time data through AI and analytics-based tools to inform action plans. CROs have regular virtual check-ins with their charges and other stakeholders, using gamification to encourage prosocial behavior and help offenders achieve goals.



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type of passion is unfortunately rare in the workplace (less than 14 percent of US workers have it), in large part because the tightly structured processes and command-and-control environment of most large companies discourage it, often explicitly.

Part of redefining work is defining it in such a way that it cultivates *questing* and *connecting* dispositions and helps individuals discover and pursue the domains where they want to make a difference. Organizations that can cultivate and unlock that passion will tap into the intrinsic motivation of their workforce. Employees who are intrinsically motivated to take on challenges, to learn, to connect with others to make more of an impact that matters—those are employees who will act like owners. And while acting like owners and focusing on value creation may also imply changes to compensation and reward systems, no extrinsic reward or perk can compete with the power of connecting with people's intrinsic motivation when the goal is to have individual workers acting with latitude to the company's benefit.

Fortunately, work that demands creativity and improvisation and rewards curiosity will likely be more stimulating and motivating than following a process manual. By creating an environment that draws out worker passion, employees will be more likely to begin exercising and developing their human capabilities as a means of having more impact on the challenges that matter to them.

Redefining work is a goal, not a process—the intent is not to create another rigid process or management theology in your organization.

Getting started

Redefining work at a fundamental level across an entire company is no small feat. If we take the opportunity, it changes everything and everything must change. It implies a major organizational transformation.

As companies begin to identify the need to redefine *what* work is, they will find they also need to redefine how they think about *where* work is done, *how* it gets done, *when* it is done, and *who* will

actually go about doing it. Companies will need to consider how to cultivate the capabilities of curiosity, imagination, creativity, intuition, empathy, and social intelligence. Management systems, work environments, operations, leadership and management capabilities, performance management and compensation systems, and other human capital practices will all need to change to support redefining work across the organization. It's worth repeating that redefining work is a goal, not a process—the intent is not to create another rigid process or management theology in your organization. Instead, seek to minimize the number of routine tasks that workers must perform, and maximize the potential for fluid problem-solving and addressing opportunities to create value for customers and participants at all levels of the organization.

Fundamentally redefining work is more than a nice-to-have—it's imperative to remaining competitive. Moreover, it's an opportunity to shift the future of work conversation from one based on fear and adversity (institutions versus individuals) to one centered around hope and opportunity (in which both institutions and individual workers win). As organizations capture more and more value through a workforce that continually identifies and addresses unseen problems and opportunities, individuals will likely benefit from having greater meaning and engagement in their day-to-day work, igniting more worker passion over time. What are you waiting for? Work is ready, today, for your organization to redefine it.

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Superminds: How humans and machines can work together

MIT PROFESSOR THOMAS MALONE ON HUMAN-COMPUTER COLLECTIVE INTELLIGENCE AND THE FUTURE OF WORK

by Jim Guszcza and Jeff Schwartz

PHOTOGRAPHY BY BEN GEBO

We naturally think of "intelligence" as a trait belonging to individuals. We're all—students, employees, soldiers, artists, athletes—regularly evaluated in terms of personal accomplishment, with "lone hero" narratives prevailing in accounts of scientific discovery, politics, and business. Similarly, artificial intelligence is typically defined as a quest to build individual machines that possess different forms of intelligence, even the kind of general intelligence measured in humans for more than a century.

Yet focusing on individual intelligence, whether human or machine, can distract us from the true nature of accomplishment. As **Thomas Malone**, professor at MIT's Sloan School of Management and director of its Center for Collective Intelligence notes: "Almost everything we humans have ever done has been done not by lone individuals, but by groups of people working together, often across time and space."

Malone, the author of 2004's *The Future of Work* and a pioneering researcher in the field of collective intelligence, is in a singular position to understand the potential of AI technologies to transform workers, workplaces, and societies. In this conversation with Deloitte's **Jim Guszcza** and **Jeff Schwartz**, he discusses a vision outlined in his recent book *Superminds*—a framework for achieving new forms of human-machine collective intelligence and its implications for the future of work.

Superminds and collective intelligence

JIM GUSZCZA, US CHIEF DATA SCIENTIST, DELOITTE CONSULTING LLP: Let's start by defining our terms. Can you tell us what a "supermind" is, and how you define collective intelligence?

THOMAS MALONE, DIRECTOR, MIT CENTER FOR COLLECTIVE INTELLIGENCE: A "supermind" is a group of individuals acting collectively in ways that seem intelligent, and collective intelligence essentially has the same definition. For many years, I defined collective intelligence as groups of individuals acting collectively in ways that seem intelligent. But I think it's probably more useful to think of collective intelligence as the *property* that a supermind has.

GUSZCZA: So collective intelligence is a kind of emergent property of a group of individuals?

MALONE: Yes, and it doesn't always have to be a group of people. Collective intelligence is something that can emerge from a group that includes people and computers. Or it could be a group of only computers, or of bees or ants or even bacteria. Collective intelligence is a very general property, and superminds can arise in many kinds of systems, although the systems I've mostly talked about are those that involve people and computers.

JEFF SCHWARTZ, PRINCIPAL AND US LEADER, FUTURE OF WORK, DELOITTE CONSULTING LLP: Even before talking about collective intelligence, you make an important distinction between two kinds of intelligence, right?

MALONE: Yes. In a very broad sense, you could say intelligence is the ability to achieve goals. There are other ways of defining intelligence, but that one is useful for our purposes. And this suggests two more specific kinds of intelligence. The first is *specialized intelligence*: the ability to achieve specific goals in specific situations. The other is *general intelligence*: the ability to achieve a wide range of goals in a wide range of situations.

GUSZCZA: And if I understand correctly, that distinction is important to understanding the capabilities of today's AI systems.

MALONE: Yes. Something many people don't realize is that even the most advanced AI programs today have only specialized intelligence. For instance, the IBM Watson program that beat the best human players on *Jeopardy!* couldn't even play tic-tac-toe, much less chess. It was very specialized for the task of playing that specific game. And, similarly, a self-driving car that may be great at staying on the road in the middle of traffic can't begin to take objects off a shelf in a warehouse and put them in a box. Each of these programs has only specialized intelligence. In contrast, even a five-year-old child has more general intelligence than the most advanced computer programs today. A child can carry on a much more sensible conversation about a much wider range of topics than any computer program today, and operate more effectively in an unpredictable physical environment.

GUSZCZA: A fundamental insight from artificial intelligence research in the past 60 years is while computers are often good at things that are hard for humans, many things that come naturally even to young children are very difficult for computers.

MALONE: To a first approximation, that's right. We have often fallen into an assumption that intelligence is one-dimensional: You can have more or less intelligence, but there's only one dimension to it. We will increasingly come to understand there are many dimensions of intelligence, and many different kinds of intelligence possible through different combinations of those dimensions. So it's much more complicated than just "more or less." It's a whole space. There may, for example, be as many different kinds of intelligence as there are species of living things on our planet.

Now, it's certainly the case that for some kinds of intelligence—doing arithmetic, for instance—computers are way better than people. And over the past decade, computers have become much better than people at certain kinds of pattern recognition made possible by machine learning. But that doesn't mean computers are smarter than people at everything, by any means. It just means that, for this particular kind of thinking, if you want to call it that, computers are way better than people. But there are plenty of other things that people are better at than computers.

Measuring group intelligence

SCHWARTZ: Early in your book *Superminds*, you discuss the characteristics of intelligent groups. Can you say a bit about this?

MALONE: We were essentially trying to develop an IQ test for groups. IQ tests measure the general—not specialized—intelligence of *individuals*, and they've been around for about a century. It turns out to be an empirical fact that people who perform well at a certain task, such as reading, also on average perform well at other things, such as math or three-dimensional figure rotations. In other words, someone's ability to do one mental task is correlated with their ability to do very many others. This is the broad general intelligence of *individuals* that traditional intelligence tests measure.

But, as far as we could tell, nobody had tried to create a test of the general intelligence of *groups*. We wanted to see whether there was a similar kind of general intelligence for groups, and we found that yes, in fact, there is. It appears there is for groups—just as for individuals—a single statistical factor that predicts how well a group will do on a wide range of very different tasks. We call this factor *collective intelligence*—it's a way of measuring what you might call *general* collective intelligence. We thought it was pretty interesting to show that such a factor exists and that it's possible to measure it.

What many people found even more interesting was what we found to be correlated with group intelligence. At first, we worried that the intelligence of individual group members would be pretty much the only thing that determined how smart the group was. But we found the correlation between the group's collective intelligence and the individual intelligence of the group *members* was only moderate. In other words, just having a bunch of smart people isn't enough to make a smart group. Instead, we found three other characteristics that were significantly correlated with the group's collective intelligence.

The first was the degree to which the people in the group had what you might call social intelligence or social perceptiveness. We measured this by showing people pictures of other people's eyes, and asking them to guess what emotion the person in the picture was feeling. It turns out that when a group has a bunch of people who are good at this, the group is, on average, more collectively intelligent than when it doesn't. The second factor was how evenly people participated in the group's conversations. If you have one or two people in a group who dominate the conversation, then, on average, the group is less collectively intelligent than when people participate more evenly. And, finally, we found the group's collective intelligence was correlated with the proportion of women in the group. Having more women was correlated with more intelligent groups. It's important to understand, though, that the factor about female membership was mostly explained statistically by the factor about social intelligence. So one possible interpretation is that what you need for a group to be collectively intelligent is to have a number of people in the group who are high on that measure of social intelligence.

We don't think this is the final word; we believe there are many other factors affecting what makes a group smart. But this is at least an intriguing set of suggestions about the kinds of things that can help make groups smart.

GUSZCZA: It often seems organizations reward individual performance, but hope for good teamwork. Is there enough of a movement toward actually trying to cultivate practices and standards around forming smart teams in large organizations?

MALONE: There is a great deal of work that could be done here. As you say, most evaluations in organizations still rest on individuals, yet the organizations' results depend almost entirely on teams. We could certainly do much more evaluation of teams and, perhaps even more importantly, we could do much more systematic analysis of what helps make teams work better. One of the things we are now increasingly in a position to do is to capture vastly more data about who's on a team, who does what work, and how well the team's work turned out. So there's a lot of really interesting work that can be done to build more evidence-based results about—and guidelines for—how to create effective teams.

Humans in the loop, computers in the group

GUSZCZA: The discussion of collective intelligence leads us back to a major theme of your book: that it's more useful to think of AI in terms of humans and computers complementing one another within the context of smart groups, rather than viewing it as a zero-sum game in which humans just fill in for what computers can't yet do.

MALONE: We have spent way too much time thinking about people *versus* computers, and not nearly enough time thinking about people *and* computers. Way too much time thinking about what jobs computers are going to take away from people, and not nearly enough time thinking about what people and computers can do together that could never be done before. As we develop a deeper understanding of the space of possible kinds of intelligences, we'll be able to talk more precisely about that.

SCHWARTZ: How should we be thinking about and exploring the different ways that people and machines will work together in the future?

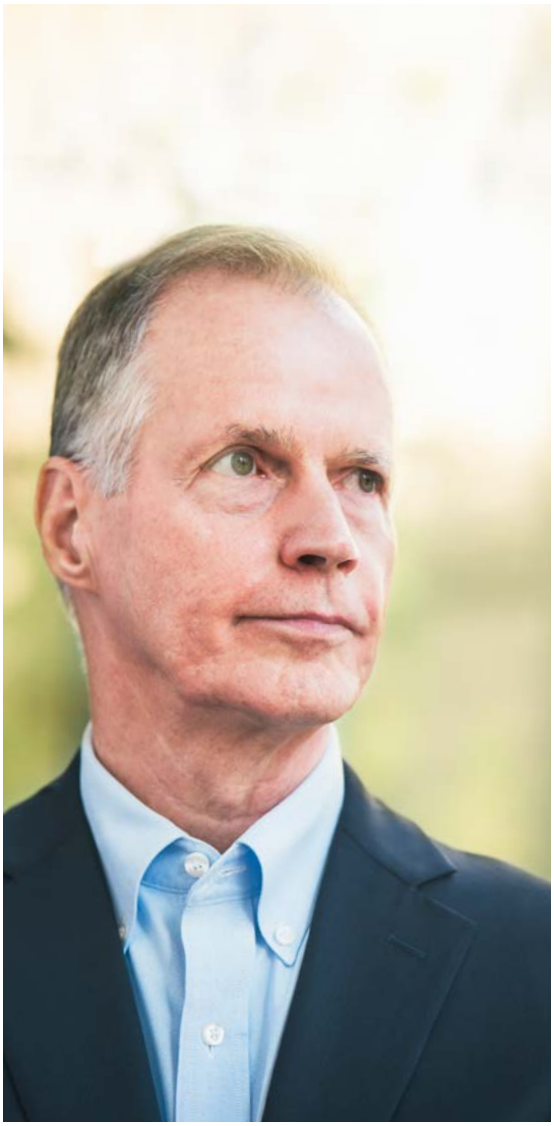
"We have spent way too much time thinking about people *versus* computers, and not nearly enough time thinking about people *and* computers."

MALONE: One thing people often talk about when discussing people and computers is to say that we need to have "humans in the loop." That usually means that computers are going to be doing almost everything, but we'd better have some people around in case something goes wrong. But I think it's much more useful to start with the ways humans have accomplished almost everything we've ever accomplished in our history: in groups. These groups of humans are examples of what I call superminds. They can be companies, or armies, or families, or many other kinds of things. Almost everything we humans have ever done has been done not by lone individuals, but by groups of people working together, often across time and space. This includes everything from inventing language to making the turkey sandwiches I usually have for lunch.

So rather than start with the "human-in-the-loop" concept of "one person, one computer," let's start with the human groups we've used to accomplish almost everything and add computers into those groups. When we do that, computers can use their specialized intelligence to do the things they do better than people, and people can use their general

intelligence to do the things computers can't do very well yet.

Even more importantly, we can also use computers to create what I call *hyperconnectivity*: connecting people at a scale and in rich new ways that were never possible before. If you think about it, almost everything we use computers for today is really some form of this. Most people use computers primarily for email or looking at the Web or word processing or social media or various things like that, none of which really involve much artificial intelligence or even much computation in the sense of arithmetic or logical reasoning. These uses of computers today are really almost entirely about connecting people to other people. And I don't think that's going to change anytime soon.



In fact, I think we often overestimate the potential of artificial intelligence, perhaps because it's so easy for us to imagine computers as intelligent as people. But unfortunately, it's much harder to create such machines than to imagine them. On the other hand, I think we often underestimate the potential of hyperconnectivity, perhaps because in a certain sense it's easier to create hyperconnected systems than to imagine them. We've already created the most massively hyperconnected groups the world has ever known, with billions of people connected to the internet. But it's hard for us to imagine what they can do already, much less what they will be able to do in the future.

A phrase I like to use to summarize all this is that we need to move from thinking about "humans in the loop" to "computers in the group."

Four types of human-computer collaboration

SCHWARTZ: You discuss multiple ways that computers can be "in the group," as tools, assistants, peers, managers, and so on. Could you give a few examples of that?

MALONE: We already know a lot about the different roles people can have relative to each other in groups. So that gives us at least some language for thinking about the roles computers can have as well. The most obvious one, and the one people talk about the most, is computers playing the role of *tools*. For example, when you're using a computer as a word processor or a spreadsheet, the computer is doing exactly what you tell it to do, and is more or less subject to your constant attention. As with

other kinds of tools, the computer doesn't do much unless you're there telling it exactly what to do.

The next level up is what you might call an *assistant*. We certainly use people as assistants for other people. And computers are increasingly taking on that role. Unlike a tool, the assistant often has more autonomy, takes more initiative in helping achieve your goals, and may know things you don't know to help you achieve your goals more effectively.

GUSZCZA: Here at Deloitte, many of us have been doing data science and predictive analytics for about 20 years. One of our applications has been building predictive algorithms to help insurance underwriters better select and price risks, or claims adjusters better handle insurance claims. For the simplest cases the computer just completes the task. For intermediate cases, the human might need to disambiguate some inputs. The human then spends more time on the complex cases that require context and common sense and judgment. Would this be an example of an assistant?

MALONE: That's a great example of an assistant. The computer can actually do some of the tasks cheaper, faster, and often better than the person, just as an electric saw can cut things faster than a person can. But, unlike the electric saw, the underwriting assistant can also take more initiative when handling straightforward cases. You could even say that things like the autocorrect function in text messaging is an example of an assistant that can take a little more initiative—often with amusingly off-the-mark results!

The next level up is what you might call a *peer*. We'll increasingly see examples of computers acting as peers for people in many kinds of situations. One of my favorite examples is from a research project I did several years ago with Yiftach Nagar. We trained machine learning predictive algorithms to predict the next plays in American football games, and then let the computers participate in prediction markets along with humans.

SCHWARTZ: And what about machines as managers?

MALONE: That's the last kind of possibility in this spectrum. People can get freaked out about this, but if you think about it, we already have machines as managers in many situations that seem very normal. In the old days, police officers directed traffic at busy intersections. Today, stoplights do this, and we think nothing of it. It seems completely natural and normal, as I think it should. It's quite likely we'll see more and more examples of machines doing things like using algorithms to figure out the sequence of tasks that need to be done, predicting which person is best suited to do each task, and automatically routing the task to that person.

Another thing managers often do is evaluate the work of the people who report to them. In some cases, computers can easily evaluate people's work. An example from the realm of science is a system called Foldit. Foldit helps scientists discover new ways of folding protein molecules in three dimensions to have certain medicinal or other properties. It turns out people are better than computers at figuring out new three-dimensional ways of folding molecules, but computers are much better than people at *evaluating* the potential energy that's relevant here. The Foldit system has helped make significant progress in developing ways of treating AIDS, for instance, by using this combination of people to generate possibilities and computers to evaluate those possibilities. This is another example of a computer acting as a kind of manager, in this case evaluating the work of the people. Once again, nobody thinks there is anything particularly strange about this, and I believe we'll see lots of such examples.

Humanizing work

SCHWARTZ: We've discussed what machines can do well, and also what groups and superminds can do well. As you think about the types of capabilities

"I don't think there is a fixed definition of what it means to be human or to humanize. That's a malleable thing that changes as the animals, machines, and other things around us in the world change."

and skills we humans need to develop and double down on in the coming decades, what will the *human* dimension of work look like? This is a big discussion on what it means to humanize work, and what skills and capabilities are required.

MALONE: Our concept of what it means to be human is affected by what else is in the world around us. A few hundred years ago, only humans could do arithmetic. So, it was in a certain sense "humanizing" to do arithmetic. But now that machines can do arithmetic way better than we can, we don't think of arithmetic calculation as a human-like activity anymore. And, more generally, as computers do more of the things that used to be doable only by people, we'll come to think of those things as not part of what it means to be human. The point is I don't think there is a fixed definition of what it means to be human or to humanize. That's a malleable thing that changes as the animals, machines, and other things around us in the world change.

With respect to computers in particular, I get a little frustrated with people who say things like, "Well, computers will never be really creative" or "They'll never be able to have deep interpersonal skills." Yes, they will be able to do some of those things more and more over time. It's very difficult to draw a hard-and-fast line around things computers will *never* be able to do.

But, as a practical guide, there are some things people are likely to be able to do better than computers for the foreseeable future. One is using general intelligence, which we've already discussed. A second is interpersonal skills, which we spoke of as being especially important for the collective intelligence of human groups. Even though computers can do some kinds of interpersonal things already and will do more of them over time, it's going to be quite a while before computers have the kind of broad interpersonal skills that people do. One thing that we'll end up paying people more for is their interpersonal abilities.

In medicine, for instance, increasingly there will be algorithms able to process all kinds of lab test results and millions of case examples in their knowledge base and do a pretty good job of diagnosing human illnesses. They will probably be able to do this better than most human physicians could even when the human is sitting in the room with the patient. But there's still going to be a need for humans in the room with the patient. People will be needed to gather the information for online diagnoses and to help provide some of the needed treatments. Perhaps most importantly, people will be needed to provide the kind of human contact and sympathy that's an important part of the healing process. In this and many other kinds of work, people's interpersonal skills will probably become even more important than we expect today.

A third dimension where it will probably be some time before computers come close to humans is certain kinds of physical skills, such as operating effectively in complicated and unpredictable physical environments. There are already robots that work just fine on assembly lines where everything is very cut and dried and very routine. But think about the physical skills needed, for example, to be a plumber. You've got to figure out how to open a particular kind of a cabinet under a sink and know how to move the different shapes of bottles and cans and whatever other stuff is under there, and you've got to figure out how to maneuver around weirdly shaped pipes and maybe cut part of a wall open to get at something in a weird old-fashioned building. All kinds of complicated and unpredictable physical skills are needed that machines aren't likely to have anytime soon.

Those are three examples of where there will be continuing needs for humans for the foreseeable future: general intelligence, social intelligence, and physical intelligence. I believe people's jobs will increasingly be humanized in the sense that they'll include more of those things that humans do better than machines.

But suppose there comes a day when computers and physical robots can do *everything* that people can do, better and cheaper. That's probably at least many decades away. But even if that day comes, I think there will still be some things that we'll want people to do, such as keeping us company. Even today, why do we go to see live actors perform a play when we can actually see a higher-quality performance on our TV anytime we want? Why do we go to a football game and watch humans try to move a ball down a field with a combination of other humans? I'm pretty sure it would be easy to make a machine that could do that better than people can, but I don't think it would be as entertaining to watch machines play football against other machines as it is to watch humans play football against other humans. I think there will always be a desire for humans to do some things simply because they're humans.

Implications for organizations

SCHWARTZ: What are some implications for public institutions and business leaders as they try to operationalize this?

MALONE: Superminds are the entities that accomplish almost everything in our world. Every company in the world is a supermind. Every democratic government is a supermind. Every army, neighborhood, scientific community, club. Every market where you buy and sell things is a supermind. Superminds have been around at least as long as people have, and when you learn to recognize them, you realize they run our world. Almost everything we've done has been done by superminds.

In the book, I discuss five different types of decision-making superminds: *hierarchies*, *markets*, *democracies*, *communities*, and what I call *ecosystems*. Thinking about which kinds of superminds are relevant for different kinds of situations is potentially a very powerful way of thinking about many of our societal problems.

We can understand many of the things that happen in society as resulting from the interplay of different types of superminds: Laws are enforced by hierarchical governments, which are chosen by democratic election processes that in some sense reflect the values of broader communities. Understanding this interplay between communities, democracies, and hierarchical governments provides a way of thinking more systematically about what should be done by which kinds of superminds.

For instance, if we want to deal with the problem of fake news, we could try to let *markets* do it on their own (which hasn't worked very well so far), we could let government *hierarchies* regulate it, or we could rely on *community*-based reputations by, for example, letting broadly respected organizations use online systems to rate the credibility of different news sources.

"Superminds have been around at least as long as people have, and when you learn to recognize them, you realize they run our world."

SCHWARTZ: And can you ask a similar set of questions at the level of companies?

MALONE: Yes. For example, most decisions in companies today are made by the corporate hierarchy, but which decisions might be better made by some kind of democracy? Are there decisions currently being made by managers that could be better made by combining the votes of people who really know the situation? Are there decisions, such as how much of which products to make, that could be made better by some kind of internal market rather than by a managerial hierarchy? And, whether we realize it or not, many decisions in a company are made by communities—a kind of informal consensus involving community norms. People often call that the "culture" of an organization, but I think "community" is another good word for that. Once again, this way of looking at the world gives us a systematic framework for thinking about how best to design and combine these different kinds of superminds.

Perhaps the simplest and most broadly applicable implication is just the very idea that each company is a supermind. Realizing this gets us thinking about a) how we're kind of "in this together", and b) how could we make our superminds smarter. Traditionally, we've spent a lot of time thinking about how to make companies more productive. But the measures of productivity were mostly developed as a way of capturing the things important in a manufacturing economy. As we increasingly move into what you might call a knowledge-based economy, productivity in some sense still measures things that are important. But many other things that are becoming more important are probably more usefully thought of as *intelligence*, not *productivity*. So how could we create more intelligent companies, more intelligent organizations? The idea of superminds is a pretty natural way of understanding our companies, the markets that interrelate them, and so on. It's useful for managers

to think in terms of us being part of a supermind, and how we can make our superminds smarter.

SCHWARTZ: To zoom out still further, what are the implications of superminds for the future of work?

MALONE: For individuals, there are at least two kinds of implications. The first is, if you want to accomplish almost anything in the world and if you're realistic about it, you need to be thinking about how to work with superminds to achieve whatever you want. In some sense we already know that, but this gives us a more systematic framework for thinking about it.

The other, perhaps even more personal, view is that we as individuals are all part of many powerful superminds. And all of these superminds are part of one giant global supermind. So not only our fate as individuals, but our fate as humanity really depends on the choices our global supermind makes. We should be hoping we can influence our global supermind to make choices that are not just *smart* but also *wise*. To do that, we should be thinking about what values are most important to us—what values we think are most wise—and how can we help support and shape our superminds to achieve those values.

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Why humans and computers think better together

Some have voiced fears that artificial intelligence could replace humans altogether. But that isn't likely. A more valuable approach may be to view machine and human intelligence as complementary, with each bringing its own strengths to the table.

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Are you having fun yet?

LEADING COMPANIES ARE DISCOVERING THERE'S A DISTINCT COMPETITIVE ADVANTAGE IN MERGING WORK WITH PLAY

by Tiffany McDowell, Sheba Ehteshami, and Kyle Sandell

ILLUSTRATION BY DONGYUN LEE

HISTORICALLY WORK WAS, well, *work*. It was about meticulously measured and critiqued efficiency, with breaks or lighthearted moments with colleagues considered taboo. We softened a bit during the 1960s and 1970s, socializing during breaks to smoke or drink, but even these interactions had a stiff formality that hardly promoted letting loose or having fun.[1] It is only in the past couple of decades that business leaders have realized what we now know to be true: that humans are inherently social and playful, and introducing these characteristics into the workplace won't actually hurt the bottom line. Even so, until more recently, a positive, social work environment was merely something "nice to have" rather than essential, because companies figured the real reason employees stayed was for stability, or pay, or prestige.

Enter the latest societal disruption. In a world where technology is exponentially changing personal and business capabilities, job-seekers often have bargaining power and are intentionally looking for employers to fulfill needs beyond material rewards. Many want the ability to work remotely or with schedule flexibility, and the desire for career stability as the end-all, be-all has shifted to a practice of changing jobs frequently to upgrade from a stale environment or to gain new and useful skills. Similarly, the thrill of working for a company with an engaging environment often usurps the traditional appeal of long-standing and reputable organizations. These seismic shifts in how work is viewed lead us to the concept of fun, something that impacts the modern-day environment. Workplace fun is becoming a form of competitive advantage. But what exactly is it?

This is about much more than one-off events or gimmicks—it's about truly embedding a climate of fun. Building meaningful work in a nurturing environment, filled with growth opportunities underpinned by supportive management and trusted leadership, is increasingly a must-have for organizations that want to thrive. Many companies have already started down this road and some are already the kind of employers that workers flock to, and rivals envy. But there are numerous strategies that can still be deployed by companies to positively change the nature of how people work and, in turn, how much they enjoy what's inevitably a large part of their lives.

From then to now: What's changed?

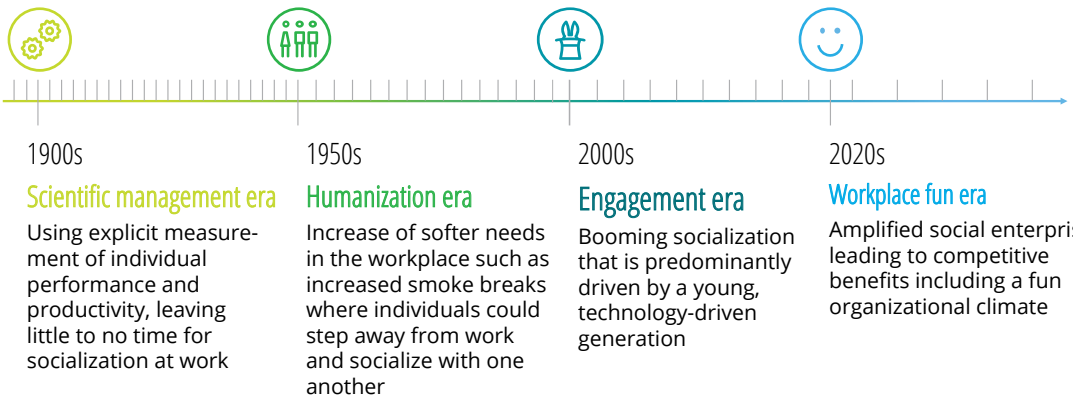
There are three shifts that have created a business opportunity for creating a climate for fun at work.

SHIFTS IN THE PSYCHOLOGICAL CONTRACT

Understanding how the workplace experience has changed requires understanding the fundamental relationship between employees and employers, which academics call a *psychological contract*.[2] In decades past, many employees were satisfied working for a "winner"—an organization that was performing well financially and in a position to provide them with the stability they desired (see figure 1 for descriptions of how workplaces have—and are—evolving). Today, an increasing number of workers believe business success should be measured by more than just financial performance. So what are they looking for? A fun and engaging experience that drives home the message

FIGURE 1

How workplaces have evolved



that their employer cares for its people, not merely the bottom line. We see this shift to a more socially aware and socially connected workplace increasingly being woven into traditional processes related to employee attraction, selection, and retention.

SHIFTS IN WORKFORCE DEMOGRAPHICS

Many of the changes to workplace expectations among employees can be attributed to major shifts in workforce demographics. In 2016, people under the age of 40 became the largest generation at work, comprising 35 percent of the United States labor force.[3] Much has been written about the differing needs and expectations millennials have with their employers, but perhaps the most telling piece of information is this: for the first time in many years, young people believe that they will be financially worse off than their parents. This has led to many actively questioning the core premises of corporate behavior and the economic and social principles that guide it. For example, in mature markets, 64 percent of millennials believe they will be less well off financially than their parents and 69 percent say they will be less happy.[4] How can businesses fill this growing void? In parallel with providing a corporate mission that inspires and instills pride among employees, they can foster engagement, social opportunities, and fun. We know from research on creating fun climates that social meaning is a fundamental driver of experiencing fun at work.[5]

85 percent of C-suite executives rated collaboration as important or very important, yet 73 percent of employees said their leaders rarely, if ever, worked together on projects or strategic initiatives.

SHIFTS IN WORK ITSELF

With new technologies and the need to solve increasingly complex, messy business problems, it has become important for individuals to reach across organizational boundaries—IT problems no longer remain solely in the IT department. Individuals and especially leaders must foster a deeper understanding of how various departments interact and impact one another, cultivating a systems-minded approach. In fact, 85 percent of C-suite executives rate collaboration as important or very important, yet 73 percent of employees say their leaders rarely, if ever, work together on projects or strategic initiatives.[6] This begs the question: how can senior leaders expect their people to

collaborate effectively if they are not doing it themselves? Research shows a key driver of collaborative environments is fostering a fun work climate.[7]

How fun attracts, develops, and retains talent

Though employee expectations, demographics, and work itself have changed during the past 30 years, talent management has often been stubbornly fixed. In the new, open environment of collaboration and growth, the "old rules" of talent management—with employee opportunities bound by considerable organizational constraints—can stifle talent, organizational growth, and productivity. Companies that embrace the new rules shift (detailed in figure 2) can deliver an experience that is differentiated from their competitors and enhances their ability to attract, retain, and develop talent. One common element is a focus on creating and cultivating a climate of fun—one in which establishing and strengthening social connections by providing a variety of differentiating experiences becomes an organizational priority.

But what do we mean by "workplace fun"? Frameworks and definitions abound but, generally, a fun work environment "intentionally encourages, initiates, and supports a variety of enjoyable and pleasurable activities that positively impact the attitude and productivity of individuals and groups."[8] We like this definition for several reasons. First, it's defining an environment of fun at work, rather than specific activities. The employee experience is a collection of events creating a culture, not one-offs that feel more like checking a box. It also mentions intentionality. Workplace fun can exist organically through, for example, a leader who values having fun at work. We have found that companies that

FIGURE 2

Key shifts in work

Old rules	New rules
Financial stability and **company prestige** are key factors in attracting and retaining talent	Candidates and employees look for a **climate of social connectedness** and engaging, fun experiences when weighing work options
Employees **expect to have the resources necessary** to serve their customers (e.g., tools, resources, and direction)	Employees expect to be **treated as customers**, with bright spots embedded within key moments of their career (e.g., onboarding, changing roles, retiring)
Companies have **separate HR leaders** across recruiting, learning, rewards, engagement, and other HR services	Companies have **someone responsible for the complete employee experience**, focused on employee journeys, experiences, engagement, and culture
A **relatively homogenous workforce** allows for simple and repeatable social events for bringing employees together	A **diverse workforce** with differing values and expectations brings the challenge of offering multiple forms of social connectedness
Departments and functions are **largely siloed**, with rare need to collaborate with one another	Leaders and employees must **reach across the organization** to diverse teams when solving complicated problems

embrace fun as an intentional cultural value tend to have more success because it's known as a widespread organizational aspiration. Finally, this definition mentions the benefits of workplace fun upfront and recognizes fun can impact both attitudes *and* behaviors. It's this combination that can differentiate workplace fun.

One example is US online retailer Zappos, whose 10 core values include fun ("create fun and a little weirdness") and positivity ("build a positive team and family spirit").[9] Zappos also delivers advice on how to live such values during a three-day culture boot camp, which culminates in a conversation with CEO Tony Hsieh.[10]

After embedding fun and positivity into the foundation of an organization, there are, of course, events and activities that successful companies use to engage employees. We've found workplace fun is used by some organizations to attract, develop, and retain talent (see figure 3) by cultivating cultures people want to join, and are reluctant to leave—a critical competitive advantage.

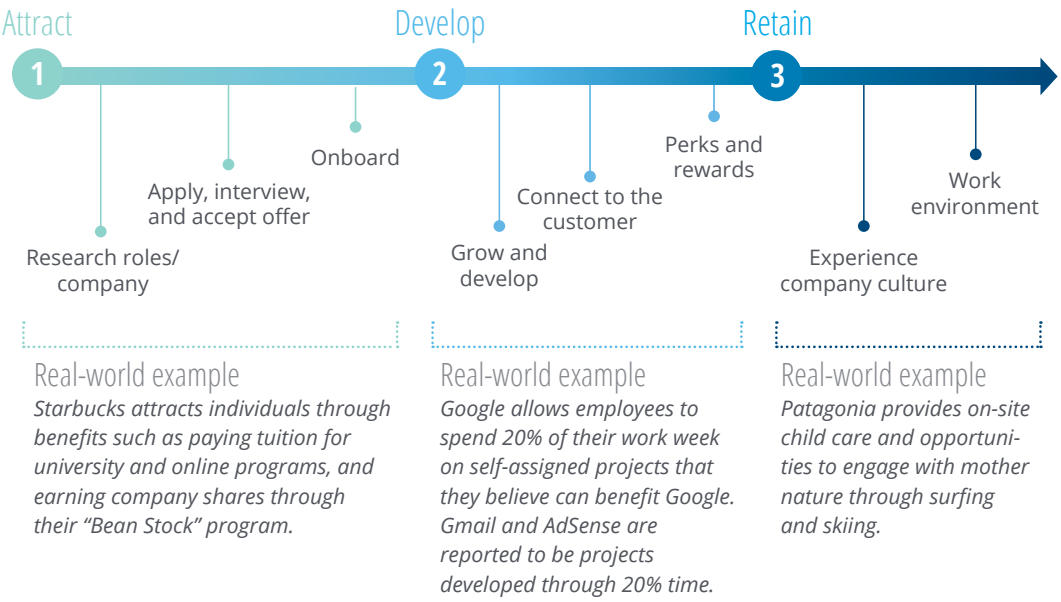
ATTRACTING TALENT

In an era of low unemployment, high employee expectations, and myriad job websites, it's harder than ever to attract the attention of prospective talent. Organizations are recognizing the value of highlighting not only traditional elements such as benefits and key job responsibilities, but the environment potential candidates will join—some even encourage applicants to speak with existing employees to get a feel for their culture. At the same time, companies use websites and social media to portray themselves as a fun place to work, describing their history, vision, values, and seeking to provide an inside view of the people that work there. This effort to inject fun into recruiting doesn't stop once an employee has been hired. Onboarding presents a unique opportunity to express company values and put employees on a path to success.

For example, Bonobos asks hiring managers to email the entire organization to announce new hires, including picture and a biography of the newcomer, along with a trivia game "two truths and

FIGURE 3

Fun and the talent life cycle



Companies leading the way in creating fun climates are not merely throwing ideas at the wall to see what sticks. They're using big data and analytics to think strategically about what kinds of activities support a climate of fun, and fine-tuning accordingly.

a lie." Employees are encouraged to select which of the three statements about the new employee is false, with a US$25 store credit awarded to the fastest correct response. Online retailer Warby Parker has "lunch roulette," where employees from different departments are randomly selected to enjoy lunch on the company's dime in an effort to promote cross-functional connections.[11] When attracting employees, there's no limit to the number of creative methods companies may use, during both pre- and post-hire phases.

DEVELOPING TALENT

Once employees experience an enjoyable onboarding process and determine an organization is a good fit, they'll likely start looking for growth opportunities. Companies that have addressed this stage offer a variety of options to learn and grow both professionally and personally, and we find crafting development opportunities through the lens of the customer experience is critical to connecting an individual or team's work to the company's broader goals.

For example, Best Buy sought feedback from employees on how to provide a unique customer experience in its retail stores, resulting in the opening of an "experience store," where customers could test the latest technologies in a highly immersive environment.[12] When Southwest Airlines introduced the all-new Boeing 737 Max into their fleet, it included a third galley area allowing flight attendants to serve customers with greater ease, an enhancement that was brought about via employee input sought during the design phase.[13] Lego offers an annual "play day," where employees have the day off to simply play with Lego products.[14] All are examples of organizations empowering employees and expanding their sphere of influence by making an intentional effort to connect them to the customer experience in engaging, playful, and fun ways.

RETAINING TALENT

Companies leading the way in creating fun climates are not merely throwing ideas at the wall to see what sticks. They're using big data and analytics to think strategically about what kinds of activities support a climate of fun, and fine-tuning accordingly. Rather than simply asking individual employees "are you having fun?," companies are using pulse surveys and soliciting qualitative feedback to gather large amounts of data that can be analyzed to gain a deeper understanding of what employees, as a group, look for. This move toward

the collective—asking "are *we* having fun?"[15]—intentionally shifts the focus toward creating a culture of fun that aligns with external, publicized values.[16]

When New Belgium Brewing Company named its second employee "director of fun," it likely didn't have a clear concept of what would follow.[17] But that senior leader, Brian Callahan, has since helped to inject fun into the physical work environment, with the Colorado-based company's headquarters now boasting a rock climbing wall, ping-pong table, and slide among its designated fun and social spaces.[18] This not only helps retain existing talent but feeds the attraction of new employees.

Embedding fun into the workplace

It's easy enough to declare that fun should be an organizational priority, embedded from top-down and bottom-up, across 360-degrees. What's harder is execution, and it requires using different tiers of the organization to enable fun, with each dimension feeling a sense of ownership of and accountability for creating and sustaining the corporate climate. By fostering a sense of responsibility at an individual level, organizations can help fun impact teams, leaders, and the overall organization (see figure 4). And, of course, all of these levels are interdependent, and only as strong as the weakest link.

THE INDIVIDUAL

While goals, resources, and other mechanisms for the "what" of delivering work may be out of employees' direct control, every individual has the power to voice ideas for constructing the "how" of achieving organizational expectations. This idea, often referred to as *job crafting*, provides individuals with the opportunity to improve their personal experience at work by creating workplace fun through their own lenses. Employees can consider several ways to meaningfully drive this change and impact how much fun they have, among them: directing their communication with other members of the organization, determining how to execute their own tasks, and engaging with a lens of valuing the work they perform.[19] All of these example tactics

FIGURE 4

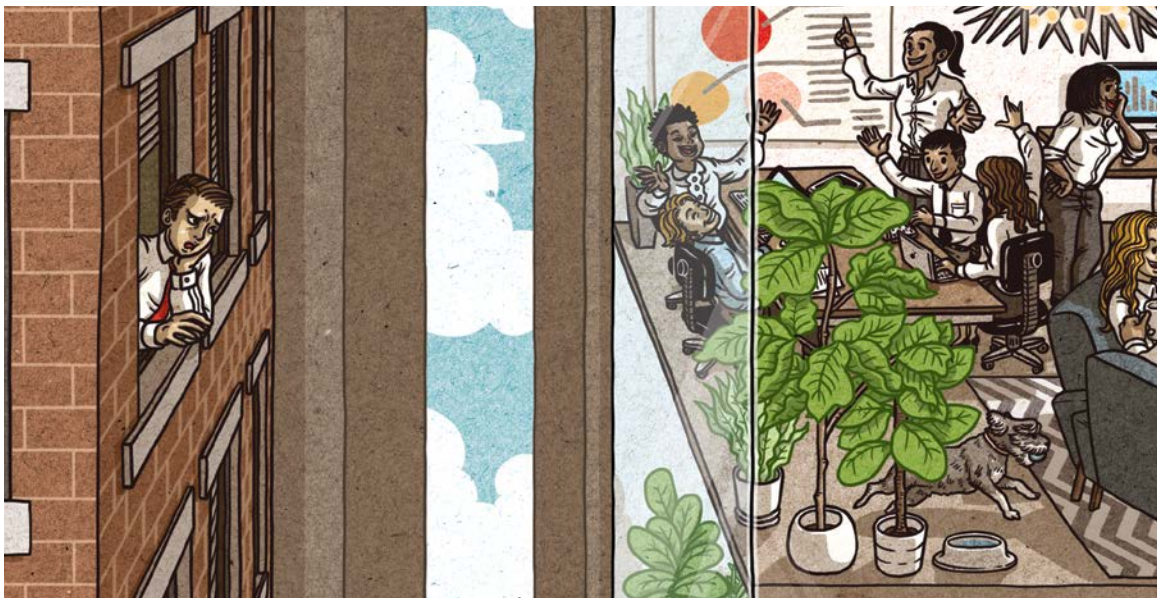
Embedding fun at all levels

The individual
Embed self-awareness behaviors on a regular basis in order to reflect on experiences and self behaviors

The leader
Enable better ways to connect with each other through interactive activities—perhaps through breaks during the day

The team
Encourage teams to focus on small, manageable goals, and gradually expand the circle to achieve bigger goals in order to avoid getting overwhelmed

The organization
Empower individuals in the organization by infusing fun and happiness through collaborative space, policies that focus on social bonds, and enhanced technologies



are a strong starting point for building fun into broader team and organizational tiers.

THE TEAM

Teams are a great way to show the fabric of individuals as contributors to a greater group, especially when teams allow individuals to feel comfortable expressing playfulness and humor. This sense of trust in the workplace—to be your authentic self—is enabled through the social interactions generated by teams. Collaboration is the glue that holds teams together, and the odds of a well-functioning team rise exponentially as employees feel comfortable being their true selves at work, displaying integrity, forgiveness, trust, and humanity. This can ultimately lead to a greater likelihood for a climate of fun. Positivity, enabled by self-motivation, is also incredibly important to fostering the strong social aspects of fun at work.

THE LEADER

Leaders connect teams to the broader organization, and share responsibilities that influence how they can support fun in the workplace. For instance, leaders can provide opportunities for individuals to experience fulfillment or joy from specific tasks, therefore improving peoples' perception of fun in the organization. They can (and should!) lead by example—by being ambassadors, leaders can drive the balance between fun and work and build environments that encourage and accept fun and playfulness at work. Fostering trust and maintaining open lines of communication can promote workplace fun and happiness, and are essential for team cohesion and collaboration (as well as overall work satisfaction). Leaders play a critical role in creating a trusting environment in which everyone is more likely to be more authentic, vulnerable, and have a positive frame of mind.

THE ORGANIZATION

Whenever possible, organizations can embed fun into processes. Employees can be recognized for specific milestones such as birthdays or tenure, and there can be social activities and other celebrations. Organizations can also encourage a climate of fun through the adoption of games, contests, and other events that are not directly related to daily work. While we accept that notions of fun and happiness are highly subjective, and culture is not something that can be changed overnight, the creation of an *environment* that encourages fun through

employee behavior can improve the overall perception of work and in turn, can potentially increase productivity and decrease turnover.

What about specific perks or rewards for people who demonstrate an aptitude for fun? Since there are direct positive correlations between self-reflection, performance, and creativity, organizations can consider creating innovative engines for fun idea creation and solicit these ideas from the broader employee population.[20] Where people are co-located, it's important to create space for people to interact openly and with others that may be working virtually, such as through differentiated physical layouts of the work environment (such as closed cubicle spaces versus open, large tables with multiple chairs). Fundamentally, organizations should provide opportunities for individuals to embrace ways of having fun and create mechanisms for tracking impact and output so everyone knows what the organization values.

Now what?

You know what you're up against—the working world has shifted. For organizations to thrive rather than merely survive in this era of evolving employee expectations and increasing competition, they should embrace fun to create a positive climate that improves the employee experience. Leading organizations are anticipating and proactively changing, paving the way for embedding various aspects of fun at work. Consider fun as a way to shake up your organizational culture—you may be surprised at its spark.

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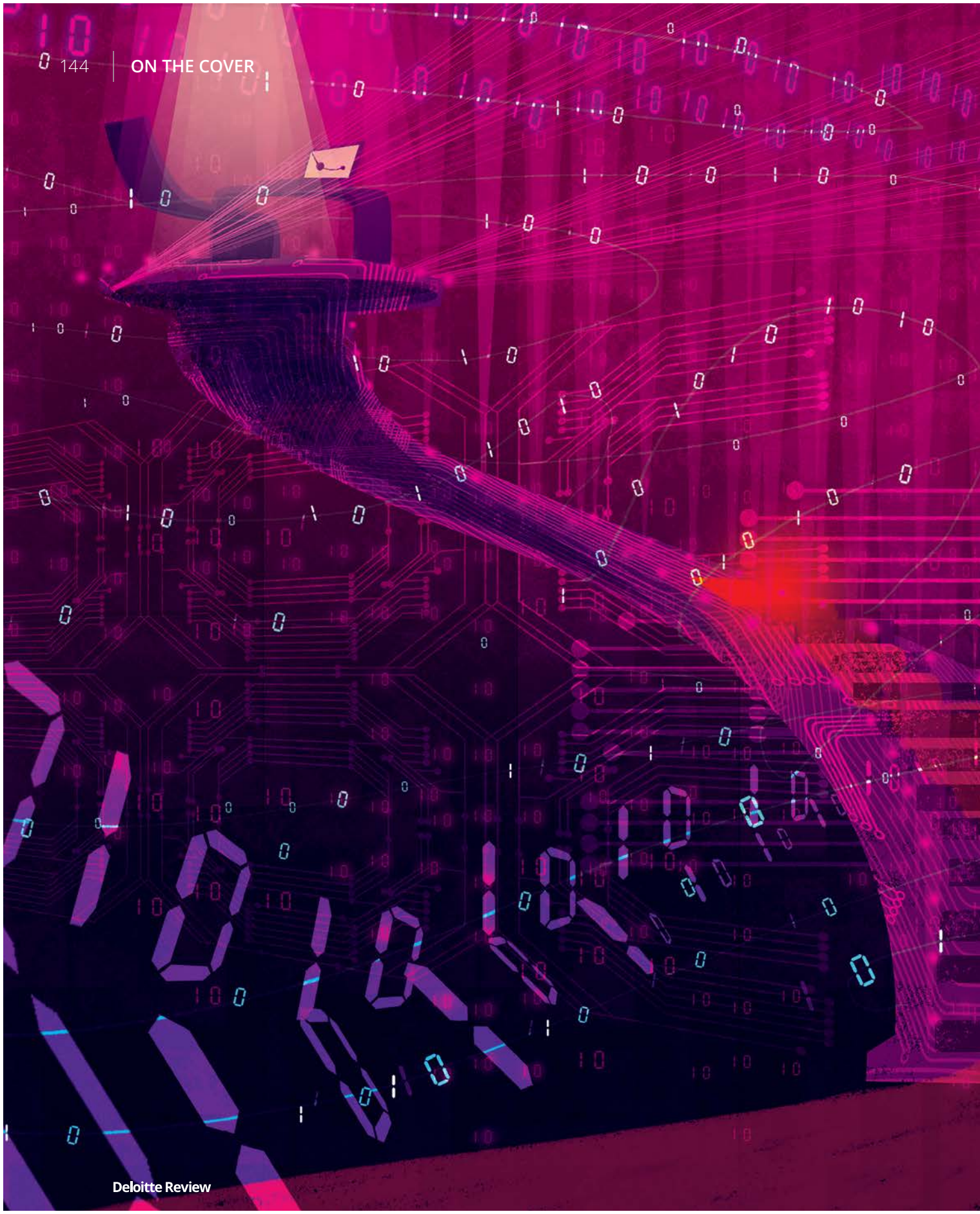


Engaging workers as consumers

TECHNOLOGY HAS TRANSFORMED THE RELATIONSHIP BETWEEN COMPANIES AND CONSUMERS. SO WHY DON'T MORE ORGANIZATIONS USE IT TO BETTER ENGAGE WITH EMPLOYEES?

by Carolyn O'Boyle and Susan K. Hogan

ILLUSTRATION BY JOHN JAY CAUBAY

IT SEEMS ALMOST everyone is focused on digital transformation.[1] And while the shape and scope may differ by organization, the potential benefits of implementing intelligent workflows, mastering data, adopting platform approaches, and a seamless experience are becoming increasingly apparent and well understood. That especially applies to consumers. Recommendation engines underpin websites, not only empowering us with information, but often improving our customer experience, increasing sales and satisfaction, and fostering engagement and loyalty.[2] Similarly, organizations such as Netflix are leveraging broad data sets to better meet our needs, not only when it comes to recommending movies and television shows we may like, but increasingly for the development of original programming they know we want.[3]

All of which begs the question: If technology has transformed how companies interact with customers, can it do more to revolutionize their relationships with the workforce? After all, workers share the same basic marketing-funnel journey: We consider opportunities, evaluate potential companies, commit to working for an organization, and the company then either earns our trust and loyalty, or we seek a better opportunity. Yet, if digital strategies are not thoughtfully implemented, rather than encouraging deeper engagement with organizations, in many cases the opposite happens. Efforts to incorporate technology into the workplace often cause insecurity and anxiety rather than improving the experience, with communications technologies, in particular, creating an "always on" environment that can contribute to burnout, loneliness, and feelings of isolation.

While technology has made it easy to do things such as shopping and working remotely, humans are, by design, social beings who desire relationships.

Firms should understand the full employee, just as marketers have learned to understand and address the full individual. While it can be argued anxiety, burnout, and loneliness are personal considerations, these generally have meaningful *professional* ramifications for business and human-resources leaders. They can lead to undesirable attrition, decreased levels of engagement, and lower productivity. The good news is many of the strategies leaders can adopt to foster greater employee engagement are right before their eyes. It's possible to draw from consumer best practices and human-centered design to identify digital transformation techniques and strategies to improve the workforce experience and mitigate the potential negative effects of technology in the workplace.[4] Additionally, by recognizing workers—like consumers—do not all have the same needs[5] and using the power of predictive analytics, enterprises can understand employees individually to diagnose and identify intervention situations.

A transformed customer experience

While we often hear about the negative ramifications of social media and, to a lesser extent, consumer use of technology, there are notable bright spots. We today have exponentially greater and easier *access to information and services*, with the growth of online retail a prime example. Online sales of non-food items soared to 24.1 percent in December 2017, from 11.6 percent five years earlier,[6] in line with the increasing convenience around both avoiding crowds and parking, and frictionless access to information allowing greater insight into products, services, and prices to aid decision-making.

While technology has made it easy to do things such as shopping and working remotely, humans are, by design, social beings who desire relationships.[7] Technology has opened multiple *communication channels*, redefining the nature and scope of relationships available. For instance, video technology has allowed the quality of interactions to become richer, enabling deeper and more personal relationships to flourish. In the customer–firm relationship, this same wider and richer communication net enables individuals to make valuable connections with other solution providers that otherwise would not be possible or feasible, and also build relationships with everyday brands and their parent firms.[8]

This has also enhanced consumer-firm relationships in terms of *enabling customers* to interact with products and brands and have a say in what a product or product experience should look like. Recent examples include Chick-fil-A's co-creation of online content via its Cow Campaign,[9] and Monopoly's online voting poll that

it used to determine new board pieces.[10] Co-creation has been found to not only increase consumer engagement and brand value, but also identify new product innovation ideas and ultimately create a competitive advantage.[11]

Finally, one of the brightest spots in social media has been the way it's facilitated *community-building* among previously unconnected populations. People have found others like them via digital platforms—whether they share interests, hobbies, or even rare diseases—and formed networks and support groups.[12] Likewise, consumers have been able to move beyond building relationships with brands to now build brand communities composed of other product users, and celebrate stories and shared experiences with these like-minded passionate brand advocates. Technology has removed the limitations of distance and time.

There's a unique opportunity for humans to redefine their roles in the workplace around aspects that are uniquely human, such as imagination, creativity, curiosity, and emotional and social intelligence.

Overcoming technology-related anxiety

Before pushing to better engage workers using these consumer-based practices, companies should address a factor that may hamper success: technology-related anxiety. It persists at a societal level[13] and with many workers,[14] manifesting primarily in two ways: indirectly, through the perception technology may change or eliminate jobs,[15] and directly through the emergence of our "always on" society.

INDIRECT ANXIETY: A ROBOT WILL REPLACE ME!

Research has shown that 60 percent of all occupations comprise at least 30 percent of activities that are technically automatable, based on currently demonstrated technologies.[16] The potential for this disruption, and the unease many workers may feel about their ability to adapt, can be a significant stressor for many. While some of this stress is unavoidable, organizations can help mitigate some of it through better communication—using digital tools.

One of the most critical factors when trying to combat anxiety is communicating authentically, sincerely, and with empathy. There is a positive message here: that despite the increasing incorporation of machines into the workforce for much of the repetitive or mundane aspects of work, there's a unique opportunity for humans to redefine their roles in the workplace around aspects that are uniquely human, such as imagination, creativity, curiosity, and emotional and social intelligence.[17] That means the need for the human element, or human skills, is not going away. Of course, delivering this message is a tall task for email communications. However, marketers who embrace *authentic and transparent communications*—sharing the good, bad, and ugly, or showing products in a realistic light—can attest to its benefits, and have even found consumers can subsequently undertake messaging and marketing for them.[18] Deloitte's research into the factors that contribute to a positive employee experience indicate transparency and honesty are typically critical, as is trust in an organization's leadership.[19] In today's virtual environment, with many workers spread across a multitude of locations, leaders can take advantage of robust video technology to allow the tone and energy of their messages to be heard by their workers. Webcasts or pre-recorded videos all bring a depth that can be well suited to calming employee anxiety. The critical point is authenticity needs to truly be, well, authentic, with the

company's overarching philosophy incorporated into the fabric of all its operations and interactions. Online retailer Zappos is an example of a company that has focused on creating a reputation of authenticity with customers and its workforce by interweaving its service philosophy through every aspect of the organization.[20] Its call-center team members are given extensive autonomy and decision-making authority to meet customer needs without supervisor approval, with examples including sending get well flowers to a customer's relative at Zappos' expense, and staying on unusually lengthy calls (one even lasted more than 10 hours!).[21]

Once a message has been crafted and developed, technology provides a *multitude of ways* to deliver it to workers. Just look at consumer brands, which engage with us in our morning inbox (usually offering 15 percent off!) and in our social-media feeds, always repeating and reinforcing the same message. Yet often workplace communications are delivered once and through one vehicle. Among marketers, a long-held belief has been that a consumer needs to receive a message a minimum of three times—ideally in different formats—to cut through the clutter, create awareness, and prompt action.[22] It stands to reason that firms should put the same multi-message and form-factor thought into internal communications strategies.

DIRECT ANXIETY: LOOK HOW HARD I'M WORKING!

On a daily level, technology has created an always-on culture where workers can feel pressure to be constantly available to colleagues and working at all hours. This can lead to both anxiety and burnout. Compared with 20 years ago, people are twice as likely to say they are always exhausted, according to the General Social Survey of 2016, and close to half of all people say they are often or always exhausted due to work—a 32 percent increase over the same period. Solutions often focus on using technology to create digital boundaries—turning off notifications, limiting newsfeed check-ins, or eliminating screen time.[23] However, the consumer space provides other strategies.

First, time spent on administrative tasks may be reduced by reimagining work through applying advanced, digital solutions with an ease, simplicity, and productivity focus. To maximize sales, many retail organizations have streamlined the online process to an extraordinary degree. From "buy now" buttons to "buy it again" reminders and using cookies to intelligently push ads to prospective shoppers, retailers can remove friction and steps from the buying process. And by providing guidance on popular and highly rated items in a product category while not forcing a decision, retailers try to guide consumers toward easy options, alleviating the effort required to make a purchase decision. Employers can provide easy access to information, offer similar default options, and enable the ability to streamline their most common interaction points with workers, such as onboarding, knowledge and data access, and routine transactions.

Second, organizations can broaden access to information to enable employee self-determination. Just as retailers have made product information available and message boards have organically cropped up, employers can supplement "official" sources of information with employee-driven content. Given the workforce is, perhaps, best positioned to provide perspectives on certain aspects of their experience, offer advice, and answer questions in a way that is relatable (and empowering), employers are wise to create forums for them to do so. While some companies fear negative feedback, they should recognize that criticism is inevitable and demonstrate their confidence in their own talent experience by hosting such open forums—which have the added benefit of increasing the workforce's perceptions of the firm's authenticity.

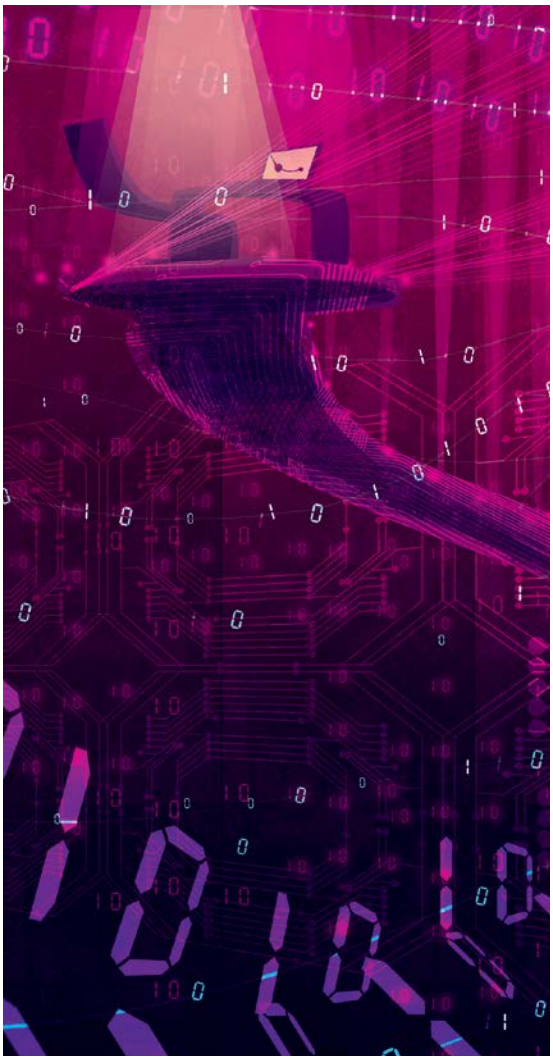
Finally, burnout can be mitigated by providing a positive and valuable talent experience, tapping into the specific needs most workers articulate around growth and development. Companies use predictive analytics to better understand customers and micro-target them with tailored messages to address their specific needs and situations, as well as to identify opportunities for additional sales and services.[24] Similarly, employers can mine information (from

talent surveys as well as operational data) to understand employee preferences and needs and curate a personalized talent experience. For example, workers beginning new roles or starting assignments in a new part of the organization could have information such as learning courses, articles, and podcasts pushed to them to help set them up for success. This data may also help firms identify employees at risk for burnout or the processes and factors that cause it, and intervene before their well-being diminishes—or they leave.

Engaging workers like consumers

Most organizations already have at their disposal the tools critical to building external relationships—using them internally just requires thinking differently. Here are some broad actions employers can consider as they attempt to digitally transform their internal organization to alleviate anxiety, improve engagement, and build communities:

- **Belonging.** Consider offering workers the flexibility to form online communities organically based on shared interests, whether that be professional interests or personal passions. Employers can draw from consumer marketing strategies for guidance on how to direct and encourage communities, such as Sony's PlayStation "Countdown to Launch" initiative, which uses new content to generate excitement and communities around the launch of new games.[25] This notion of self-directed, organic communities can be critical; in this type of environment, workers are more likely to feel that they can be their authentic selves at work, leading to higher engagement and performance.
- **Connection**. Leverage technology to remove geography and time zones as barriers to connections among employees and teams. Positive stories from social media often focus on how friends are better able to maintain and strengthen relationships across the globe. Technology can allow colleagues to better maintain relationships



over time and space, creating a stronger attachment and loyalty to their co-workers and allowing them to have the social interactions they desire. As a side benefit, these long-lasting ties can also enhance the informal development and capabilities growth of individuals who may be better able to share knowledge across teams.
- **Authenticity**. Connections can be meaningful … or superficial. Expressing an enterprise's values or taking a stand on a potentially controversial issue can be a step toward creating a more meaningful connection. Consider the recent decision by a popular sports apparel company to feature a controversial sports figure in its advertising

campaign, or the longstanding policy of a large restaurant chain to remain closed on Sundays. While such moves can be polarizing, the loyalty and engagement they create may well be worth it in the long term. Likewise, for companies that truly want engaged workers who feel fully embraced within the organization, providing and encouraging an environment of authentic two-way sharing is important. So often—at least historically—workers feel they need to toe a party line or water down what they say. Many also feel bombarded by corporate-speak rather than what's really going on. While organizations should obviously vet and wordsmith external communications, there's value in speaking plainly and honestly—both internally and externally.

- **Deep relationships**. Use technology to enrich communications with more vibrant media, such as audio and video. Just as traditional advertising is losing ground to more innovative and creative forms of messaging, workers are likely to find nontraditional and more interactive forms of work communications a welcome change from emails or terse instant messages. Audio and video chat can enhance the quality of social interactions, enabling workers to form deeper personal relationships with one another, conferring meaning and depth to their relationships, and reducing loneliness.
- **Broad interactions**. Let technology act as an *indirect enabler* for a wide range of experiences organizations want to deliver to workers to help address anxiety and other potentially adverse consequences of the virtual world such as detachment and loneliness. Just as consumers love recognition, consider the same for worker accomplishments around both big and small moments that matter—such as promotions, the first 90 days after onboarding, or completing a project. Technology can deliver recognition seamlessly, immediately, and (if appropriate) publicly. And if it's easier to recognize and show appreciation for one another, it's probably more likely to happen.
- **Micro-targeting**. While great strides are currently being made by some enterprises in better connecting with workers via the development of personas (for example, manager, high potential, new hire, executive, contingent worker),[26] one-on-one relationships are still required, and technology can help. Just as companies embrace micro-targeting strategies with consumers—to the extent that consumers may feel marketers know them better than some of their closest friends—firms can utilize technology and predictive analytics to better understand and communicate with individuals or teams.

Technology is here to stay, and employers have an opportunity to embrace and incorporate its benefits internally as they have externally.

Parting thoughts

Technology is here to stay, and employers have an opportunity to embrace and incorporate its benefits internally as they have externally. Best practices from the way digital has transformed the relationship between companies and consumers have the potential to guide that journey, increasing engagement, well-being, and ultimately firm success. Yet there are some important considerations to remember.

First, unless companies eliminate anxiety associated with technology, even the most wonderful digital transformation strategy may fall flat.[27] Second, messaging strategies are just as important as implementation strategies. Further, companies should put the same level of thought and effort

into internal communications as they do external communications. Third, the experience should be across all channels with physical opportunities mixed with digital—just as it is for consumers. And finally, organizations should understand the importance of choice and individual preferences. Workers should be guided toward digital transformation without foisting it upon them—they need choices and guidance, but get to have the final say.

Lasting transformations take time. Revolutionizing engagement between companies and consumers didn't happen overnight, and it wasn't without hiccups and hurdles. But recognizing the fundamental nature of the employer-worker relationship has changed—and, with it, the workforce social contract—allows companies to embrace the opportunities presented by digital technologies and again rewrite the psychological contract that underpins how we all spend a large part of our lives.

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How the financial crisis affected the world's workforce

BRIDGING SKILLS GAPS REQUIRES UNDERSTANDING HOW LABOR MARKETS HAVE CHANGED IN THE DECADE SINCE THE FINANCIAL CRISIS—PARTICULARLY FOR YOUNG PEOPLE AND WOMEN

by Rumki Majumdar and Patricia Buckley

ILLUSTRATION BY KATIE EDWARDS

WE SPEAK OFTEN of the "future of work," usually probing how technology is redefining the very nature of what we do. Yet the composition of the supply of labor—the actual people who do the work—seems to get less attention. How have global labor markets changed in the decade since the global financial crisis? To find out, we examined the labor markets of the 20 largest economies, the G20, focusing on two workforce categories often targeted by policy initiatives and interventions: youth and gender. Our findings? There has been uneven progress among both groups, leading to some potentially worrying implications for how workforce demands can be met in the years ahead. And that means policymakers and businesses should consider how to develop more effective policies and programs that match these new realities.

Persistent youth unemployment

Of the several lingering consequences of the financial crisis that began in 2007, youth unemployment has been one of the most challenging for both developed and developing G20 countries. Although economic growth has gained momentum over the past few years, the recovery in youth unemployment has been too weak to reverse the impact of the crisis for most of these nations. In fact, the problem has worsened for two-thirds of the G20 countries in the past decade (figure 1), and most European Union nations have yet to see youth unemployment rates below precrisis levels.

One fundamental shift affecting youth employment is the changing nature of most entry-level roles. Young people are more likely to fill these critical first rungs on the career ladder, which have historically comprised basic and routine functions. Yet the definition of "entry-level" is changing as technology automates tasks,[1] with obvious implications not only for young people generally but, more specifically, for developing nations, as they have a larger share of the global youth population. In past years, developing countries could better absorb these new entrants as most marketed themselves to the world as the lowest-cost producers, but their relative labor cost advantage is eroding as the nature of entry-level roles becomes more advanced: Brazil and South Africa were among the G20 countries most hit by rising youth unemployment in the decade to 2017, and the youth jobless rate actually increased in India and Russia during that period, despite each country's overall jobless rate falling.

The disparity between the unemployment rates of young men and women is striking—and likely attributable to broader country-by-country trends related to education, the shifting nature of work, and progress on diversity.

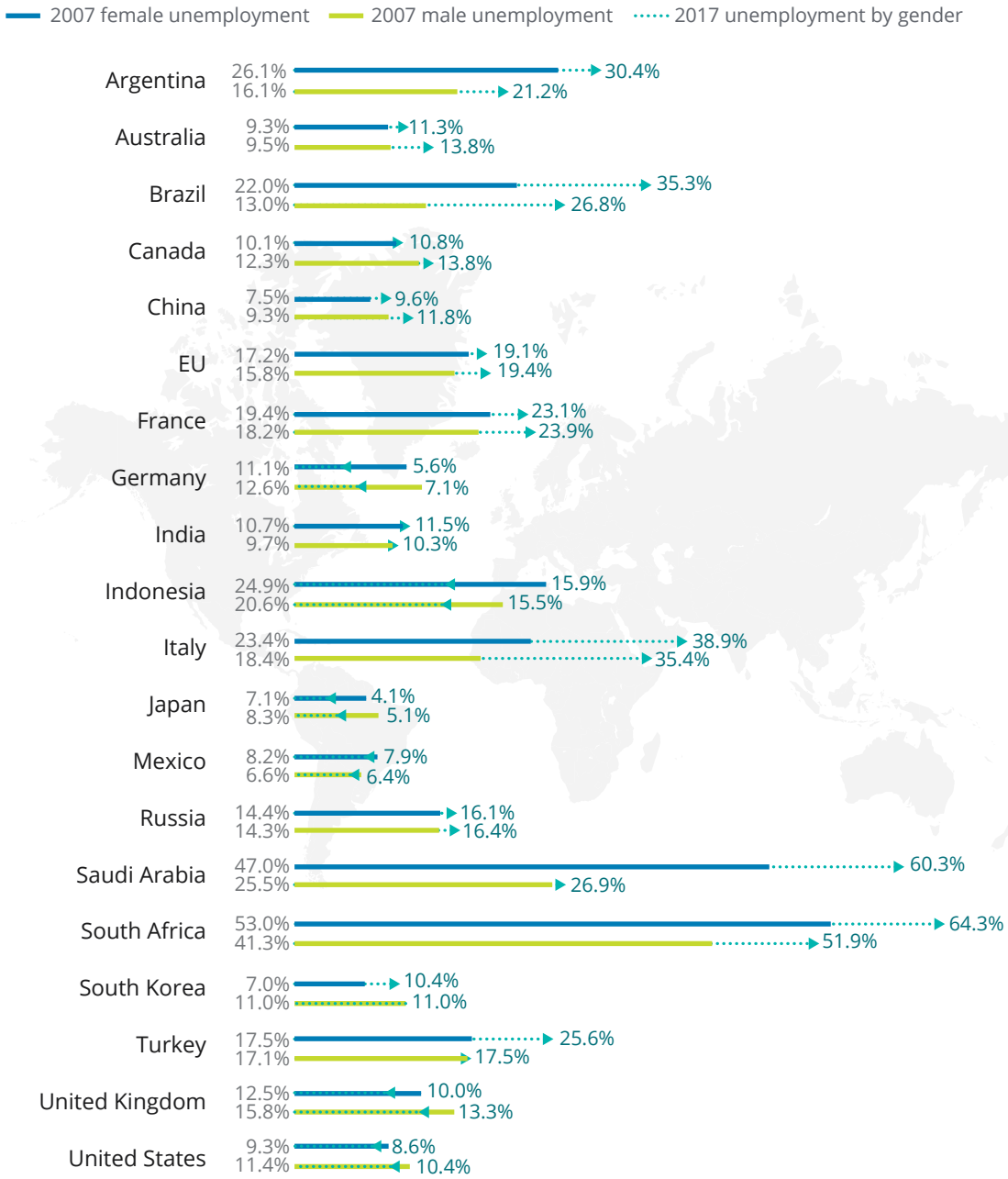
We also found a widening gender gap among unemployed youth. Six members of the G20—five of them developing countries—had a significantly higher female youth unemployment rate in 2017; developed nations, meanwhile, largely had higher male youth unemployment rates (figure 1). The long-term implications of this remain uncertain, but the disparity between the unemployment rates of young men and women is striking—and likely attributable to broader country-by-country trends related to education, the shifting nature of work, and progress on diversity.

Uneven progress for women

Looking more broadly at the role of women in labor markets, we found a disturbing trend: the

FIGURE 1

Youth unemployment has generally risen since 2007, with the largest increases among women in developing nations



Source: World Bank data, sourced from Haver Analytics; International Labour Organization, ILOSTAT database, May 2018.

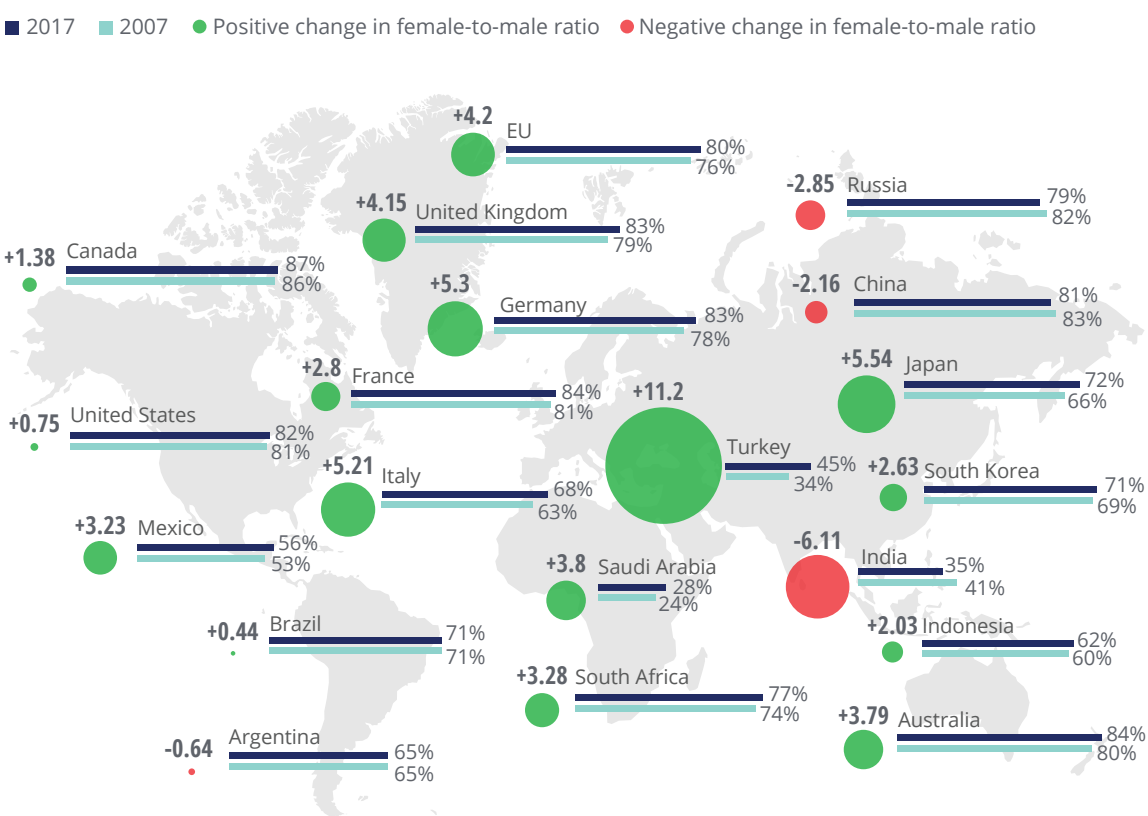
continued uneven progress toward workforce inclusion. The value of diversity within organizations is increasingly clear, and many organizations are contributing to a powerful movement to diversify today's workforce in terms of gender, age, background, experience, and viewpoint.[2] Yet the labor force participation numbers show only modest increases in the ratio of women relative to men in G20 countries during the past decade. In fact, Turkey is the only nation where relative female participation has grown noticeably, while India saw a significant decline (figure 2). In other major economies, progress has been mixed.

This uneven progress is despite an ongoing foundational shift toward the services sector, which increasingly employs women. The proportion of women employed in the services sector rose in every G20 country with the exception of Saudi Arabia in the decade to 2017, with the United States the only developed country where the sector employs fewer

FIGURE 2

Female labor-force participation has barely changed in most G20 countries

Percentage of women in the workforce, 2007 and 2017; bubbles indicate change in female-to-male employment ratio.

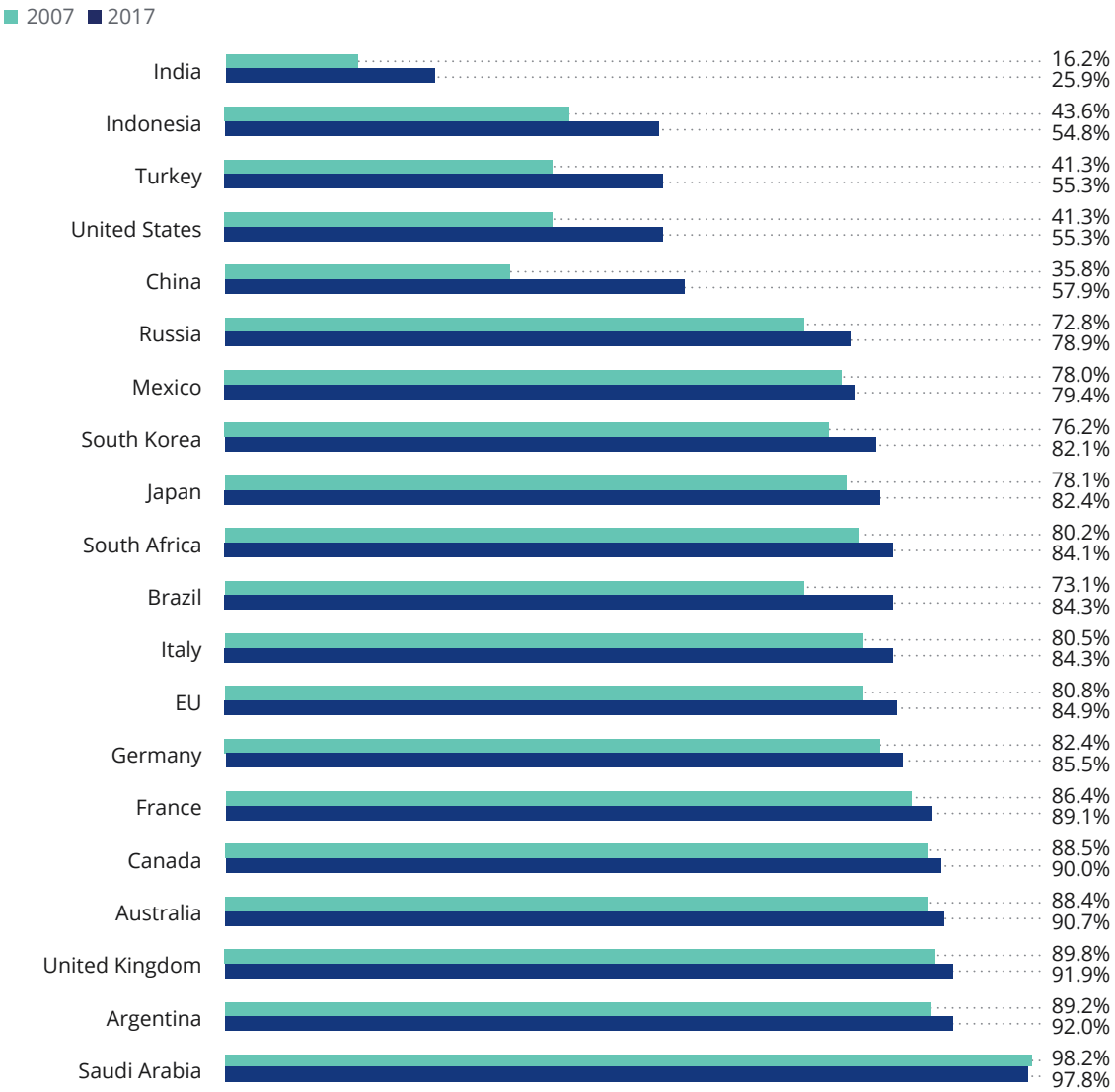


Source: World Bank data, sourced from Haver Analytics, May 2018.

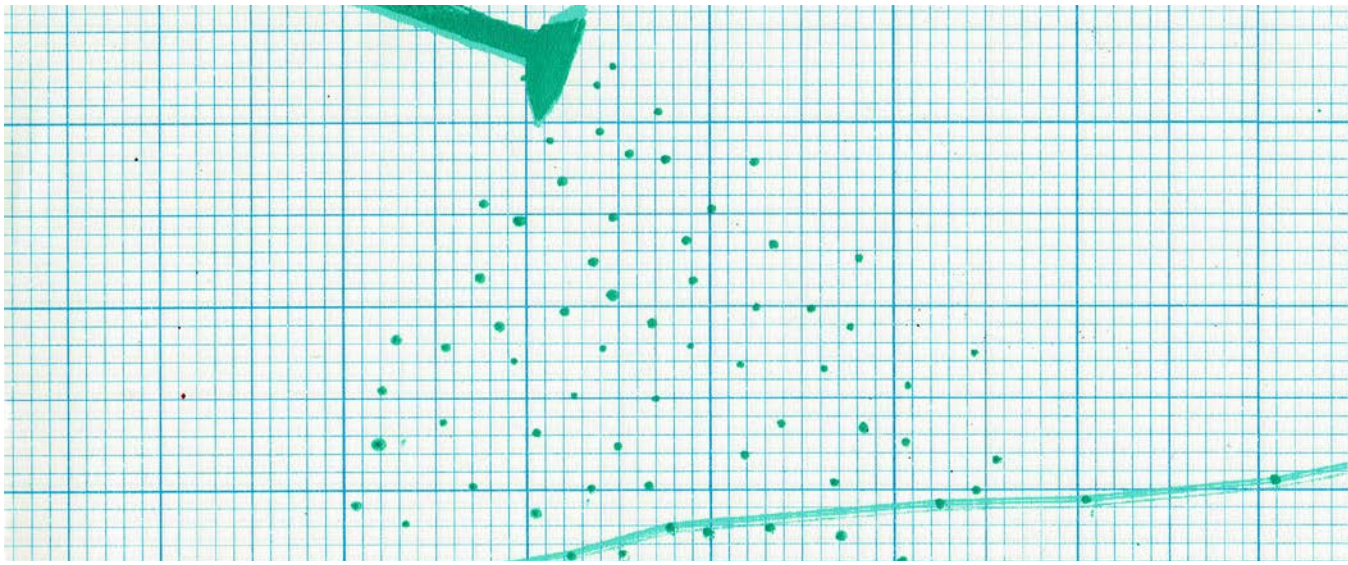
than 60 percent of all employed women (figure 3). Several factors drive female participation in services roles, including the fact communication and interpersonal skills are at a premium and women have a natural comparative advantage in both fields. In addition, many services positions are difficult to automate, such as health and personal care and household work.[3]

FIGURE 3

More and more women are working in the services sector



Source: World Bank data; International Labour Organization, ILOSTAT database, May 2018. Employment is defined as persons of working age who were engaged in any activity to produce goods or provide services for pay or profit.



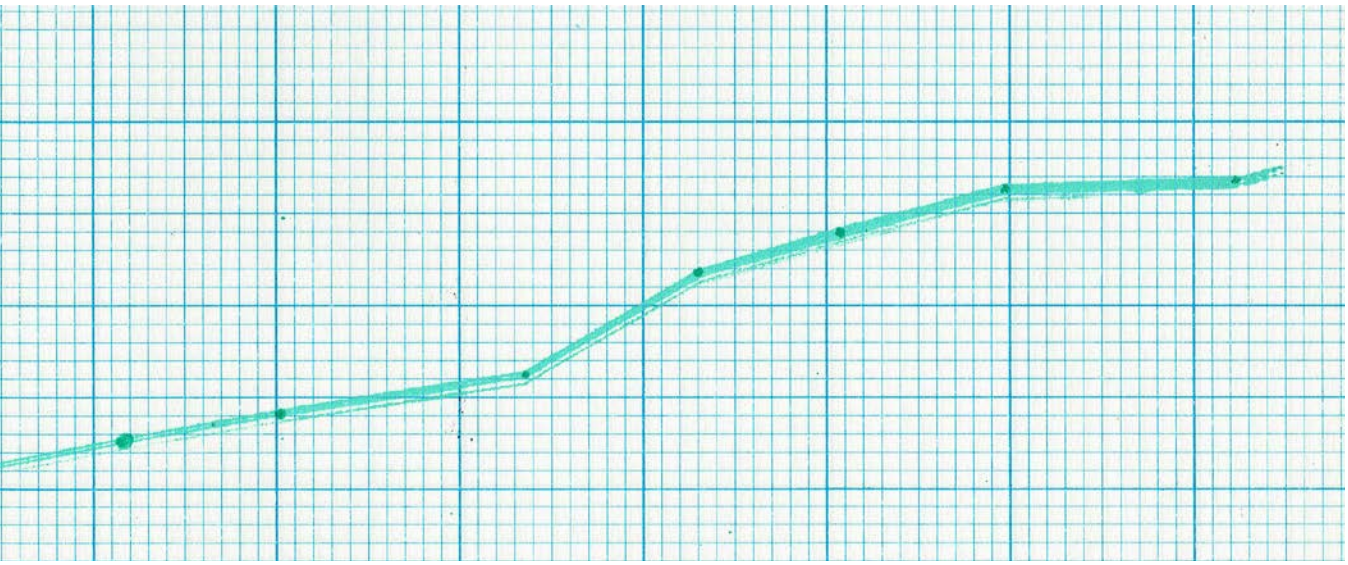
Bridging the skills gap

So what are the implications of these changes to labor markets? As jobs shift toward the service sector and many industries require more advanced skills, companies risk a shrinking pool of qualified candidates. The key is overcoming the gap between the needs of the business and the talent available, a mismatch often exacerbated by the failure of traditional education systems to develop dynamic skills to assist students in transitioning to the workforce.

As jobs shift toward the service sector and many industries require more advanced skills, companies risk a shrinking pool of *qualified* candidates.

Indeed, educational achievement remains very uneven across nations. Fewer than half of the adult population in developing nations in the G20—aside from Russia and South Africa—complete at least an upper secondary education, and women are significantly less likely to do so than men in three-quarters of all G20 countries. This disparity—which likely hinders efforts to improve gender diversity in the workplace—is particularly acute among youth. Since 2013, most G20 nations have reported a higher proportion of young women not in education, employment, or training, with the difference notably higher among developing countries.

While policymakers should be leading efforts to improve access to and the quality of education, companies also should play an active role in closing these gaps. First, they can redesign entry-level work by re-evaluating traditional approaches to employee acquisition as well as job assignments, employee development, and influencing overall organizational culture.[4] Second, while companies often plan to invest in upskilling employees by providing more on-the-job training and education, that effort can start earlier. Companies can allocate resources to support training and developmental programs to bring change at an early stage of education, and those with global outreach can involve and engage students in schools and colleges to help them envision a career path and resources



they need that can help them steer into the industry. Finally, companies can promote a culture that values employees for their unique skills, experiences, and perspectives. The question isn't whether labor markets have shifted in the decade since the financial crisis, driven by societal, economics, and technological changes. What's important is the collective response.

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Accelerating digital transformation in banking

page 8

1. "Banking ICT spending predictor," *Ovum*, February 2, 2018.
2. Taylor Nicole Rogers, "Bank of America finally sees mobile deposits surpass in-person transactions," *The Street*, July 16, 2018.
3. Ibid.
4. Val Srinivas, Steve Fromhart, and Urval Goradia, *First impressions count: Improving the account opening process for millennials and digital banking customers*, Deloitte University Press, September 6, 2017.
5. The sample was cleaned to take rogue responses out of consideration. For our cluster analysis, we studied 13,912 respondents (with cleaned data) for their channel usage behavior and how it relates to emotional engagement.
6. Rob Danna, "How emotional connections build champions for your brand," *Forbes*, December 22, 2017.
7. Scott Magids, Alan Zorfas, and Daniel Leemon, "The new science of consumer emotions," *Harvard Business Review*, November 1, 2015.
8. *eMarketer*, "Digital payments struggle to catch on with consumers in Japan," October 14, 2016.
9. Li Hong, "ICT lifts China to become global trendsetter," *Global Times*, April 12, 2018; Melissa Cheok, "For all its tech savvy, Singapore still prefers cash over digital payments," *Bloomberg*, September 5, 2017.
10. Peter Renton, "The new intersection of banks and marketplace lending," *Lend Academy*, December 21, 2016.
11. Srinivas, Fromhart, and Goradia, *First impressions count*.
12. Chris Skinner, "Big banks are not fleeing the fintech heat (yet)," *The Finanser*, accessed July 31, 2018.
13. Shirra Frost, "Engage customers with financial alerts," ABA Bank Marketing, March 8, 2017.
14. For our cluster analysis, we included data for 13,912 respondents on channel usage behavior.
15. A small portion of respondents indicated that their favorite brand is a bank.
16. European Commission, "The Digital Economy and Society Index (DESI)," accessed on September 19, 2018.
17. Greg Simpson, "The ambient customer experience: Physical, digital, virtual and everything in between," CIO.com, November 22, 2016.

18. Sara Baker, "Why voice biometrics will end the password era," *Security Brief*, July 9, 2018.

19. Grace Noto, "Capital One joins effort to educate seniors about online banking," *Bank Innovation*, August 5, 2016.

20. Val Srinivas, *2018 Banking Outlook*, Deloitte Center for Financial Services, 2017.

21. *Deloitte Review* is an independent publication and has not been authorized, sponsored, or otherwise approved by Apple Inc. iPhone® is a trademark of Apple Inc., registered in the United States and other countries.

22. Paul Brown and Diane O'Neill, "Apple iPhone: 10 years of UX innovation," Strategy Analytics, December 11, 2017.

23. Lisa Joyce, "What consumers love (and hate) about mobile banking apps," *The Financial Brand*, April 24, 2018.

24. Adam Shell, "Chase all-mobile bank, Finn, rolled out nationwide in search of millennials," *USA Today*, June 28, 2018.

25. Frank Chaparro, "JPMorgan Chase launched an online bank for millennials called Finn, and I prefer it to the real thing," *Business Insider*, July 8, 2018.

Millennial behavior: Making sense of hidden influences

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1. Pew Research Center, *The generations defined*, accessed January 26, 2017; Richard Fry, *Millennials are the largest generation in the US labor force*, Pew Research Center, April 11, 2018.

2. Daniel Kahneman and Jack L. Knetsch, "Anomalies: The endowment effect, loss aversion, and status quo bias," *Journal of Economic Perspectives* 5, no. 1 (1991): pp. 193–206, DOI: 10.1257/jep.5.1.193; Daniel Kahneman, *Thinking, Fast and Slow* (Farrar Straus & Giroux, 2011).

3. H. O. Maycotte, "Millennials are driving the sharing economy—and so is big data," *Forbes*, May 5, 2015; Goldman Sachs, *Millennials: Coming of age*, sourced on November 22, 2017.

4. Dr. Patricia Buckley and Akrur Barua, *The US housing market recovery: The past is not prologue*, Deloitte University Press, November 16, 2016; Dr. Patricia Buckley and Akrur Barua, *Are we headed for a poorer United States? Growing wealth inequality by age puts younger households behind*, Deloitte Insights, March 12, 2018.

5. National Center for Education Statistics, *Digest of Education Statistics*, sourced in November 2018.

6. Daniel Kahneman and Amos Tversky, "Advances in prospect theory: Cumulative representation of uncertainty," *Journal of Risk and Uncertainty* 5, no. 4, (1992): pp. 297–323.

7. Dorie Clark, "What you need to stand out in a noisy world," *Harvard Business Review*, January 6, 2017; Lu Chen, "How to create customer loyalty with millennials," *Forbes*, June 26, 2017.

8. S. S. Iyengar and M. Lepper, "When choice is demotivating: Can one desire too much of a good thing?," *Journal of Personality and Social Psychology* 79, no. 6 (2000): pp. 995–1006; Eric J. Johnson and Daniel Goldstein, "Do defaults save lives?," *Science* 302, no. 5649 (2003): pp. 1338–9, DOI: 10.1126/science.1091721; Alain Samson, "A simple change that could help everyone drink less," *Psychology Today*, February 25, 2014.

9. Aime Williams, "Best of money: Why millennials go on holiday instead of saving," *Financial Times*, February 12, 2016; Kathleen Elkins, "Here's how millennials spend their money, compared to their parents," CNBC, June 30, 2017.

10. Ted O'Donoghue and Mathew Rabin, "Doing it now or later," A*merican Economic Review* 18, no. 1 (1999): pp. 103–24.

11. Sarah Halzack, "Shoppers are choosing experiences over stuff, and that's bad news for retailers," *Washington Post*, January 8, 2016.

12. Survey of Consumer Expenditure, Bureau of Labor Statistics, sourced from Haver Analytics in May 2018; Akrur Barua and Dr. Daniel Bachman, *The consumer rush to "experience": Truth or fallacy?*, Deloitte Insights, August 18, 2017.

13. Barua and Bachman, *The consumer rush to "experience."*

Looking beyond age to understand consumers

page 34

1. Based on the responses received in a Web-based US consumer survey. For more details, see: Curt Fedder, Shweta Joshi, and Jagadish Upadhyaya, *Millennials and beyond*, Deloitte Insights, July 27, 2018.

The Industry 4.0 paradox

page 38

1. Mark Cotteleer and Brenna Sniderman, *Forces of change: Industry 4.0*, Deloitte Insights, December 18, 2017.

2. Fabian Hecklau et al., "Holistic approach for human resource management in Industry 4.0," *Procedia CIRP* 54 (2016): pp. 1–6.

3. Punit Renjen, *The Fourth Industrial Revolution is here—are you ready?,* Deloitte Insights, January 22, 2018.

4. Ibid.

5. John Hagel, John Seely Brown, Tamara Samoylova, and Michael Lui, *From exponential technologies to exponential innovation*, Deloitte Insights, October 4, 2013.

6. Renjen, *The Fourth Industrial Revolution is here*.

7. Tom Davenport and Jeanne G. Harris, *Competing on Analytics: The New Science of Winning* (Harvard Business School Publishing Corporation, 2007).

8. Bill Briggs and Craig Hodgetts, *Tech Trends 2018: The symphonic enterprise*, Deloitte Insights, 2017.

9. Ruth Schmidt, *Frozen: Using behavioral design to overcome decision-making paralysis*, Deloitte Insights, October 7, 2016.

10. Renjen, *The Fourth Industrial Revolution is here.*

11. Ibid.

12. Mark Cotteleer and Brenna Sniderman, *Forces of change: Industry 4.0*, Deloitte Insights, December 18, 2017.

13. Stephen Laaper, Glenn Yauch, Paul Wellener, and Ryan Robinson, *Embracing a digital future*, Deloitte Insights, March 21, 2018.

14. Adam Mussomeli et al., *The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains*, Deloitte University Press, December 1, 2016; Kevin O'Marah, "What's the point of a CSCO?," *Forbes*, May 26, 2016.

15. The supply chain appears to serve as a higher priority among larger companies—69 percent of respondents from large companies (US$10 billion or greater in revenue) chose the supply chain as the top priority, compared with 61 percent of respondents from companies with less than US$10 billion in annual revenue.

16. Mussomeli et al., *The rise of the digital supply network.*

17. Peter L. O'Brien, "Inside the mind of the chief supply chain officer," Russell Reynolds Associates, October 23, 2017.

18. Mussomeli et al., *The rise of the digital supply network.*

19. Ibid.

20. Renjen, *The Fourth Industrial Revolution is here.*.

21. John Ferraioli and Rick Burke, *Drowning in data, but starving for insights: Starting the digital supply network journey with legacy systems*, Deloitte Insights, April 11, 2018.

22. Donald Mitchell and Carol Coles, "The ultimate competitive advantage of continuing business model innovation," *Journal of Business Strategy* 24, no. 5 (2011): pp. 15–21.

23. Rick Burke et al., *The smart factory: Responsive, adaptive, connected manufacturing*, Deloitte University Press, August 31, 2017.

24. Gerald C. Kane et al., "Coming of age digitally: learning, leadership, and legacy," *MIT Sloan Management Review* in collaboration with Deloitte Digital, June 5, 2018.

25. Individuals were given 12 different categories to choose from with an option of selecting up to three.

26. Jeremy Reimer, "A history of the GUI," ArsTechnica, May 5, 2005.

27. Nobody scored a "1," which indicates that all respondents at least have some interaction with these technologies.

28. Christopher A. Chung, "Human issues in technology implementation management simulator," *Development in Business Simulation and Experimental Exercises* 21 (1994).

29. Jim Guszcza, "The last-mile problem: How data science and behavioral science can work together," *Deloitte Review* 16, January 26, 2015.

30. Renjen, *The Fourth Industrial Revolution is here*.

31. Cliff Kuang, "Why good design is finally a bottom line investment," *Fast Company*, April 17, 2015.

32. Gerald C. Kane et al., *Achieving digital maturity: Adopting your company to a digital world*, Deloitte University Press, July 13, 2017.

33. For further information about Deloitte's perspective on Industry 4.0 and the physical-digital-physical loop, see Mark Cotteleer and Brenna Sniderman, *Forces of change: Industry 4.0*, Deloitte Insights, December 18, 2018.

Tax governance in the world of Industry 4.0

page 68

1. Adam Mussomeli, Doug Gish, and Stephen Laaper, *The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains*, Deloitte University Press, December 1, 2016.

2. Punit Renjen, "Industry 4.0: Are you ready?," *Deloitte Review* 22, January 22, 2018.

3. For more information on the previous Industrial Revolutions, see Brenna Sniderman, Monika Mahto, and Mark Cotteleer, *Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises*, Deloitte University Press, February 22, 2016.

4. In a previous article, Deloitte examined the impacts of Industry 4.0 on tax from the perspective of business leaders. To learn more, see Gareth Pritchard et al., *When tax meets technology: Tax implications of Industry 4.0*, Deloitte University Press, January 24, 2017.

5. Adam Mussomeli et al., *The digital supply network meets the future of work: People, machines, and a new era of collaboration*, Deloitte Insights, December 18, 2017.

6. The Kanban method is a method used for managing the creation of products. The method aims to balance demands with available capacity and its approach is designed to limit work in progress and wastage, as well as focus on customer requirements.

7. Rick Burke et al., *The smart factory: Responsive, adaptive, connected manufacturing*, Deloitte University Press, August 31, 2017.

8. *Ab initio*: From the outset.

9. Simon Creasey, "Does the direct-to-consumer sales model work?," *Supply Management*, December 1, 2017.

10. Mussomeli, Gish, and Laaper, *The rise of the digital supply network*.

11. European Commission, "Modernising VAT for e-commerce: Question and answer," press release, December 5, 2017.

12. Sonny Chheng, Kelly Monahan, and Karen Reid, "Beyond office walls and balance sheets: Culture and the alternative workforce," *Deloitte Review* 21, July 31, 2017.

13. Mark Cotteleer and Brenna Sniderman, *Forces of change: Industry 4.0*, Deloitte Insights, December 18, 2018.

14. Chris Coleman et al., *Making maintenance smarter: Predictive maintenance and the digital supply network*, Deloitte University Press, May 9, 2017.

15. Jeff Hood, Alan Brady, and Raj Dhanasri, *Industry 4.0 engages customers: The digital manufacturing enterprise powers the customer life cycle*, Deloitte University Press, December 15, 2016.

16. European Parliament, Directorate-General for Internal Policies, *Tax challenges in the digital economy*, 2016.

17. European Commission, "Fair taxation of the digital economy," accessed August 6, 2018.

18. Kelly Monahan, Jeff Schwartz, and Tiffany Schleeter, *Decoding millennials in the gig economy: Six trends to watch in alternative work*, Deloitte Insights, May 1, 2018.

19. John van Wyk, Peter Brooke, and Justine Bornstein, *Selling Industry 4.0: The new sales mind-set for connected products*, Deloitte Insights, March 29, 2018.

20. From a regulatory perspective, the European Union authorities have long sought to reduce—and ultimately eliminate—missing trader fraud. With this type of fraud, perpetrators focus on the sale of goods: purchasing goods VAT-free from suppliers in other European Union member states, selling on the goods with VAT added, and then "disappearing" before paying over the tax collected. In the United Kingdom alone, this type of fraud is estimated to cost the government between £500M and £1 billion annually, according to HM Revenue

and Customs. In more recent years, missing trader fraud has increasingly occurred among services, as by their very nature, they are intangible and difficult to track compared to physical goods. Proposals have been tabled by the European Union to seek to reduce this fraud by obliging the supplier to account for VAT on supplies of cross-border goods. Yet with the increasing prevalence of businesses selling digitized services rather than goods, it remains to be seen whether they will keep pace.

21. Rolls-Royce, "Nor Lines and Rolls-Royce sign landmark Power-by-the-hour service agreement," accessed August 6, 2018.

22. Rolls-Royce, "Rolls-Royce celebrates 50th anniversary of power-by-the-hour," press release, October 30, 2012.

23. European Commission, "Fair taxation of the digital economy."

24. OECD, "Milestone in BEPS implementation: Multilateral BEPS Convention will enter into force on 1 July following Slovenia's ratification," March 22, 2018.

Regulating the future of mobility

page 80

1. William D. Eggers, Mike Turley, and Pankaj Kishnani, *The future of regulation*, Deloitte Insights, June 19, 2018.

2. Darrell Etherington, "Waymo orders thousands of Pacificas for its 2018 self-driving fleet rollout," TechCrunch, January 30, 2018; Jamie L. LaReau, "How General Motors is leading the race for self-driving cars," *Detroit Free Press*, July 19, 2018.

3. Connexion, "Make self-driving cars pass driving test, agency says," April 1, 2018.

4. Etherington, "Waymo orders thousands of Pacificas for its 2018 self-driving fleet rollout"; LaReau, "How General Motors is leading the race for self-driving cars."

5. Deloitte analysis of the official XML copy of the Code of Federal Regulations, downloaded April 2018.

6. Nidhi Kalra and Susan M. Paddock, *Driving to safety: How many miles of driving would it take to demonstrate autonomous vehicle reliability?*, RAND Corp., 2016.

7. Asha McLean, "Nvidia redefines autonomous vehicle testing with VR simulation system," ZDNet, March 27, 2018.

8. Waymo, "On the road," accessed November 28, 2018.

9. Shai Shalev-Shwartz, Shaked Shammah, and Amnon Shashua, "On a formal model of safe and scalable self-driving cars," Mobileye, 2017; Junko Yashida, "Can Mobileye validate true redundancy?," *EE Times*, May 22, 2018.

10. Bloomberg Philanthropies and the Aspen Institute, "Initiative on cities and autonomous vehicles," accessed July 24, 2018.

11. Marcus C. Peacock, Sofie E. Miller, and Daniel R. Perez, "A proposed framework for evidence-based regulation," Regulatory Studies Center, February 22, 2018.

12. The National Highway Traffic Safety Administration's revised guidance clarified that guidance is voluntary and that entities do not need to wait to test their automated driving systems. It also removed the elements of registration and certification from its *safety assessment letter*, as both were already subject to state government regulations. The guidance also urged states not to codify the voluntary guidance, as some states tried to do with its 2016 guidance. See Marc Scribner, "NHTSA releases improved federal automated driving system guidance," Competitive Enterprise Institute, September, 12, 2017. The department's 2018 update also further elaborated guidance for commercial vehicles—i.e., trucking.

13. Max Ng and Amira Nabila Budiyano, "New regulations to address automated vehicle technology," Lexology, April 10, 2017.

14. See, for example, Land Transport Authority, "NTU, LTA and JTC unveil Singapore's first autonomous vehicle test centre," November 2017.

15. Leon Nash et al., *Securing the future of mobility*, Deloitte Insights, April 4, 2017.

16. Alyssa Bereznak, "So how legit is that wild car-hacking scene in 'The Fate of the Furious,' anyway?," *Ringer*, April 18, 2017.

17. Kristen Lee, "It's scarily easy to hack a traffic light," Jalopnik, August 16, 2016.

18. Adrienne LaFrance, "How self-driving cars will threaten privacy," *Atlantic*, March 21, 2016.

19. See, for example, Self-driving Coalition for Safer Streets, "FAQs," accessed August 13, 2018, calling for "one clear national framework" for AVs; and Securing America's Future Energy, "Autonomous vehicle legislation: State of play and SAFE's role," accessed August 13, 2018, which advocates for "federal preemption to supersede the messy patchwork of AV laws at the state level."

20. Alliance of Automobile Manufacturers, "Cybersecurity—Partnerships," accessed August 14, 2018.

21. Philip Bump, "Why Russian hackers aren't poised to plunge the United States into darkness," *Washington Post*, March 16, 2018; Maggie Koerth-Baker, "Hacking the electric grid is damned hard," *Vox*, August 13, 2018.

22. Scott Corwin et al., *Cities explore digital mobility platforms*, Deloitte Insights, March 9, 2018.

23. Ryan Beene, "NHTSA chief vows action this year on cybersecurity," *Automotive News*, January 19, 2016.

24. European Automobile Manufacturers Association, "Cybersecurity measures announced by auto manufacturers," October 18, 2017.

25. Automotive Information Sharing and Analysis Center, accessed March 27, 2017.

26. Auto Alliance, *Framework for automotive cybersecurity practices*, January 14, 2016.

27. Federation of Local Authorities of Israel, "The Federation of Local Authorities in Israel will hold the first international cyber security conference of its kind for the municipal sector," January 22, 2018.

28. Scott Corwin et al., *The future of mobility: What's next?*, Deloitte Insights, September 13, 2016.

29. Bureau of Transportation Statistics, "Transportation difficulties keep over half a million disabled at home," *Issue Brief* no. 3, 2003.

30. Henry Claypool et al., "Self-driving cars: The impact on people with disabilities," Ruderman white paper, January 2017.

31. Richard Mudge, *America's workforce and the self-driving future: Realizing productivity gains and spurring economic growth*, Securing America's Future Energy, June 2018.

32. Regina R. Clewlow and Gouri Shankar Mishra, *Disruptive transportation: The adoption, utilization, and impacts of ride-hailing in the United States*, University of California-Davis Institute of Transportation Studies Research Report UCD-ITS-RR-17-07, October 2017.

33. Javier Alonso-Mora et al., "On-demand high-capacity ride-sharing via dynamic trip-vehicle assignment," Proceedings of the National Academy of Sciences 114, no. 3 (2017): pp. 462–7.

34. Bruce Schaller, "The new automobility: Lyft, Uber, and the future of American cities," Schaller Consulting, July 25, 2018.

35. Skip Descant, "Could autonomous vehicles add to congestion? Maybe, say planners," GovTech, May 1, 2018.

36. National Association of City Transportation Officials, "Transit Street Design Guide," accessed August 2, 2018.

37. NYC Department of Transportation, *New York City mobility report*, June 2018.

38. Anne Elizabeth Brown, "Ride-hail revolution: Ride-hail travel and equity in Los Angeles," doctoral dissertation, University of California Los Angeles, 2018.

39. Matthias Spielkamp, "Inspecting algorithms for bias," *MIT Technology Review*, June 12, 2017.

40. Adam Pearce, "How 2 MTA decisions pushed the subway into crisis," *New York Times*, May 9, 2018.

41. Samantha Melamed, "Electric scooters have brought chaos and outrage in cities across the country. Is Philly next?," *Inquirer*, August 20, 2018.

42. This passage is adapted from Simon Dixon et al., "Funding the future of mobility," *Deloitte Review* 23, July 30, 2018.

43. Christina Anderson et al., "Three far-flung cities offer clues to unsnarling Manhattan's traffic," *New York Times*, February 26, 2018.

44. National Association of City Transportation Officials, *Curb appeal: Curbside management strategies for improving transit reliability*, November 2017.

45. Linda Poon, "This map takes all the guesswork out of confusing street parking rules," CityLab, April 3, 2018.

46. Corwin et al., *Cities explore digital mobility platforms*.

47. David Roberts, "Here's the real nightmare scenario for self-driving cars," *Vox*, April 20, 2018.

48. Andrew Salzberg, "Road pricing: A solution to gridlock," Medium, March 30, 2017; Faiz Siddiqui, "Lyft co-founder's vision to 'end traffic': congestion-priced roads," *Washington Post*, January 17, 2017.

49. David Meyer, "Beyond car ownership: How Finland set the stage for mobility-as-service," Streetsblog NYC, December 2, 2016.

50. Warwick Goodall et al., "The rise of mobility as a service," *Deloitte Review* 20, January 24, 2017.

51. World Economic Forum, *Reshaping urban mobility with autonomous vehicles: Lessons from the city of Boston*, June 2018.

52. Hussein Dia and Farid Javanshour, "Autonomous shared mobility-on-demand: Melbourne pilot simulation study," *Transportation Research Procedia* 22 (2017): pp. 285–296.

53. Lyft, "How Lyft works with public transit agencies across the country to eliminate transportation barriers," June 7, 2018; Uber, "Partnering with transit systems," accessed October 19, 2018.

54. Ian Marcus Corbin, "Silicon Valley has entered the culture war to 'make the world a better place,'" *Spectator*, May 17, 2018.

Picturing how advanced technologies are reshaping mobility

page 92

1. Deloitte, *2018 Global automotive consumer study: Exploring consumer trends on the future of automotive retail*, 2018.

2. For more, see David Smud, Craig Wigginton, Simon Ninan, Karthik Ramachandran, and Paul Moceri, *Connecting the future of mobility*, Deloitte Insights, February 28, 2017.

3. Yole Development, "Sensor technologies are mature for autonomous driving application," January 2016.
4. Patrick Nelson, "Just one autonomous car will use 4,000 GB of data/day," *NetworkWorld*, December 7, 2016.
5. Jack Stewart, "Tesla's self-driving software gets a major update," *Wired*, September 11, 2016.
6. For more, see Robin Lineberger, Aijaz Hussain, Siddhant Mehra, and Derek M. Pankratz, *Elevating the future of mobility*, Deloitte Insights, January 18, 2018.
7. For details of four potential future states of mobility, see Scott Corwin, Joe Vitale, Eamonn Kelly, and Elizabeth Cathles, *The future of mobility: How transportation technology and social trends are creating a new business ecosystem*, Deloitte Insights, September 24, 2015.

To live and drive in LA

page 102

1. Los Angeles Department of Transportation, "LADOT annual report fiscal year 2016–2017," accessed September 18, 2018.

What is work?

page 112

1. See Deloitte Insights' *Future of work* collection.
2. For more on the concept of skills versus capabilities, see John Hagel, "Mastering the learning pyramid," Edge Perspectives, November 28, 2017.
3. John Hagel, John Seely Brown, Maggie Wooll, and Alok Ranjan, *If you love them, set them free*, Deloitte University Press, June 6, 2017.

Are you having fun yet?

page 134

1. Amy Vanderbilt, *Complete Book of Etiquette: A Guide to Gracious Living* (New York: Doubleday, 1958).
2. Denise M. Rousseau, "Psychological and implied contracts in organizations," *Employee Responsibilities and Rights Journal* 2, no. 2 (1986): pp. 121–138.
3. Richard Fry, "Millennials are the largest generation in the US labor force," Pew Research Center, April 11, 2018.
4. Deloitte, *The Deloitte Millennial Survey 2018,* 2018.
5. Tiffany McDowell, *Fun at Work: Scale Development, Confirmatory Factor Analysis, and Links to*

Organizational Outcomes (San Diego: Alliant International University, 2004).

6. Deloitte Insights, *2018 Deloitte Human Capital Trends Report,* 2018.

7. McDowell, *Fun at Work*.

8. Robert Ford, Frank McLaughlin, and John Newstrom, "Questions and answers about fun at work," *Human Resource Planning*, accessed November 12, 2018.

9. Zappos Insights, "Zappos 10 core values," accessed November 12, 2018.

10. Zappos Insights, "3-day culture camp: The power of culture," accessed November 12, 2018.

11. Bryan Burkhart, "Getting new employees off to a good start," *New York Times*, March 13, 2013.

12. Mario Toneguzzi, "Best Buy unveils overhauled Montreal 'experience store,'" Retail Insider, December 5, 2017.

13. Southwest, "The MAX difference," accessed November 12, 2018.

14. LEGO, "Adding play into your workday can benefit engagement and wellbeing," September 7, 2018.

15. Kyle James Sandell, "Climate of workplace fun in a retail setting" (Unpublished doctoral dissertation, Colorado State University, Fort Collins, CO), 2015.

16. McDowell, *Fun at Work*.

17. Tony Kiss, "New Belgium celebrates 25 years," *Greenville News*, August 27, 2016.

18. Connor Green, "A crazy, behind-the-scenes tour of the New Belgium brewery," *Thrillist*, June 24, 2014.

19. Amy Wrzesniewski and Jane E. Dutton, "Crafting a job: Revisioning employees as active crafters of their work," *Academy of Management Review* 26, no. 2 (2001): pp. 179–201.

20. Sheba Ehteshami, "The happiness design: An innovation study," University of Southern California, May 2018.

Engaging employees as consumers

page 144

1. Ken Corless, Jacques de Villiers, Chris Garibaldi, and Kieran Norton, "Reengineering technology: Building new IT delivery models from the top down and bottom up," *Tech Trends 2018*, Deloitte Insights, December 5, 2018.

2. Matt Louden, "The 10 key benefits of digital transformation," *EnterpriseAppsTech*, June 26, 2017.

3. Jon Markman, "Netflix knows what you want … before you do," *Forbes*, June 9, 2017.

4. Arthur Mazor, Jannine Zucker, and Maribeth Sivak,

Crafting the HR customer experience: Design thinking meets the HR customer, Deloitte, 2017.

5. Michael Gretczko and Arthur Mazor, *Designing HR for the moments that matter*, Deloitte, 2017.
6. Ed Bowsher, "Online retail sales continue to soar," *Financial Times*, January 11, 2018.
7. Abraham H. Maslow, "A theory of human motivation," *Psychological Review* 50, no. 4 (1943): pp. 370–396.
8. Roger Lay, "Digital transformation—the ultimate challenge for the fashion industry," Deloitte, accessed November 28, 2018; John Souza, "How to improve brand perception with social media," *Social Media Impact*, June 6, 2011.
9. Stan Rapp, "Consumers as marketing co-creators," *1to1 Media*, November 16, 2009.
10. Ned Ehrbar, "Monopoly unveils new game pieces," *CBS News*, March 17, 2017.
11. Gaurav Bhalla, "Collaboration and co-creation: the road to creating value," *Marketing Journal*, May 25, 2016.
12. Susan K. Hogan, Rod Sides, and Stacy Kemp, "Today's relationship dance: What can digital dating teach us about long-term customer loyalty?," *Deloitte Review* 20, January 23, 2017.
13. Kristen Walsh, *How technology is creating anxiety*, Bentley University, December 17, 2015.
14. Kermit Burley, "How is technology impacting workplace stress?," *Houston Chronicle*, accessed November 28, 2018.
15. Michael Jones, "Yes, the robots will steal our jobs. And that's fine," *Washington Post*, February 17, 2016.
16. James Manyika, *Technology, jobs, and the future of work*, McKinsey & Company, accessed November 28, 2018.
17. Deloitte, "Robots can restore our humanity," accessed November 28, 2018.
18. Ashley Deibert, "Why authenticity in marketing matters now more than ever," *Forbes*, May 26, 2017.
19. Josh Bersin, Jason Flynn, Art Mazor, and Veronica Melian, "The employee experience: Culture, engagement, and beyond," *2017 Deloitte Global Human Capital Trends*, Deloitte University Press, February 28, 2017.
20. Young Entrepreneur Council, "How to embrace the power of authentic marketing," *Forbes*, August 10, 2012.
21. Sally, "The customer service strategies behind Zappos's success," *Sharpen*, September 9, 2016.

22. Scott Elser, "The marketing rules of three," *Inc*., December 2, 2015.

23. Amy Blankson, "5 strategies for setting digital boundaries," *Thrive Global*, July 10, 2017.

24. Victoria Petrock, "Are consumers warming up to personalized marketing services?," *eMarketer Brief*, July 26, 2016.

25. Jeff Beer, "PlayStation Is using content To build communities around video game launches," *Fast Company*, November 2, 2017.

26. Mazor, Zucker, and Sivak, *Crafting the HR customer experience*.

27. Everett M. Rogers, *Diffusion of Innovations* (New York: Free Press, 1983).

How the financial crisis affected the world's workforce

page 152

1. Carolyn O'Boyle, Josefin Atack, and Kelly Monahan, *Generation Z enters the workforce: Generational and technological challenges in entry-level jobs*, Deloitte Insights, September 19, 2017.

2. Heather Stockton, Mariya Filipova, and Kelly Monahan, *The evolution of work: New realities facing today's leaders*, Deloitte Insights, January 30, 2018.

3. Rachel Ngai and Barbara Petrongolo, "How the rise of the service sector boosted the demand for women workers," *LSE Business Review*, July 28, 2017.

4. Ibid.

PETER HORVATH

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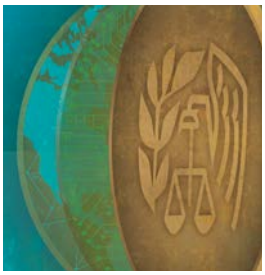

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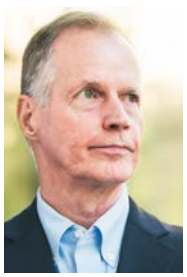

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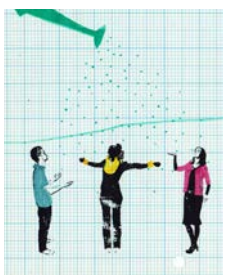

KATIE EDWARDS

THE END NOTE

{ What we said then }

"It is our prediction that within the next few years, FWAs (flexible work arrangements) will be viewed as an interim, late-20th-century workplace solution, a transitional step that helped individuals cope with changing work and personal demands. What is needed now is a more significant structural response to the workforce changes that are already well underway."

From "Mass Career Customization: Building the corporate lattice organization" by Cathy Benko and Anne Weisberg, published August 1, 2008

{ What we think now }

IF YOU THINK back years ago, a question from some could have been: *Isn't flexibility just a problem for a nominal few?* Indeed, flexible work arrangements were broadly considered a 'women's issue.' But we were clear that while women may have been first to point out the urgent need for greater flexibility, they were the proverbial canaries in the corporate coal mines. The rules of the one-size-fits-all, industrial age workplace weren't designed to fit the increasingly varied needs of more diverse, digital-age workers.

CATHY BENKO
Former vice chairman and managing principal, Deloitte Consulting LLP

Today, the question is no longer 'Why do we need a flexible workplace?' but rather, 'What's the best way to provide flexibility at scale?' 'Work' has been redefined from a place you go between nine and five to what you do within a dynamic, increasingly virtual workplace where technology enables new possibilities for where, when, and how work gets done. What's also emerged is an understanding that contemporary career journeys ebb and flow so individuals can have the flexibility to deal with life issues—eldercare, for example—that call for fitting life into work and work into life over time.

From here, it is expected to increasingly be *your career, your way.*

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*Source: Environmental Paper Network, papercalculator.org.

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