

Deloitte Review

The journey to agile
The workplace of tomorrow
Regulating digital reality

Issue 25 | July 2019



Looking ahead, staying ahead

Organizational transformation | Cyber | Future of Mobility | Technology and society

Deloitte.
Insights

DELOITTE REVIEW

EXECUTIVE EDITOR

Craig Giffi

CREATIVE DIRECTOR

Emily Moreano

EDITOR

Junko Kaji

LEAD DESIGNER

Molly Woodworth

DELOITTE INSIGHTS

EDITORS

Rupesh Bhat
Matthew Budman
Karen Edelman
Nairita Gangopadhyay
Abrar Khan
Ramani Moses
Aditi Rao
Kavita Saini
Prakriti Singhania
Rithu Thomas

DESIGN

Tushar Barman
Adama Manshiva
Mahima Nair
Anoop K R
Sonya Vasilieff
Rajesh Venkataraju
Kevin Weier

PRODUCTION

Lead: Blythe Hurlley
Preetha Devan

DATA VISUALIZATION & MULTIMEDIA

Sarah Jersild
Joanie Pearson
Vishal Prajapati
Megha Priya
Sourabh Yaduvanshi

AUDIENCE DEVELOPMENT

Lead: Amy Bergstrom
Ankana Chakraborty
Nikita Garia
Alexandra Kawecki
Hannah Rapp
Rhea Rawla
Anup Sharma

DIGITAL MANAGING EDITOR

Mike Boone

STAKEHOLDER ENGAGEMENT

David Scholes

CONTACT

Email: insights@deloitte.com



@DeloitteInsight #DeloitteReview



www.linkedin.com/company/deloitte-insights



Download the Deloitte Insights app

Deloitte.

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee, and its network of member firms, each of which is a legally separate and independent entity. Please see <http://www.deloitte.com/about> for a detailed description of the legal structure of Deloitte Touche Tohmatsu Limited and its member firms. Please see <http://www.deloitte.com/us/about> for a detailed description of the legal structure of the US member firms of Deloitte Touche Tohmatsu Limited and their respective subsidiaries. Certain services may not be available to attest clients under the rules and regulations of public accounting. For information on the Deloitte US Firms' privacy practices, see the US Privacy Notice on Deloitte.com.

Copyright © 2019 Deloitte Development LLC.
All rights reserved.

DEPARTMENTS

4

Leader

Deloitte US CEO Joe Ucuzoglu on staying ahead of change.

6

On the Web

Explore highlights from our website.

160

The end note

Jennifer Veenstra on the evolution of the chief marketing officer role.

IN BRIEF

Short takes from our longer content



Agile, prepared, and confident | **56**



Innovation in Europe: | **58**



The more they bet, the more they'll watch | **74**



Government, business, and closing the talent gap | **76**



The consumer is changing ... but perhaps not how you think | **102**



Launching innovative biopharma in China | **104**

Organizational transformation



The digital workforce experience | 10

by Arthur H. Mazor, Sandra Houillier, Maude Tremblay-Charland, Jannine Zucker, and Steve Winsor

Technology in the workplace often presents users with a disjointed, frustrating experience. Going beyond portals to build a unified engagement platform that allows workers to interact seamlessly with the organization can increase both engagement and productivity.



Pivoting to digital maturity | 18

by David Schatsky and Ragu Gurumurthy

Why do digital transformation efforts sometimes fail to deliver? Applying seven “digital pivots” across the enterprise can help organizations reap the benefits of increasing digital maturity.



Stepping stones to an agile enterprise | 36

by Carsten Brockmann, Christian Nagel, Stephan Kahl, and Andreas Biermann

Few IT organizations—or enterprises—can make the leap to agile in one fell swoop. Here’s how to make the journey step by step, realizing benefits at every stage.



If these walls could talk | 46

by Susan K. Hogan, John Lucker, Robbie Robertson, and Flavie Schäfer

Can redesigning the workspace boost collaboration, productivity, and engagement? Here’s why it often doesn’t—and how to approach a remodeling project for more positive results.

Cyber



Cyber, cyber everywhere | 62

by Nick Galletto, Ed Powers, and Tim Murphy

Organizations are embedding connected digital technologies in their information technologies, operational technologies, and end products, making cyber a top organizational priority. Innovating fast is now contingent on a well-orchestrated cyber program.

Future of Mobility



Toward a mobility operating system | 82

by Scott Corwin, Anant Dinamani, and Derek Pankratz

The future of mobility is arriving none too soon for cities struggling with outdated transportation infrastructure and ever-increasing demand. But the challenges of the new mobility ecosystem—including transparency, interoperability, and coordination—demand a mobility operating system. Meet the MOS.



Tempering the utopian vision of the mobility revolution | 94

by Craig Giffi, Joe Vitale, and Ryan Robinson

As global consumers start to critically evaluate advanced vehicle technologies and whether they are willing to pay for them, utopian visions of future mobility systems may not be as close as we thought, leaving OEMs in the precarious position of needing to push forward on costly R&D programs with little assurance of ROI.

Technology and society



Digitalizing the construction industry | 108

by Peter Evans-Greenwood, Robert Hillard, and Peter Williams

Technology isn't the only, or even main, source of disruption. Increasingly, all it takes is the realization that social and economic factors enable old technologies to be used in new ways.



Reimagining customer privacy for the digital age | 122

by Val Srinivas, Sam Friedman, and Tiffany Ramsay

Privacy isn't just about compliance anymore. Learn how financial institutions can adopt a more expansive framework to strike the right balance between better access to information and ensuring consumer trust.



How to begin regulating a digital reality world | 136

by Allan V. Cook, Joe Mariani, Pankaj Kishnani, and Cary Harr

Augmented reality is rapidly bringing the physical and digital worlds closer. While this can create value for businesses, it also means new challenges, such as who owns augmented spaces, that government and businesses need to work together to address.

LEADER

Looking ahead, staying ahead



JOE UCUZOGLU
CEO, Deloitte US

BEING A SUCCESSFUL senior business leader has never been easy. Leadership—in any era—has always needed to drive the creation of products, services, and experiences that delight customers, and do so under constant threat of competitors creating something better. Making important business decisions in the face of uncertainty and a highly competitive environment has, and likely always will be, extremely challenging.

If creating a winning customer value proposition is akin to scoring a goal, doing so in today’s environment is like shooting with moving goalposts. Customer expectations are changing, driven by advancing technology and a competitive landscape that is constantly offering something new and better. More than ever, what was good enough to win last year is unlikely to be good enough this year, and almost certainly won’t work two or five years from now. This means leaders should constantly challenge their organization to do things differently, creating a burning platform for change even when they are currently enjoying significant success. The question is: What direction to take? How can we know the right *direction* to shoot?

Foresight on this level can be hard to achieve. In an age of unprecedented cultural and demographic diversity, what does it really mean to understand one’s customers or take care of one’s people? With digital technology permeating every aspect of business and society, how can organizations marshal digital capabilities to help drive innovation and improve efficiency?

That’s where we aim to help. This issue of *Deloitte Review* digs into the pressing business concerns of today, past the level of platitudes and sound bites, to explore how organizations can achieve meaningful, sustainable results both now and in the future. In the pages that follow, you’ll find insights on topics including:

- **Digital transformation.** Organizations across industries are racing to “digitally transform” their operations and invest in their long-term future. But what does it really mean to be “digitally mature”—and what actions can an organization take to get there?

-
- **Cybersecurity beyond the IT function.** There's a whole world of cyber risk outside the mainframes and systems of corporate IT infrastructures, and the target is the technology that increasingly pervades the products and services that organizations offer to customers. How can companies protect their customers—and themselves—from these risks?
 - **Regulating digital reality.** Imagine that someone has digitally “sprayed” a rude phrase, visible only through augmented reality glasses, on one of your billboard advertisements. Do you have the right to do something about it? Does government? How does the progressive blending of digital and physical space affect the role of regulation in both?
 - **Complex disruption.** We all know that breakthrough new technologies can disrupt the market, upending whole industries. But how prepared are leaders to recognize and deal with disruption that arises, not from a specific invention, but from a confluence of disparate socioeconomic, marketplace, and technological trends?
 - **The workplace of tomorrow.** Open office layouts have been quite the rage over the past few years, but it turns out that workers don't always welcome them with open arms. How can organizations approach designing the physical workspace in ways that drive positive results?

In the pages that follow, I encourage you to explore these and the many other questions we raise in this installment of *Deloitte Review*. Because when it comes to anticipating and dealing with change, keeping up with everyone else is no longer enough. Creating and sustaining value today depends on setting yourself apart in ways your competitors haven't even thought about—continually looking ahead to understand what drives superior performance.



on the

THE FUTURE OF AGING

In a future of health focused on prevention, aging may no longer be defined by disease, but, rather, extended vitality. How will people work, retire, and pay for their later years? See what experts in aging services, policy, innovation, and technology think about the future.

www.deloitte.com/insights/aging



SHIFTING DIVERSITY INTO HIGH GEAR

Auto companies appear to be moving backward when it comes to women in the workplace. What roadblocks do women in auto face, and what steps can companies take to close the auto industry's talent gap?

www.deloitte.com/insights/women-in-auto

CLIMATE, COST, AND CHOICE

Our 2019 Resources Study asked more than 1,500 US residential consumers and 600 US businesses about their attitudes and actions regarding energy and resource management. While most businesses and consumers surveyed realize the need to address climate change, they are still held back by cost and complexity. Learn more about how businesses can up the ante.

www.deloitte.com/insights/resources



e w e b

Now available on www.deloitte.com/insights



YOU SNOOZE, YOU WIN

Is sleep a business issue? Sure, getting a good night's sleep increases well-being, but it can also boost productivity and creativity and help foster innovation. Learn how organizations can create an environment that puts sleep first.

www.deloitte.com/insights/snooze

VIDEO GAMING GOES MAINSTREAM

Video gaming has become a legitimate competitor to TV and movies in the battle for consumers' attention. Overall, 30 percent of US consumers pay for a gaming subscription service and 41 percent play video games at least weekly. What are the implications for strategic planning for media and entertainment companies?

www.deloitte.com/insights/gaming



WHAT'S HAPPENING THIS WEEK IN ECONOMICS?

In this weekly update, Deloitte's team of economists examines news and trends from around the world. Get the latest on how world events are shaping economic and business concerns.

www.deloitte.com/insights/economic-weekly

ORGANIZATIONAL TRANSFORMATION

CYBER

FUTURE OF MOBILITY

TECHNOLOGY AND SOCIETY



The digital workforce experience | 10

By Arthur H. Mazor, Sandra Houillier, Maude Tremblay-Charland, Jannine Zucker, and Steve Winsor

Pivoting to digital maturity | 18

By David Schatsky and Ragu Gurumurthy

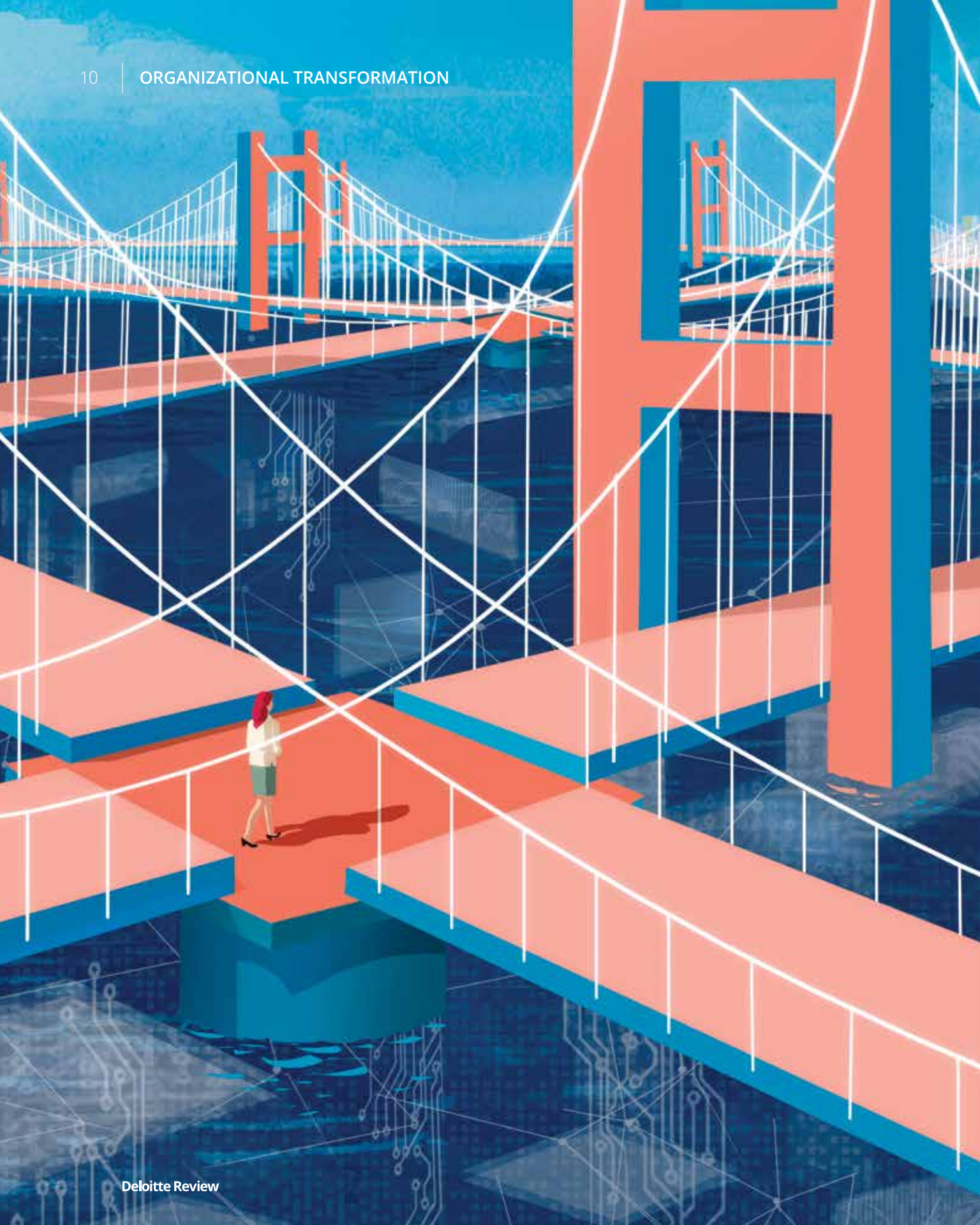
Stepping stones to an agile enterprise | 36

By Carsten Brockmann, Christian Nagel, Stephan Kahl, and Andreas Biermann

If these walls could talk | 46

By Susan K. Hogan, John Lucker, Robbie Robertson, and Flavie Schäfer





The digital workforce experience

Getting technology to work at work

BY ARTHUR H. MAZOR, SANDRA HOULLIER, MAUDE TREMBLAY-CHARLAND,
JANNINE ZUCKER, AND STEVE WINSOR

ILLUSTRATION BY EVA VÁZQUEZ

Today, the complexity in our personal lives is made simple through well-orchestrated services and great experiences enabled by digital technology. With just a few clicks or taps on a screen, we can book a multicity vacation, stream a recommended video on a device of our choosing, or buy a product online with next-day delivery. All are complex services to deliver; yet they are easy to request and receive. The seamless digital experiences to which we have become accustomed in our personal lives have created an expectation for better experiences, with near-flawless technological enablement, in our work lives as well.

However, when we join an organization, things are often very different. The experience we have as a worker is not at all the same as the one we have as a customer. We often struggle to effectively connect with our colleagues and to uncover the information we need to be immediately productive. Instead of the intuitive digital experience we have as customers in the outside world, we may be asked to maneuver through complex internal organizational structures, processes, and systems, often with no straightforward way to get support. Indeed, 70 percent of workers report having to enter the same data in multiple systems to get their job done.¹

Why does this matter? Because in a world where people expect to be able to engage with each other and with organizations with the greatest of ease, a digital workforce experience that doesn't measure up to the commercial standard can cause a great deal of frustration—contributing to a negative workforce experience overall. And that's a problem, because the quality of the workforce experience matters a great deal to productivity and engagement. According to one recent study, organizations with the most compelling workforce experiences generated 22 percent higher engagement among their workers than organizations with a less compelling workforce experience. These workers were also four times more likely to stay in their jobs than those at organizations with a less compelling workforce experience.² What's more, organizations with

the best workforce experiences also enjoyed 12 percent greater customer satisfaction than other organizations, and their three-year revenue growth rate was 2.3 times greater than the average of the whole sample.³

The good news is that organizations *can* improve their digital workforce experience and, along with it, worker engagement and productivity. To do this well, however, means devoting the same level of focus to workers' internal digital experience—and to the systems, processes, and capabilities that support it—as is given to the digital experience offered to external customers. In our experience, this degree of focus and investment is unfortunately



rare: While companies make enormous investments in their efforts to offer the best experiences possible to their customers, few if any invest anywhere near as much to offer an equally compelling workforce experience.

The perhaps predictable result of this lack of investment is that many workers don't find their workforce experience very fulfilling, engaging, or even particularly satisfactory. Deloitte's 2019 Global Human Capital Trends survey, for instance, found that less than half (49 percent) of the responding HR and business leaders believed that their organizations' workers were satisfied or very satisfied with their job design. Only 42 percent thought that workers were satisfied or very satisfied with day-to-day work practices, 38 percent thought that they were satisfied or very satisfied with work-related tools and technology, and 38 percent thought that workers had enough autonomy to make good decisions.⁴

Transforming enterprise service delivery with better governance and technology

Of course, there's more to enabling a positive workforce experience than getting the digital dimension

right. But our work with a variety of organizations suggests that the digital experience is often where leaders have a great, perhaps the most, opportunity for improvement.

Where might those opportunities lie? The details of what technologies might be needed to enable different kinds of work are unique to each industry and, to some extent, every organization. But across the board, one major area that can often benefit from improvement is the way the enterprise of the organization itself interacts with its workers. The opportunity is nothing less than to transform enterprise service delivery. By leveraging technology and establishing cross-functional, enterprise-level governance, organizations have the chance to streamline and simplify the transactions between the workforce and the enterprise, fostering greater engagement and driving more productivity in both the front and the back office.

The vision of a unified engagement platform

A dozen or so years ago, the concept of helping workers navigate an organization's various systems, tools, and sources of information was, at best, translated into an intranet portal through which to



access various organizational systems (the old-fashioned “link farm”). Each function, especially the ones supporting workers (such as IT, HR, finance, security, legal, facilities, supply chain, and procurement), typically developed its own set of functionally optimized digital tools and processes, along with its own service delivery structures and governance mechanisms. As a result, workers faced multiple points of contact for requesting transactions, making approvals, viewing request statuses, and actually receiving services. A new employee, for instance, might have to make four separate requests through four different systems to obtain a laptop (through the IT system), get a badge (through security), enroll in benefits (through HR), and set up direct deposit (through finance). For that employee, things would be much easier if he or she could simply place *one* request for “onboarding”—and then take care of various onboarding activities through the same point of access using the same interface.

The problem has the potential to get worse, not better, given many companies’ probable future technological trajectory. The average number of systems workers must access as part of their day-to-day jobs has recently risen from eight to 11,⁵ and 27 percent of surveyed workers estimate they lose up to an entire day every week on irrelevant emails and messages.⁶ Furthermore, as more and more organizations reduce their reliance on traditional, monolithic systems of record in favor of more nimble, microservice-based architectures, they will actually have more, not fewer, back-end technologies.

But today, having many disparate back-end systems doesn’t have to mean a fragmented front-end user experience. Technologies are available that make it possible to create what we call a “unified engagement platform”: a user-experience layer that can span across systems to provide a seamless digital experience. Some leading companies, in fact, are

implementing this kind of unified engagement platform today to create a single, brand-aligned digital experience for their employees, managers, and service delivery agents. These platforms seek to integrate core systems of record into a single enterprise service management platform, and may also incorporate an ecosystem of automation and collaboration tools such as chatbots, robotic process automation (RPA), and enterprise social platforms.

Having many disparate back-end systems doesn't have to mean a fragmented front-end user experience.

A well-designed unified engagement platform can do more than enable a seamless digital experience for employees, managers, and agents when they request and manage services. It can also include enterprise-grade workflow tools to simplify service delivery and improve service delivery speed and accuracy across the enterprise. To do so, a platform must tightly integrate personalized knowledge and content with case management; be able to capture service-level compliance; and provide operational reporting and analytics so outcomes can be measured and the system continually improved. A platform that can do all this while delivering services through the channel and form factor of the user’s choice can be of enormous benefit to an enterprise, not only by improving the digital experience but by increasing service delivery efficiency. For instance, Australia Post has recently implemented an integrated experience and workflow platform that—besides streamlining workers’ access to and delivery of enterprise services—has cut the training time for its customer sales and service agents in half and reduced the average number of clicks per transaction from 160 to 11.⁷

Further, the same technology that bridges functional systems to improve business users’ access to

services can also give individuals and teams within the functions an integrated platform from which to provide those services. For instance, cases can be automatically routed to the appropriate department, team, or person, and workflow tools can help manage those cases according to predefined timelines with detailed fulfillment instructions and checklists. Procedures, guidelines, and policies are all documented within the system, immediately accessible to those who may need to refer to them. Dashboard reporting allows supervisors and managers to track metrics and perform analytics to evaluate performance and support improvement efforts.

On the cusp of the future

Pioneering enterprises are also looking at the bigger technological picture by integrating innovative automation and collaboration technologies into their unified experience platforms. Take HR technology as an example. Some 40 percent of large enterprises have implemented cloud human capital management (HCM) technology in the hope of transforming



the HR experience by centralizing HR and payroll data.⁸ But at the same time, as many companies were implementing cloud HR platforms, a major marketplace shift was turning these platforms into table stakes: the development of new, complementary technologies for automation, communication, collaboration, and service management. These newer technologies are just now reaching the point at which they can address rising workforce expectations for a consumer-grade experience in everything they do across life and work.

For example, one global automotive company undertook a major initiative to automate work as well as to enable more effective collaboration within and outside the enterprise, including with its more than 2,000 suppliers and 15,000 dealerships around the world. Using a human-centered perspective to design solutions that cut across functional silos, the organization considered what its employees and partners needed to be more collaborative, speed decision-making, and enhance business results. Ultimately, while multiple technologies from different vendors were introduced, all were integrated into a single common platform for all parties to use. This effort has been credited with driving savings of more than US\$2 million to date.

Implementation considerations

By its very nature, an effort to integrate the digital workforce experience across the enterprise is not something that can be confined to a single function. However, a large technology investment in any one function can help jump-start the process if the organization views the implementation as a chance to revamp the whole technology ecosystem. To do this successfully, organizations must drive collaboration across functions and platforms and create enterprise governance structures that optimize workflows and experiences for the enterprise as opposed to optimizing them for any single function. If transformation happens in silos or is solely

focused on a single core set of technologies, workforce experience can suffer, and organizations may be left with a suboptimal digital experience, low user-adoption of new tools, and cumbersome processes that have simply been brought from one legacy environment to a newer platform.

No matter what function takes the lead, it's important to take a "worker-centric" rather than a "process-driven" approach to building a unified experience platform—which means designing the platform around the experience people want to have when they use it, rather than basing its design on the steps of the processes it supports. Successful enterprises approach this task by using design thinking to listen to their workers' pain points and needs, gaining insights about their experience from diverse sources: focus groups, surveys, net promoter scores, webpage tracking, and so on. To understand what a "good" digital experience looks like, personas can be created to represent various roles and workforce segments—including workers in the "alternative" workforce, whose representation in many organizations' workforces continues to grow. The organization can then formulate journey maps that depict the personas' current and desired interactions with the organization's technologies, as well as their anticipated thoughts, feelings, and concerns while doing so. Because workers' perceptions of experience don't depend on what function or service they're trying to reach when using the technology, a cross-functional perspective is essential to mapping out a digital experience that is consistent across touchpoints. These journey maps can guide the design of the unified front end and the implementation of the technologies that will enable it. Agile and design methodologies (such as A/B

testing, sprints, and rapid prototyping) can be used to quickly tease apart what matters from what doesn't. Metrics to gauge workforce experience—for instance, technology adoption rates or engagement survey results—can help leaders assess the effort's effectiveness, both during implementation and afterward.

Australia Post's approach to developing its integrated experience and workforce platform illustrates how an organization can strive to take a worker-centric view. The organization began by asking and answering three key questions:

1. What do employees require of Australia Post to effectively connect the organization?
2. What must Australia Post enable for employees to feel empowered and motivated to continually evolve and innovate how they do their work?
3. What do employees expect to be able to do for themselves in managing both work and personal administrative obligations?

An important part of this step was the creation of eight personas to represent Australia Post's diverse workforce. The resulting understanding of worker needs then informed the project's overall strategy, including the platform's desired future role, its target architecture, an implementation road map, and even a high-level cost estimate. To bring the strategy to life, Australia Post developed creative concepts for its user interface, with a strong focus on user-centered design, enhanced interactivity, clear layout and format, and direct links to important content.

Australia Post's approach to developing its integrated experience and workforce platform illustrates how an organization can strive to take a worker-centric view.

It goes without saying that an enterprise must manage change continuously in an effort of this nature. Without a robust change approach, a seamless digital experience will never arise, even with the most advanced enabling technologies in place. To facilitate change, organizations can create a centrally managed community of champions and change agents tasked with disseminating the expected behavior into the workplace.

The bottom line: When people experience technology that works for them *at work*, they are on the path to a positive workforce experience overall—one that can increase organizational loyalty, engagement, and productivity. The sophisticated digital experiences that today's workers enjoy in their private lives has set a high bar for enterprises to clear, but the potential business benefits can be well worth the effort. ●

ARTHUR H. MAZOR, a principal with Deloitte Consulting LLP, is the Human Capital practice's digital leader and the global leader for HR Strategy & Employee Experience. He is based in Atlanta.

SANDRA HOULLIER, Deloitte LLP, is a director for Deloitte's Human Capital practice in Canada. She is based in Montreal.

MAUDE TREMBLAY-CHARLAND, Deloitte LLP, is a senior consultant with Deloitte's Human Capital practice in Canada. She is based in Montreal.

JANNINE ZUCKER, a principal with Deloitte Consulting LLP, is the HR Customer Experience leader for the Human Capital practice. She is based in Miami.

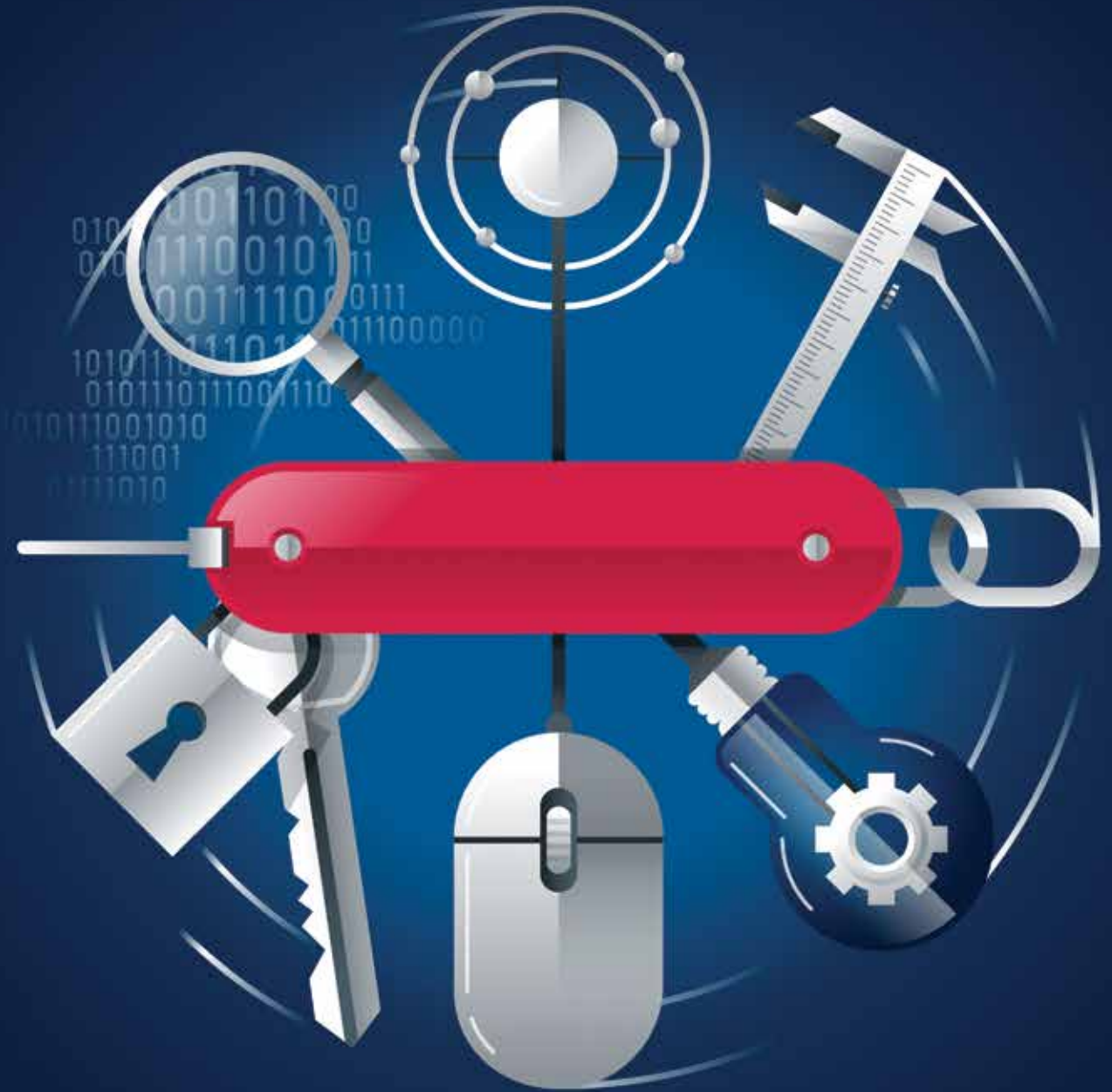
STEVE WINSOR is the national ServiceNow leader in Canada, where he leads Deloitte Canada's Enterprise Services and Service Transformation practice. He is based in Alberta, Canada.

Read more on www.deloitte.com/insights
The journey to digital

Digital technologies can improve efficiency, power new products and services, enable new business models, and blur the boundaries between industries. Every successful enterprise will one day be a digital enterprise. Explore our Digital Transformation collection to see how leading companies are making this journey.

Visit www.deloitte.com/insights/digital-transformation





Pivoting to digital maturity

Seven capabilities central to digital transformation

BY DAVID SCHATSKY AND RAGU GURUMURTHY

ILLUSTRATION BY YANN SADI

Why do digital transformation efforts sometimes fail to deliver? Applying seven “digital pivots” across the enterprise can help organizations reap the benefits of increasing digital maturity.

Constant pressure on businesses to innovate and grow in a dynamic competitive environment has made digital transformation a top priority for businesses across industries. Organizations are devoting significant time, effort, and capital to digitally transform. Some achieve significant tangible results from these efforts. Others achieve less impact. Why?

In search of the factors that lead to digital transformation success, we surveyed 1,200 senior executives knowledgeable about their organizations’ digital transformation efforts. The findings from the survey, coupled with our own experience, show how organizations can structure their digital transformation initiatives to help ensure they have a positive impact—in other words, that they’re doing what it takes to become more digitally mature.

In this article, we discuss in detail our findings on what tends to drive successful digital transformation. These can be briefly summarized as follows:

- Organizations are planning to invest aggressively in digital transformation efforts. According to our survey, digital transformation budgets will increase by 25 percent in the coming year versus the prior year.
- Digital transformation is about more than implementing discrete technologies. Rather, it requires developing a broad array of technology-related assets and business capabilities, which we call *digital pivots*, that can help propel an organization along the journey toward becoming a digital enterprise.
- Organizations that are more digitally mature—meaning they are deriving greater benefit from digital transformation efforts—are in large part distinguished by their cross-functional execution of more digital pivots. In other words, the more comprehensive and coordinated an organization’s digital transformation efforts are, the more likely it is to be digitally mature.
- On average, higher-maturity organizations’ digital transformation efforts are twice as broad as those at lower-maturity organizations.
- To prioritize transformation efforts, we recommend first implementing foundational pivots focused on assets such as infrastructure and talent, then applying a broad range of pivots to one business function to achieve *systemic, pervasive* transformation of that function. Focusing on transforming back-office operational functions first is less risky, whereas focusing on customer-facing functions may produce market impact more quickly.
- The digital pivots are necessary—but not sufficient—for digital transformation. Higher-maturity organizations tend to be distinguished by the presence of complementary “soft” factors such as strong leadership and a digital mindset.
- A higher level of digital maturity is correlated with above-average financial performance. Higher-maturity organizations are nearly three times more likely than lower-maturity organizations to report net profit margins and annual revenue growth that are significantly above the averages in their industry.¹

Executing digital transformation

Digital transformation has risen to the top of organizational agendas. In a recent survey of US and European business and technology decision-makers, some three-quarters said their company had undertaken a digital initiative.² But effort does not necessarily translate into benefit, and many

organizations continue to struggle to translate the execution of digital transformation programs into tangible impact.

It must be noted that there is disagreement on what digital transformation means. For our purposes, digital transformation is about becoming a digital enterprise: an organization that uses data and technology to continuously evolve all aspects

FIGURE 1

Seven digital pivots propel an organization's progress toward digital maturity

- 1 Flexible, secure infrastructure**
Implementing technology infrastructure that balances security and privacy needs with the ability to flex capacity according to business demand.
- 2 Data mastery**
Aggregating, activating, and monetizing siloed, underutilized data by embedding it into products, services, and operations to increase efficiency, revenue growth, and customer engagement.
- 3 Digitally savvy, open talent networks**
Retooling training programs to focus on digital competencies, and staffing teams through flexible, contingent talent models to rapidly access in-demand skill sets and flex the organization's workforce based on business need.
- 4 Ecosystem engagement**
Working with external business partners including R&D organizations, technology incubators, and startup companies to gain access to resources such as technology, intellectual property, or people to increase the organization's ability to improve, innovate, and grow.
- 5 Intelligent workflows**
Implementing and continuously recalibrating processes that make the most of both human and technological capabilities to consistently produce positive outcomes and free up resources for higher-value actions.
- 6 Unified customer experience**
Delivering a seamless customer experience built around a 360-degree view of the customer that is shared companywide so that customers experience coordinated digital and human interactions that are useful, enjoyable, and efficient in immersive, engaging environments.
- 7 Business model adaptability**
Expanding the organization's array of business models and revenue streams by optimizing each offering to adapt to changing market conditions and augment revenue and profitability.

Source: Deloitte analysis.

of its business models—what it offers, how it sells (interacts with its customers) and delivers, and how it operates.

THE DIGITAL PIVOTS

Our experience tells us that becoming a digital enterprise requires the development of a broad array of assets and capabilities, which we call digital pivots, enumerated in figure 1.

We have learned—and will show in this report—that the digital pivots have greater impact *when executed in concert rather than selectively*. And the greatest benefit comes to organizations that apply them widely—across multiple business functions.³

Increasing the impact of digital transformation

To better understand the digital pivots' role in driving digital maturity, we surveyed senior executives at medium-sized and large organizations in the United States who were knowledgeable about the

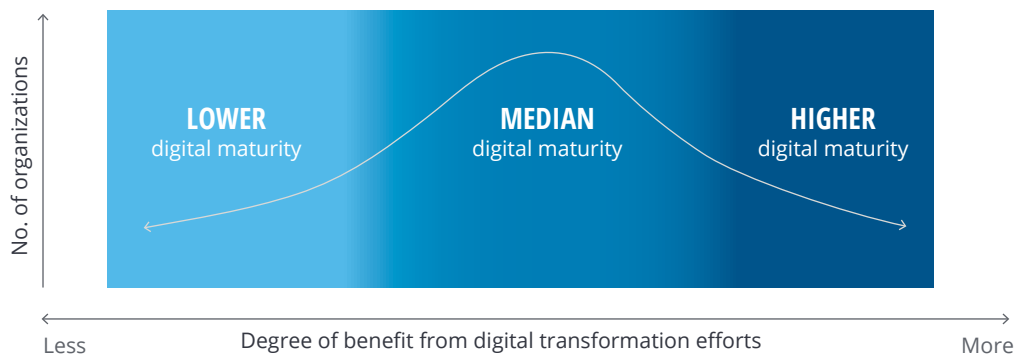
digital transformation efforts underway across their organizations. The survey asked respondents to indicate which pivots their organization had executed and how broadly the pivots were applied across business functions such as IT, marketing, sales, finance, and so on. We also asked how much benefit, if any, those pivots had delivered. (For details on the survey methodology, see Appendix: Methodology and demographics.)

DIGITAL MATURITY IS MEASURED IN BUSINESS BENEFIT

Transformation initiatives are only as valuable as the business impact they drive. In our analysis of the survey results, therefore, we adopted a simple measure of digital maturity: the extent to which respondents said an organization's digital transformation efforts are delivering business benefit. We then classified respondents into three segments—lower, median, and higher—according to the degree of business benefit they said they were achieving from their actions (figure 2). Digital transformation is a continual process, and digital maturity is a moving target. So we present these as relative rather than absolute classifications.

FIGURE 2

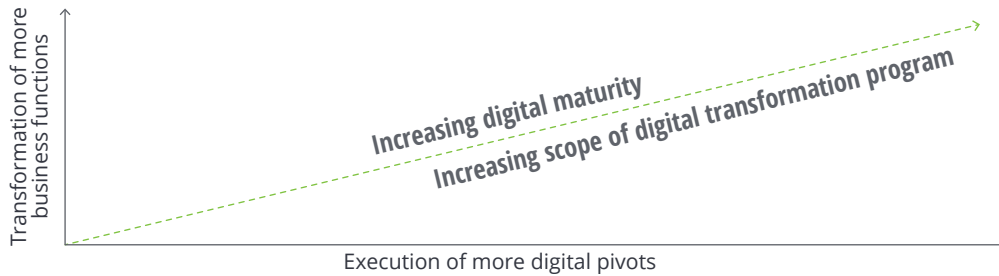
We measured digital maturity based on the extent of the business benefit yielded by an organization's digital transformation efforts



Source: Deloitte analysis.

FIGURE 3

An organization's digital maturity correlates with the scope of its digital transformation efforts



Source: Deloitte analysis.

The data we collected and analyzed in this survey, in addition to our experience helping our clients navigate their digital transformation journey, has helped us isolate some of the key factors that drive successful digital transformation. While no single prescription applies to every company, these insights can be used to guide the design and implementation of digital transformation programs that deliver tangible results.

DIGITAL MATURITY INCREASES AS PIVOTS ARE APPLIED IN MORE BUSINESS FUNCTIONS

Digital maturity is correlated with how systematically and how broadly an organization executes the digital pivots. In other words, the more widely these assets and capabilities are implemented and adopted in an organization, the more likely the organization will experience significant positive business impact from them (figure 3).

Lower-maturity companies tend to think of digital transformation in narrow terms—for instance, as simply supporting omnichannel customer interaction or investing in robotic process automation for call centers. Higher-maturity companies tend to have a more expansive view.

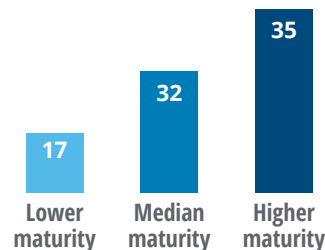
Our survey found that higher-maturity organizations' digital transformation efforts tend to be

twice as broad as those of lower-maturity organizations, on average.⁴ Having asked participants to select in which of nine business functions any of seven digital pivots were being applied, we could identify which of the 63 possible pivot applications—that is, efforts to apply a pivot to a specific function—each organization was executing. Lower-maturity organizations executed an average of 17 pivot applications, whereas higher-maturity organizations executed an average of 35 (see figure 4).

FIGURE 4

On average, higher-maturity organizations have executed roughly twice as many pivot applications as lower-maturity organizations

Mean number of pivot applications executed by digital maturity level



Source: Deloitte Digital Transformation Executive Survey 2018.

What's more, all higher-maturity respondents had executed all seven of the pivots in at least some functions. This validates our belief that maximizing the benefits of digital transformation requires a concerted effort to execute the digital pivots, applying them broadly across an organization.

Prioritizing digital transformation efforts

Digital transformation requires a comprehensive, concerted effort. But organizations must start somewhere.

BEGIN WITH THE FOUNDATIONAL PIVOTS

All the pivots are important, but three are foundational: They make it possible to execute the other pivots more effectively. They also lend themselves to broad application across all business functions. These are *flexible, secure infrastructure*; *data mastery*; and *digitally savvy, open talent networks*.

Invest early in flexible, secure infrastructure

The *flexible, secure infrastructure* pivot involves implementing a technology infrastructure that balances security and privacy needs with the ability to flex capacity according to business demand and develop new capabilities with agility. This entails adopting cloud infrastructure; embracing agile/DevOps methodologies; developing and using technology platforms where possible, rather than ad hoc applications; and implementing a cybersecurity strategy, among other elements. The IT function is the natural leader of this pivot and should undertake it with an evangelical spirit and the goal of organizationwide adoption. Over 60 percent of higher-maturity companies surveyed had implemented this pivot in at least five functions compared to just 15 percent of lower maturity companies.

A word about *platforms*, a term that has come to mean many things. In this context, we consider a

platform to be any reusable collection of digital assets and capabilities that can work together to make it easier to build a product or deliver a service. We do not mean platform in the sense of a multi-sided platform or platform-based business, such as Uber or Airbnb. The platform business model can be highly attractive but is not appropriate for every company. Digital transformation does not *require* creating a platform-based business model.

Data mastery is a path to insight

Another foundational pivot is *data mastery*. Data mastery involves the use of data and analytics to find insights that help organizations become more efficient and pursue new business opportunities effectively. Data mastery is about more than building “data lakes” or empowering senior leaders to make better decisions. It is also about structured and unstructured data flowing through organizational processes to enable decisions at the *edges* of an enterprise. Much of the value of data mastery is derived from making micro insights widely available to people and processes across an organization.

Achieving data mastery can entail an organization-wide effort, sometimes under the direction of a chief data officer, to identify and evaluate data assets and build or acquire (with IT support) the necessary platforms and competencies. Eighty-eight percent of higher-maturity companies in our survey reported that they were obtaining a significant positive impact from their use of data, compared to just 24 percent of lower-maturity companies. The IT function is the natural orchestrator of this pivot as well. But its execution requires broad involvement of the other business functions.

Bring talent along on the journey

Talent is undeniably critical to digital transformation. Research by Deloitte and *MIT Sloan Management Review* found that the No. 1 operational and cultural challenge organizations most commonly face in digital transformation is finding, training, and retaining the right talent.⁵ Accordingly, the *digitally savvy, open talent networks* pivot is

an amalgam of practices intended to give organizations access to the right talent at the right time. These include retooling training programs to focus on digital competencies and staffing teams through more flexible, contingent talent models to rapidly access in-demand skill sets and flex the organization's workforce based on business need.

Higher-maturity organizations are almost five times more likely than lower-maturity companies to strongly agree that their organization excels at helping employees develop digital skills. And they are more than six times as likely to strongly agree that they excel at leveraging contingent/flexible labor sources. The human resources function is the driver of this pivot. HR also has a key role to play in architecting incentives and rewards to nudge the talent in an enterprise to behave more like the talent at digital native companies in terms of how decisions are made and processes are orchestrated.

WHEN THE FOUNDATION IS IN PLACE, FOCUS ON A FUNCTION AND GO DEEP

With the foundational pivots in motion, we recommend that organizations proceed by selecting a single business function for comprehensive digital transformation. By this, we mean applying the full complement of digital pivots to achieve systemic transformation of that function. This approach helps organizations develop confidence in their ability to execute the pivots. And it allows leaders of other functional areas to observe the benefits of transformation achieved by those who have gone first. This can build organizational momentum to support the scale and scope of change that digital transformation requires.

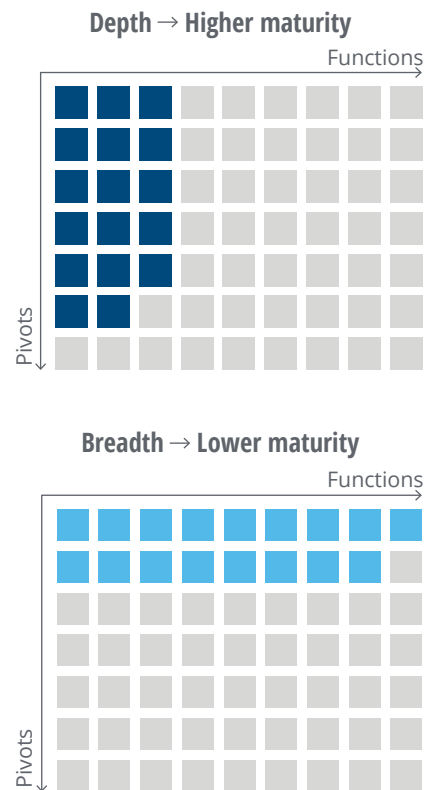
As an example of systemic functional transformation, consider the finance function. A more digitally mature finance function may automate transaction processes (intelligent workflows); streamline data collection and preparation and use advanced analytics to continuously identify opportunities to improve performance (data mastery); use chatbots,

cognitive agents, and self-service tools to improve business users' access to financial data (unified customer experience); and shift headcount from operational to technology-based skill sets (digital savvy). It may also change its approach to funding, from an annual process based on pure financial business case to one that is more agile.

The survey provides support for the idea that companies are better off concentrating early efforts to implement pivots in one or two functions rather than spreading those efforts across many functions (figure 5). While digital maturity tends to be correlated with the level of effort, we found some

FIGURE 5

Early in the digital journey, “depth” translates into higher digital maturity than “breadth”



Source: Deloitte analysis.

respondents at the lower end of the effort spectrum were at the higher end of the digital maturity spectrum. These companies tended to execute twice as many pivots per function on average than their lower-maturity peers, who spread their efforts out across business functions.⁶ Early on in a company's digital journey, it pays to go deep rather than broad.

WHICH FUNCTIONS SHOULD I START WITH?

So where should an organization begin? While customer and market-facing functions are critical, our experience suggests that starting with a back-office functional area such as finance, HR, or R&D can help an organization build confidence and digital skills at lower risk. As explored in previous Deloitte research, efforts to transform the "heart of the business" are critical precursors to front-office transformation.⁷ And the benefits from transforming back-office functions can be meaningful; significant efficiency gains and operational benefits can be achieved by transforming them. An organization can then apply the learnings from a back-office functional transformation to market-facing functions such as marketing, customer operations, or sales. Being able to show that digital transformation efforts are generating top-line impact can build additional enthusiasm and momentum.

APPLY THE REMAINING PIVOTS NEXT

With a function targeted for systemic transformation, an organization can undertake to apply the full complement of digital pivots (as relevant), described below, to that function.

Engaging with the ecosystem can accelerate innovation

A pivot strongly associated with higher levels of digital maturity is *ecosystem engagement*, which involves working with external business partners that may include R&D organizations, technology incubators, and startup companies to gain access to resources such as technology, intellectual

property, or people to increase the organization's ability to improve, innovate, and grow. Lower-maturity companies tend not to engage as effectively with external resources. Just 16 percent of these organizations strongly agreed with the statement that engaging with external business partners was making a significant positive impact on their business, compared to some 85 percent of higher-maturity organizations.

Intelligent workflows can unlock new opportunities

The *intelligent workflows* pivot entails implementing and continuously recalibrating processes to make the most of both human and technological capabilities. The idea is to pair people with technology to produce better outcomes instead of letting them deliver on their own. This pivot calls for streamlining core processes and workflows, using automation (such as robotic process automation [RPA]) to perform repetitive tasks, and supporting staff with artificial intelligence-powered tools. One payoff that doesn't get enough attention: freeing up people to focus on higher-value tasks. Although data suggests that adoption of intelligent workflows is more common among higher-maturity organizations⁸—70 percent of which are making significant use of it compared to just 13 percent of lower-maturity organizations—companies do not have to wait to act on this until they are more advanced in their digital transformation journey. Technologies such as RPA are ripe for exploration and can deliver quick wins.

Excellent customer experience is a hallmark of digital maturity

Executing the unified customer experience pivot means delivering a seamless customer experience built around a 360-degree view of customer activities accessible across the organization. This allows customers to experience coordinated digital and human interactions that are useful, enjoyable, and efficient in immersive, engaging environments. It can require breaking down data and operational silos to gain a comprehensive view of the customer



and may involve exploring new digital interaction technologies such as augmented reality or voice assistants. Organizations that treat each customer touchpoint as part of an experiential system are not just being responsive to customer expectations; they are also unlocking significant commercial benefits. Our survey found that 87 percent of higher-maturity organizations were experiencing a significant positive impact from this pivot versus just 17 percent of lower-maturity organizations. This impact can take many shapes and forms—from higher levels of customer engagement to more repeat sales.

Business model adaptability helps capitalize on new opportunities

Lastly, business model adaptability—the adoption of new business models to meet the demands of new and shifting markets—is a common goal of companies with digital aspirations. Higher-maturity companies are almost twice as likely as lower-maturity organizations to say they have digital business models.⁹ Examples include offering two-sided platforms or marketplaces, products-as-a-service, or subscriptions for data or other digital

content. This pivot typically requires the solid execution of foundational pivots: Digital business models such as subscriptions or products-as-a-service, for instance, may require a more flexible, secure infrastructure than legacy business models. They often have data at their core. And they may require new talent models. Product companies implementing service-based business models, for instance, often require sales and customer service skills that are new to the organization.

Beyond the digital pivots

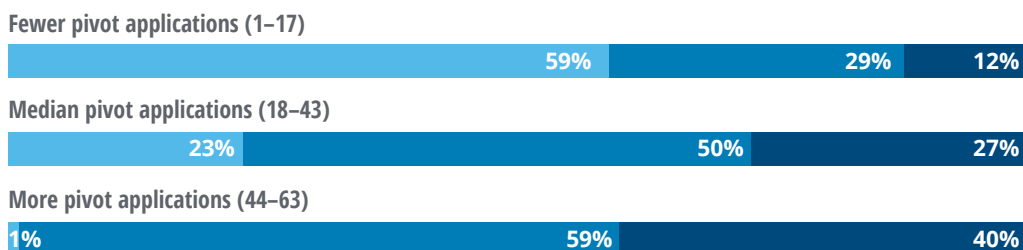
As essential as the digital pivots are, organizations need more to fulfill their potential. This can be seen in the survey data as well. As shown in figure 6, most (59 percent) of the organizations that had executed the most pivot applications—meaning they had executed many digital pivots in many functions—were at only the median level of digital maturity. *Conclusion: The pivots are necessary but not sufficient.* Prior research has suggested that intangible factors such as leadership and

FIGURE 6

Executing more pivot applications is associated with higher maturity, but many companies that do so still achieve only median maturity

The application of additional “soft” capabilities may explain why some organizations achieve higher levels of maturity from their digital transformation programs.

■ Lower maturity ■ Median maturity ■ Higher maturity



Note: Companies’ classification into “fewer” (n=298), “median” (n=605), and “more” (n=297) pivot applications is based on a normal distribution (25 percent/50 percent/25 percent) of the entire sample.

Source: Deloitte Digital Transformation Executive Survey 2018.

culture are also critical to the success of digital transformation initiatives.¹⁰

LEADERSHIP IS KEY

Without the right leadership, digital transformation efforts tend not to fulfill their potential. Digital transformation requires executive sponsorship and engagement to both convey the message that digital transformation is a priority and facilitate collaboration throughout the organization.

Functional leaders and teams cannot drive effective transformation without support from the organization's leadership. Strong leadership was the most commonly cited tactic in the survey for overcoming challenges associated with digital transformation. Respondents at higher- and median-maturity companies were significantly more likely to do so than

those at lower-maturity companies (62 percent and 59 percent versus 45 percent) (figure 7).

A DIGITAL MINDSET ENCOURAGES DIGITAL BEHAVIORS

Another organizational attribute that can help translate transformation effort into impact is a *digital mindset*, which encourages the habit of looking at old problems and processes through new eyes and approaching them in new ways. Organizations can help cultivate a digital mindset by encouraging a culture of experimentation and enabling people throughout the organization to both challenge and improve upon best practices. According to the survey, higher-maturity organizations are nearly four times more likely than lower-maturity companies to strongly agree that their organization and incentives encourage smart risk-taking to innovate and grow (figure 8).

FIGURE 7

More median- and higher-maturity organizations than lower-maturity organizations cited leadership as most helpful for overcoming challenges

Percent of respondents who identified leadership as a tactic

■ Lower maturity ■ Median maturity ■ Higher maturity



Source: Deloitte Digital Transformation Executive Survey 2018.

FIGURE 8

Higher-maturity organizations are far more likely to encourage smart risk-taking to innovate and grow

Percentage of respondents who "strongly agreed"

■ Lower maturity ■ Median maturity ■ Higher maturity



Source: Deloitte Digital Transformation Executive Survey 2018.

For useful perspectives on digital leadership and culture, see “Coming of age digitally: Learning and leading in new ways.”¹¹

Facing challenges

Organizations undergoing digital transformation encounter multiple challenges. Many companies, for instance, find that their current operating model, even if it has served them well in the past, is a barrier. Executing the pivots broadly requires cross-functional coordination and the development and shared use of assets such as technology

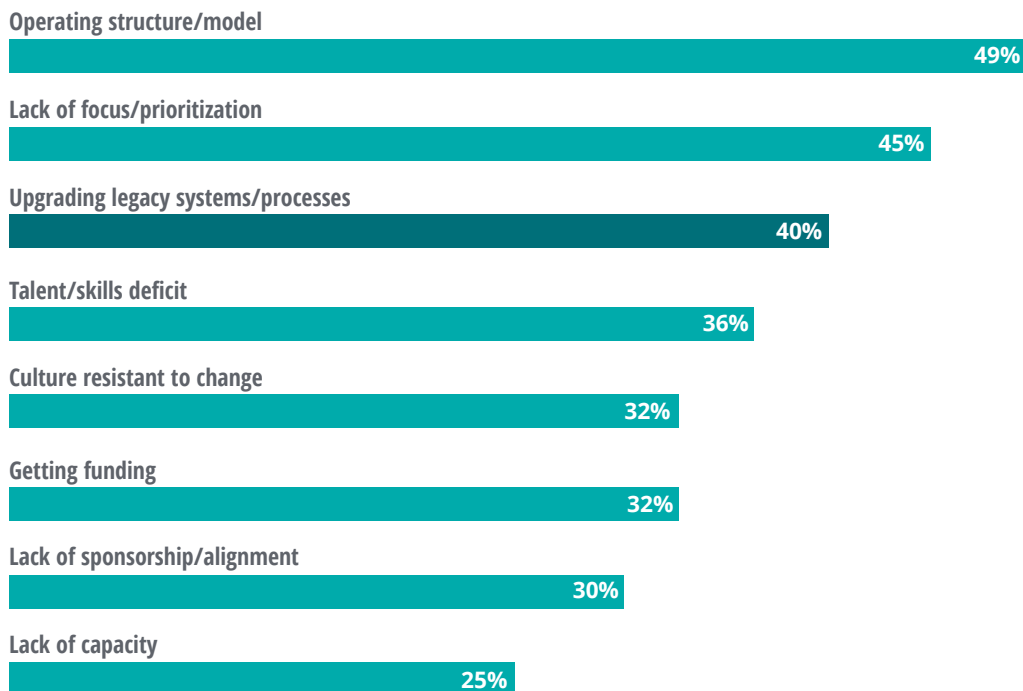
platforms, which may not be well supported in some operating models. In our survey, an ill-suited operating model/structure was the most widely cited challenge (figure 9).

Many companies find their digital ambitions are hampered by a lack of focus, leadership attention, and funding. Often, they struggle to acquire or develop talent with the necessary skills; using flexible talent models requires changes that are difficult for some companies. Prioritizing transformation efforts is also often a big challenge—understandably so, given the breadth of the changes and size of the

FIGURE 9

Respondents most often viewed the legacy operating structure/model as a top-three challenge to digital transformation

Percentage of respondents who listed each challenge as a top-three challenge



Source: Deloitte Digital Transformation Executive Survey 2018.

investment required. This is why we have highlighted a prioritization approach here.

Some 40 percent of respondents cited “upgrading legacy systems/processes” as a top-three challenge to digital transformation. This is no surprise: All organizations face the need to upgrade their information systems and evolve their business processes from time to time, and the usual challenges involved in systems integration, business analysis, and change management are familiar to many. However, digital transformation programs tend to bring these issues to the forefront, particularly when executing pivots such as *intelligent workflows* and *unified customer experience*.

How do companies get past these challenges? Respondents at higher- and median-maturity companies tend to believe certain tactics are most helpful. These include strong leadership (noted above) and a consistent digital vision; establishing dedicated funding for transformation programs; and creating a distinct digital organization/function (figure 10).

The benefits: Digital maturity drives financial impact

A key fact motivates some leaders’ commitment to digital transformation: A higher level of digital maturity is associated with better financial performance. About one-half of our surveyed higher-maturity organizations reported that their net profit margin and revenues were significantly above the average in their industry, compared to 17 and 19 percent respectively of lower-maturity organizations (figure 11).¹² We believe this is due, in large part, to how the digital pivots enable digitally mature organizations to identify and seize new opportunities, develop new revenue streams, respond with more agility to customers and market demands, and operate with greater efficiency.

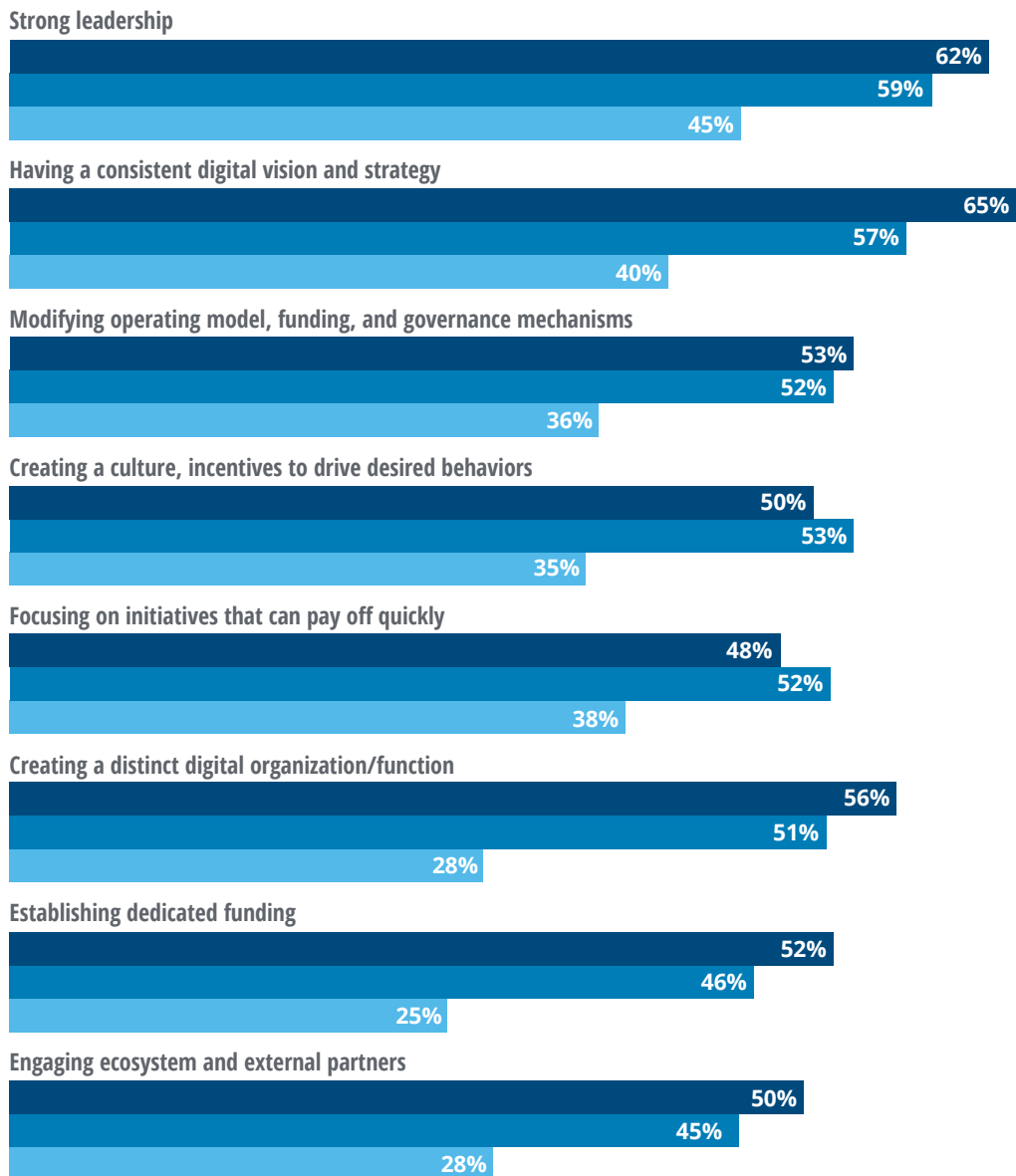
The tactics most helpful to get past digital transformation challenges include strong leadership, a consistent digital vision, establishing dedicated funding for transformation programs, and creating a distinct digital organization/function.

FIGURE 10

Higher- and median-maturity companies were more likely than lower-maturity companies to endorse many tactics to overcome challenges

Percentage of respondents who selected each tactic as one of the top three

■ Lower maturity ■ Median maturity ■ Higher maturity

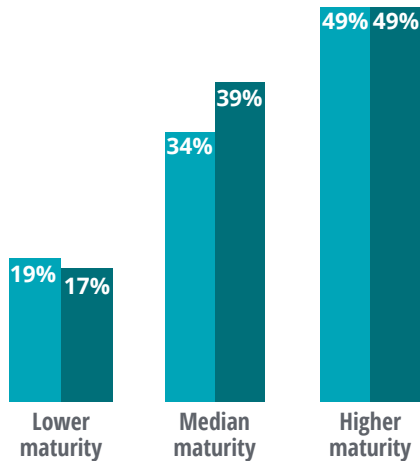


Source: Deloitte Digital Transformation Executive Survey 2018.

FIGURE 11

Digital maturity correlates with financial performance

- Significantly above industry average annual revenue growth
- Significantly above industry average net profit margin growth



Source: Deloitte Digital Transformation Executive Survey 2018.

Digital transformation investments are slated to rise sharply

Estimates of how much companies spend on digital transformation are imprecise because there are no standards to distinguish between digital transformation investments and “ordinary” IT spending. But investments in digital transformation are robust and growing vigorously. Market researcher IDC has projected that spending on digital transformation globally will reach nearly US\$2 trillion in 2022, achieving a five-year compound annual growth rate of 16.7 percent.¹³

Survey respondents’ organizations invested around 0.6 percent of their revenues in digital transformation in 2018. In light of a prior Deloitte analysis showing that IT budgets accounted for about 3.3 percent of revenues,¹⁴ digital transformation

could account for close to 20 percent of IT spending at some companies.

Moreover, companies plan to increase this spending significantly in 2019, with an average increase among our survey respondents of 25 percent over the prior year. More than one-half plan to spend more than US\$10 million, while the share of those who plan to spend over US\$20 million will double from 10 percent to 19 percent (figure 12). Company leaders may want to benchmark their own digital transformation spending against these figures and other sources to ensure they are investing at a level appropriate to their competitive environment and aspirations.

Continually becoming a digital enterprise

Digital transformation is a journey toward becoming a digital enterprise. This is not a fixed destination: A digital enterprise is continually evolving, always seeking to take full advantage of new technologies to innovate what it offers, how it sells and delivers, and how it operates. Digital maturity, consequently, isn’t an endpoint. It is the evolving capacity to reap the benefits of being a digital enterprise.

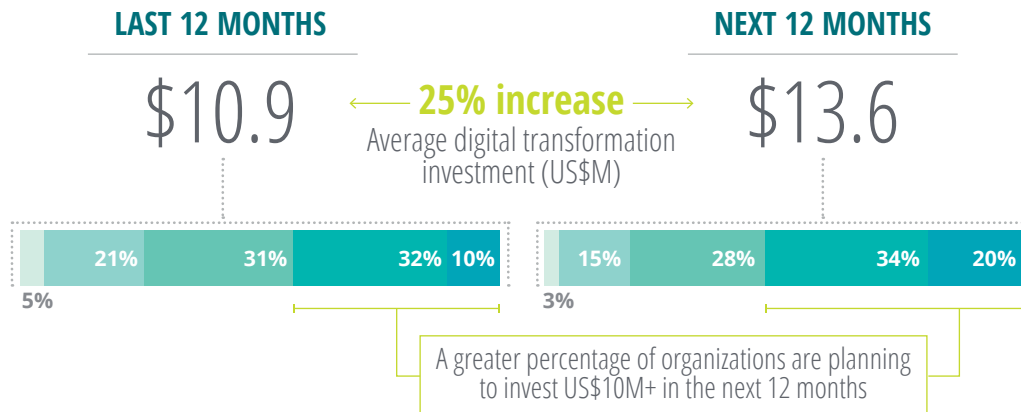
Executing the seven digital pivots is a way to realize greater business benefits—including stronger financial performance. Our research shows that greater benefits accrue to companies that execute more of the pivots more broadly across their organizations. We believe that maximizing the potential of digital transformation may require executing all of them, in concert.

Organizations cannot do everything at once, of course. There are commonsense ways to prioritize digital transformation efforts, which we have highlighted earlier. Leaders need to determine what path forward best suits their situation. The prize of progressing on that journey is often better financial

FIGURE 12

Spending on digital transformation is expected to increase sharply in the next 12 months

■ Less than US\$1M ■ US\$1M to US\$5M ■ US\$5M to US\$10M ■ US\$10M to US\$20M ■ US\$20M+



Source: Deloitte Digital Transformation Executive Survey 2018.

results and greater strategic resilience in a rapidly changing world.

Appendix: Methodology and demographics

This report draws upon insights gleaned from a survey conducted in November 2018, which asked 1,200 US-based executives to assess their organization's approach to digital transformation. The respondents included in our analysis were those who reported that they were somewhat or highly knowledgeable about their organization's digital transformation efforts, and who were from organizations of at least 500 people and US\$250 million in annual global revenue (figure 13). This sample included an equal number of respondents (200) from each of the following industries:

- Consumer products and services
- Energy, resources, and industrials
- Financial services and insurance
- Government and public services

- Life sciences and health care
- Technology, media and entertainment, and telecommunications

Seventy-four percent had C-level titles; the rest were VP or director level or equivalent. For greater accuracy, our analysis in this report excludes investment and financial performance data from government and public services respondents, which tended to be outliers.

MODELING DIGITAL MATURITY

A portion of the survey asked respondents about their adoption of the digital pivots. For each pivot, they were asked about:

- The degree of effort invested in executing the pivot, on a five-point scale
- The breadth of their efforts to apply the pivot, calculated as the number of business functions to which the digital pivot has been applied. (Respondents were asked to select up to nine

business functions to which the pivot applied; the more they selected, the greater the breadth.)

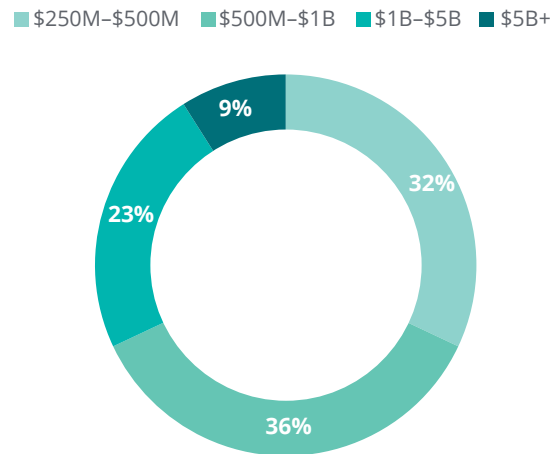
- Their use of tools and approaches of the pivot
- The degree of impact of the pivot on the business, on a five-point scale

Because we believe the purpose of digital transformation is to create business impact, we took the aggregate business impact of all pivots, captured in the fourth of the above set of questions, as our measure of digital maturity.

Based on each organization's responses to question 4 for all seven digital pivots, organizations were classified according to a normal distribution. Firms that scored in the top 25 percent were classified as "higher maturity," those in the middle 50 percent were classified as "median maturity," and those in the bottom 25 percent were classified as "lower maturity" (figure 2). ●

FIGURE 13

Respondents by company annual global revenue (USD)



Source: Deloitte Digital Transformation Executive Survey 2018.

RAGU GURUMURTHY is chief innovation officer and chief digital officer of Deloitte LLP, guiding overall innovation efforts across all Deloitte's business units.

DAVID SCHATSKY is a managing director at Deloitte LLP. He tracks and analyzes emerging technology and business trends, including the growing impact of cognitive technologies, for the firm's leaders and its clients.

Read more on www.deloitte.com/insights Agile teams, ecosystems, and ethics

The fifth annual *MIT SMR* and Deloitte study of digital business reveals digitally mature organizations don't just innovate more, they innovate *differently*—leveraging ecosystems and cross-functional teams that play critical roles.

Visit www.deloitte.com/insights/becoming-digital







Stepping stones to an agile enterprise

BY CARSTEN BROCKMANN, CHRISTIAN NAGEL,
STEPHAN KAHL, AND ANDREAS BIERMANN

ILLUSTRATION BY MARCO WAGNER

More customer value, faster development times, greater responsiveness to market changes, better employee motivation, higher user satisfaction, and lower costs. The lure of benefits like these often motivates IT organizations to investigate agile methodologies, widely believed to be able to deliver such positive outcomes. However, transforming a traditional IT shop to an agile one is rarely easy or quick, and it can be even harder to extend the agile philosophy to functions outside IT to become a truly “agile enterprise.” Our experience shows that many agile initiatives get stuck in implementation, failing to deliver the hoped-for benefits. Why?

One big reason is often the approach to agile transformation. Many leaders adopt a mindset that envisions an orderly transition from one stable state to another, seeking to move the entire IT organization to agile in one fell swoop. However, such an approach rarely yields the desired results. Instead, we have often observed that more-successful agile initiatives break with traditional ways of thinking to begin the journey with selected parts of the IT organization. This alternative mindset accepts a certain degree of instability and uncertainty during the transition to agile, and allows ample time for the IT organization as a whole to adapt (in essence, applying agile principles to the agile transformation process itself). Once agile practices are well-established in portions of IT, they can be expanded to other teams, and eventually to other functions within the

broader organization, so that the entire enterprise supports the IT organization’s efforts to operate in an agile manner.

There is no way around the observed fact that a wholesale agile transformation usually takes time. Indeed, it can take up to 10 years to go from a traditional IT organization just getting started with agile to an entire enterprise where agile ways of working are part of the culture. But that is no reason not to start. We envision a four-stage transformation process in which every step along the way can deliver benefits—and where each step can be accelerated by taking certain specific actions (figure 1). Below is our guide to cultivating agility in an organization, from small beginnings in the IT department to its adoption across the entire enterprise.

FIGURE 1

Four stages in the journey to an agile enterprise

	Number of agile-minded workers	Entities that are most affected	Accelerators to reach the next stage faster
1. Traditional IT	Few, hand-selected	IT department	Establish a structured operating model Outsource IT operations to vendors using agile methodologies
2. Bimodal IT	Some	Innovators and labs within the IT department Customer interface developers and front-end IT	Require outsourced vendors to use agile methodologies Deploy innovation coaching or form an innovation team to diffuse knowledge about agile ways of working
3. Agile IT	Most	Remaining product development units within IT	Implement a scaled agile transformation using a “minimum viable change” approach
4. Agile enterprise	All	Laggard functions	Provide other (non-IT) functions with learnings and guidance for supporting agile ways of working

Source: Deloitte analysis.

Stage 1: Traditional IT *Seeding the agile alternative*

At the first stage, the *traditional IT* level, the predominant operating model follows a “plan-build-run” approach. This model calls for each team within IT to focus on a certain activity that it and it alone performs. The planning team defines the strategy, processes, and governance mechanisms; the build team is responsible for all change initiatives, which are conducted with waterfall methods; and the run team focuses on IT operations. Process frameworks such as ITIL are often used, defining stage gates at which the most promising initiatives are selected and given resources and budget to continue.

To introduce agile methodologies into an environment like this, leaders can identify one or more projects or groups to manage separately from the prevailing plan-build-run model. This may mean implementing agile approaches for a specific project, or it may mean identifying a relatively self-contained group within the IT organization that can adopt agile approaches without extensive detrimental impact on the rest of the organization. The idea is to seed agile within the broader IT organization, creating a nucleus of experience and know-how in agile methodologies that can later be extended to other parts of IT.

Paradoxically, one step toward preparing an IT organization for the journey toward agile can be to

establish a structured operating model for a plan-build-run approach. This step can be important for IT organizations where development occurs in an unstructured, ad hoc manner, as it allows IT personnel to become accustomed to following a defined process instead of approaching each project in an idiosyncratic way.

Another important action leaders can take to help accelerate progress out of the traditional IT level is to outsource a number of projects and encourage those vendors to use agile methodologies. The organization can hand over all IT services and initiatives related to the project in an unstructured state. The outside vendor then takes over, structuring the activities and providing services by applying standardized processes, while monitoring agreed metrics and intervening if the metrics fall outside the agreed-upon ranges. By observing the vendor's actions, the client's staff can learn how an agile project is managed, sharpening their ability to steer the outsourcing vendor over time.

The experience of a multinational banking corporation shows how a traditional IT organization can begin moving toward agile. Under pressure from new marketplace entrants (such as fintechs) that were often more flexible, had shorter times to market, and offered more comprehensive product suites, the company decided to experiment with agile methodologies to shorten its product development cycle. It had already outsourced most of its IT projects to vendors that followed agile methods, and the positive results from these efforts supported the business case for establishing an agile delivery model in-house.

By observing the vendor's actions, the client's staff can learn how an agile project is managed, sharpening their ability to steer the outsourcing vendor over time.

The company decided to start the transformation in its offshore center in India to keep costs down, targeting IT executives in a specific organizational unit. Cultural differences between workers from the company's headquarters in Germany and those in India presented an initial difficulty, but after both sides reached a common understanding, the change of mindset toward agile principles—as well as the motivation to act differently—took hold. The teams in India learned agile methodologies from the overseas professionals and developed effective ways to manage multicultural teams in an agile context. Currently, the company is expanding agile practices throughout its Indian IT organization with the goal of eventually applying agile methods around the world. As a first step, the organization has refined its project approval and budgeting process so that agile endeavors are being evaluated on the same basis as classical projects.

Stage 2: Bimodal IT *Straddling both worlds*

An IT department at the *bimodal IT* level operates in two worlds. At this stage, IT organizations frequently have several initiatives or “digital labs” that use a broad range of agile methodologies and thinking approaches such as Kanban, lean startup, design thinking, and scrum. These digital labs operate as self-contained entities aiming to develop prototypes and minimum viable products outside of the traditional IT environment. Their goal is to deliver innovative solutions that are easy to understand by customers in the business. Meanwhile, the rest of the IT organization continues to operate along plan-build-run lines.

Tension between the digital labs and the remainder of the IT organization is not uncommon at this stage. For one thing, projects started in digital labs are difficult to complete by the classical IT organization, as the timelines for

planning and implementation often differ significantly. For another, the classical IT organization tends to be skeptical of the digital labs' agile project managers, perceiving them as lacking clarity on how to reach the final goal since the agile teams' minimum viable products are developed in increments. The funding process also differs fundamentally between the digital labs and the rest of IT. While classical projects need up-front funding for the entire project duration, agile digital labs typically compete with each other for budget, with only the most promising developments receiving funding at each project checkpoint.

One way for a bimodal IT department to progress to the next stage more quickly is to require—not just encourage—vendors to apply agile methodologies to outsourced projects. This can deliver benefits on two fronts. First, technology companies frequently have agile resources and know-how on hand, so many vendors are able to start projects very quickly. And second, the client's IT staff can learn about the procedures and tools of an agile way of working by observing how the vendor acts.

As an example of how digital labs can help an IT organization gain comfort with agile, consider the story of a global insurance company that had created a digital lab to gain experience with agile methodologies. The digital lab had evolved to the point where it was using agile methods to develop standardized insurance products without being technologically or culturally constrained by direction from corporate headquarters. In fact, by having experts from the insurance business work with the software developers, using journey maps to gain a customer-centric perspective, and continuously reprioritizing projects based on the end product's envisioned value to the customer, the digital labs were able to develop more-relevant products—and get them to market more quickly—than the product development initiatives driven by headquarters.

Some time after the digital lab's establishment, leaders decided to centralize the provision of IT services for all of the company's products, hoping to take advantage of synergies with current and previously developed software products to reduce asset development costs. Encouraged by its positive experience with the digital lab, IT embarked on an ambitious agile transformation, establishing multiple cross-functional scrum teams in multiple delivery locations. A strong change management program enabled the scrum teams to spool up on a steady and gradual basis regardless of location.

The company intended to use the scrum teams to not only develop standardized products, but to apply agile methodologies to quickly consider and implement local requirements (for instance, to comply with specific countries' regulations) into those products. The effort was successful. To date, the scrum teams have been able to produce more than 12 digital assets, which are live in eight countries.

Stage 3: Agile IT Focusing on products, not projects

The third stage, *agile IT*, is characterized by increased collaboration among groups and a prevailing mindset that focuses on outcomes over predefined outputs and deliverables. Typically, this stage is catalyzed by leaders who have seen the benefits of the digital labs' agile operations in the bimodal IT phase and now want to extend those benefits to the entire IT organization. Although the biggest shift in this transition is cultural, there is also an organizational impact: Whereas a traditional IT organization organizes by process—putting together teams from multiple groups focused on completing specific tasks—an agile IT organization organizes around the product, integrating all team members into a single group striving to achieve the same outcome. The product they are working on, in essence, becomes the organizational entity to which these workers belong.

Operating as a product organization can enable the formation of stable, self-organizing, cross-functional teams across the IT organization that can be up to 400 percent more efficient than traditional IT project teams.¹ Such product teams adopt an agile mindset and culture, and are thereby able to take over further development of any minimum viable products that a digital lab may produce.

Another common strength of a product-focused organization is that, as it becomes more mature, it is increasingly able to use a variety of different frameworks, such as SAFe and DevOps, that focus on different aspects of agility while still maintaining a common agile culture. The impetus for variety typically comes from the realization that a single framework cannot fit all situations equally well, and that teams could be more effective if allowed to pursue their method of choice as long as they commit to following agile values and principles. Hence, teams can use different methods, including scrum, Kanban, or even waterfall, without sacrificing the adaptability and focus on outcomes that are hallmarks of agile. (See figure 2 for a guide to deciding what kind of approach may be preferable in different situations.)

To accelerate progress to the next stage, organizations can deploy transformation teams organized in communities of practice to share knowledge and lessons learned among the IT organization's various development teams. The use of a minimum viable design approach, in which the most basic changes are implemented first, can help to reduce the transformation teams' need to reinvent the wheel for each new group they work with. At the same time, the transformation team should be allowed the freedom to calibrate the speed of agility adoption to each group's needs. We recommend taking a "minimum viable change" approach in which change progresses by making small, frequent adjustments rather than all at once. This can help the transformation team quickly test its approach with each new group with which it works, and speeds up the delivery of value for the larger organization due to the small but frequent increments of change.

One multinational telecommunications company that had historically relied on classical development approaches for its core systems wished to adopt agile approaches—both within the IT organization and across the broader business—to become more responsive to the marketplace. Since the company's mission revolves around the

FIGURE 2

Several factors can help determine whether a traditional or an agile approach is preferable

	Traditional approaches work well when ...	Agile methodologies work well when ...
Number of systems that depend on output	Many	Few
Number of systems providing input	Many	Few
Required/desired number of releases per year	Few	Many
Degree of hardware development or embedded systems	High	Medium-low

Source: Deloitte analysis.

technology-enabled dissemination of information, it had the advantages of both an advanced technical infrastructure and a culture that was supportive of innovative business solutions. At this company, the IT organization had reached the point where it was organized around products—but the business was still split into the familiar departmental silos of finance, procurement, marketing, and so on. The company sought to extend the adoption of agile principles across these silos by promoting collaboration between business and IT. Customer journey maps—which depict a customer’s interactions with the organization, along with the related internal processes and information systems, from the customer’s own perspective—and value streams—which show the multiple customer journeys that can lead to a given outcome—were extensively used to drive collaboration. These journey maps allowed personnel in different functions to understand, for the first time, how customers interacted with the organization’s technology at various points in their experience, which helped engage functional representatives in proposing and testing improvements.

Other changes also supported the business’s shift to agile ways of working. From a financial perspective, the company went from project-based funding to an incremental approach that allowed it to provide seed funding for developing minimum viable products. In terms of leadership, executives were coached to accept failure as an option, while remaining cognizant of the need to halt unsuccessful efforts. Finally, from a technology architecture standpoint, the company was able to allow classical methodologies (primarily waterfall) to seamlessly coexist with agile methodologies by eliminating “technical debt” and ensuring that the organization’s long-term vision was reflected in the data model.

Stage 4: The agile enterprise *Teaming across functions*

The fourth and final stage in the progression to agile is the *agile enterprise* stage. At this level, all stakeholders work closely with each other to increase the alignment between technology products and customer requirements. To increase collaboration, organizations create end-to-end teams that cut across functions. Further, the concept of the *customer* has evolved. All parties orient themselves toward serving the end customer—those who buy the company’s products or services—instead of considering the customer to be the internal business units or functions that use IT products.² Endeavors are funded incrementally in stages rather than contractually via a fixed project budget. (In an environment with stage-based funding, a project team must continuously apply for the next round of funding, with approval contingent on delivering the desired results.³ In this way, funding is directed to the most promising intermediate products rather than to a predetermined but possibly suboptimal final deliverable.) From an HR perspective, performance management also reflects an agile way of working, with workers’ performance



being measured on multiple agile endeavors rather than against the outcome of a single project.⁴

It can be helpful, to ease the non-IT functions' transition to agile ways of working, to develop templates or blueprints that give examples of how they can support agile approaches. For example, the finance department can be given an off-the-shelf model for incremental funding. In this way, the functions can more quickly and easily implement the changes they need to adopt to support IT's use of agile methodologies.

Different stages, different benefits

That it may take years to move through one stage to the next should not necessarily be a cause for concern. Every stage in the journey to an agile enterprise can yield benefits, although the advantages (and limitations) can differ from stage to stage (figure 3).

An important point, too, is that many different methodologies can coexist in an agile enterprise—as long as all teams commit to a joint culture based

FIGURE 3

Every stage of the journey to an agile enterprise has different advantages and limitations

	Attributes	Advantages	Limitations
Traditional IT	<ul style="list-style-type: none"> • Separation of planning and execution • Efficient processes • Predictability and control 	<ul style="list-style-type: none"> • Clear structure and responsibilities • Greater ability to plan ahead • Process efficiency facilitates cost control 	<ul style="list-style-type: none"> • Slow development speed • Adjustments to plans are time-consuming • Low employee motivation • Limited customer focus
Bimodal IT	<ul style="list-style-type: none"> • Balance between stability and speed • Separation of different cultures 	<ul style="list-style-type: none"> • More innovation • Increased focus on customers 	<ul style="list-style-type: none"> • High potential for conflict • Minimum viable products are often rejected by traditional IT • Tension between waterfall and agile project teams
Agile IT	<ul style="list-style-type: none"> • One culture for the entire IT organization • Agile values and principles prioritized over methods and tools • Shift from project to product organization 	<ul style="list-style-type: none"> • Successful implementation of products based on minimum viable products • Increased customer and employee satisfaction • Significantly faster time to market 	<ul style="list-style-type: none"> • Nonagile business units/functions limit IT's agility • Limited interaction between product developers and end customers
Agile enterprise	<ul style="list-style-type: none"> • One culture for the entire organization • End-to-end stakeholder responsibility for product development • Cross-functional teams • Adaption of agile principles by business units/functions 	<ul style="list-style-type: none"> • Flexible organization that can respond to changes quickly • Further increases in customer and employee satisfaction • Fast time to market 	None

Source: Deloitte analysis.

on the agile values and principles defined in the agile manifesto:⁵

- Individuals and interactions are preferred over processes and tools
- A working solution is preferred over comprehensive documentation
- Collaboration between all parties is preferred over contract negotiation
- A fast response to change is preferred against following a plan

Becoming agile on an enterprise level is a long journey that, for many organizations, is most feasible to accomplish in a stepwise fashion. Starting the journey toward agility often requires leaders to accept that the IT organization will likely experience some instability and conflict during the first two stages, when pockets of agile activity are still surrounded by traditional development culture and processes. Although each of the steps toward enterprise agility has certain limitations, each also delivers worthwhile benefits. The ultimate payoff: the potential for gaining a competitive edge through agile methods that allow companies to be more responsive to and aligned with customer demands. ●

CARSTEN BROCKMANN, Deloitte Consulting GmbH, is a senior consultant in Deloitte Consulting's Strategy and Operations Finance practice. He is based in Berlin.

CHRISTIAN NAGEL, Deloitte Consulting GmbH, is a senior consultant in Deloitte Consulting's Technology Strategy and Architecture practice. He is based in Frankfurt.

STEPHAN KAHL, Deloitte Consulting GmbH, is a manager with Deloitte Consulting's Technology Strategy and Architecture practice. He is based in Munich.

ANDREAS BIERMANN, Deloitte Consulting GmbH, is a director in Deloitte Consulting's Technology Strategy and Architecture practice and leads the organization's Enterprise Agility service offering. He is based in Hamburg, Germany.

Read more on www.deloitte.com/insights
CIO Insider: Reimagining the role of technology

Technology in and of itself is not the answer to successful transformation. Long-term sustainable value will only be created by unifying the business and technology strategies.

Visit www.deloitte.com/insights/tech-value



If these walls could talk

Getting the workplace of tomorrow right

BY SUSAN K. HOGAN, JOHN LUCKER, ROBBIE ROBERTSON,
AND FLAVIE SCHÄFER

ILLUSTRATION BY PABLO CARACOL





“The work environment can bring out the ‘best’ or the ‘worst’ in you.”

— *Abhishek Ratna*

OPEN-PLAN OFFICES. NATURAL lighting. Ellipticals in the break room. Many enterprises have been going “all in” when it comes to work environment redesign, investing heavily in remodeled workspaces in the hope of realizing a host of benefits: better talent attraction and retention, improved collaboration, greater creativity, higher productivity ... and the list goes on and on. But as some firms have discovered, cashing in on those benefits isn’t always as simple as breaking down walls, eliminating private offices, and installing skylights. Some organizations that were enthusiastic early adopters are now discovering unforeseen downsides or unrealized benefits from their investments—and wondering whether the problems can be fixed (and if so, how difficult that would be).¹

What can organizations do to address issues with their current workspace, or transform it properly the first time around? Drawing upon behavioral science theory and organizational literature, this

article explores why problems have sometimes occurred despite positive leadership intentions and careful planning. We leave readers with practical guidelines to consider for how organizations can go about rethinking and redesigning their workplaces to remediate current issues and avoid future missteps.

Looking back: What’s changed?

Before delving into current trends in workplace redesign, it’s informative to take a step back and look at how the workforce, and work itself, has evolved—in ways that have perhaps shaped the changes taking place in the physical workspace. One obvious difference is that, looking back to the 1970s and even early 1980s, *computers and digital technology* in general were essentially absent from most people’s day-to-day work.² Not only has technology transformed work in myriad ways, but it has also, in many cases, eliminated the need to come to

a set physical location to get work done. With this decoupling of work and location has come the ability for most enterprises to cast a broader net for workers and talent, sourcing workers from more-distant locales. This has contributed to an increase in *workforce population diversity*. Today's workforce is more culturally and geographically diverse than that of 50 years ago, in part due to technology's reach, but also due to greater workforce participation among women as well as changing overall demographics.³ Additionally, workplace norms regarding *hours* and *attire* have shifted. It is no longer a given that workers will work from nine to five, Monday through Friday. Hours have become more flexible, as have workforce contracts, with more part-time, gig, contract, and freelance workers entering the labor pool.⁴ What one wears to work has also changed—even for organizations such as those on Wall Street, where at one time wearing anything but suit-and-tie business attire was unthinkable.⁵

Keeping the workplace current: Open layouts versus cubicles

Given these changes in what work is and how and where it is done, and the concurrent evolution in the workforce's desires and needs, it's not surprising that enterprises have felt the need to look critically at their workplaces to identify how they might best evolve to meet the needs of both the work and the worker.

One of the most widespread changes occurring at workplaces around the world has been the creation of open office spaces. According to one study, 68 percent of people in 2010 worked in an office with either no or low walls—"and that number has undoubtedly grown," deadpans a *Fast Company* article published in early 2019.⁶ But has this been a positive trend?

One aim of an open-plan office is to facilitate colleague contact and collaboration—and thereby improve productivity.⁷ However, contrary to prior hypotheses, recent research suggests that most employees are neither fans of these types of offices,⁸ nor necessarily accomplishing the goals of greater collaboration and productivity in them. In fact, one study of the interactions between colleagues at two multinational companies that had recently switched to open-plan layouts found that the open floor plans had the exact opposite effect. At one company's open-plan office, the volume of face-to-face interactions decreased by more than 70 percent from what it had been in the old, cubicle-based office. Ironically, what did increase was the number of emails and instant messages people sent; their frequency increased by 56 percent, even when the correspondents could clearly see each other across the room. The findings were similar at the second company, with face-to-face interactions decreasing by two-thirds after the office moved to an open floor plan, and email increasing by between 22 percent and 50 percent. What's more, for at least one of the companies, productivity after the switch to an open office layout declined.⁹

One of the most widespread changes occurring at workplaces around the world has been the creation of open office spaces.

The study authors explained these findings by positing that employees, valuing their privacy, used technologies such as email to find new ways to preserve it in these open-plan offices.¹⁰ But email isn't the only way to preserve one's privacy in an open office. We've often observed, at offices with open layouts, workers wearing large headphones or earbuds to keep out the distractions caused by nearby colleagues or foot traffic in the area—and possibly signal to others that they don't want to be disturbed.

Cubicles—the common alternative to an open-plan layout—are often not viewed as a great work environment either, though some have contrasted them with open-plan offices as the lesser evil.¹¹ While cubicles might be viewed as a “happy medium” solution between private offices and open-plan layouts, they have their downsides. Compared with offices, they are typically noisier—and compared with open-plan layouts, they often cut off workers from natural light. However, cubicles do give workers an opportunity to give their work area a personal touch with pictures, awards, personal mementos, and the like.¹² Thus, people are able to give their cubicle space its own (or their own) personality, making their cubicle an extension of themselves. This bringing of one’s “authentic self” to work has been found to be beneficial, not just to the worker’s personal happiness, but also to his or her output, as workers who are able to let their authentic self shine through are typically more productive—and, over time, more successful.¹³

However, putting a personal touch on one’s environment becomes much harder, if not impossible, when firms move away from permanent cubicle assignment toward either *hoteling*—reserving a desk or workstation space in advance of use—or *hot desking*—where workspaces are available on a first-come, first-served basis.¹⁴ It’s worth noting in this regard that 30 percent of multinational firms now use hot desking, with 45 percent of multinational enterprises planning to implement it by 2020.¹⁵ Given that the average office worker spends eight hours a day at work, one might raise the question of whether forcing people to forego workplace personalization might have detrimental effects on workers.

It’s not just about privacy: Supply, demand, and optics

Adaptable offices—spaces, furniture, tools, and technologies that are easily reconfigurable depending on the need or demand—are not a perfect

answer, either. Neither are hoteling or hot desking, whether for cubicles or for workstations in an open office. Offices that adopt these strategies need to get several things right. First, they need to align supply and demand (for example, how many people will need quiet spaces to finish work under tight deadlines, and how many will need conference rooms for meetings and collaboration?). Second, regarding hoteling,¹⁶ what is the process for reserving these rooms? Is it first-come, first-served? If so, how can companies discourage *bogarting*—people reserving rooms “just in case”? And if there is a limited supply, who is given priority? Who isn’t?

Company leaders also need to understand the messages their layout and space reservation processes send. Do they signal that some employees are more important than others? Hot desking, for example, can make employees feel as if they are disposable cogs in a machine. When offices employ a two-tiered system in which higher-level employees are given offices while more junior employees are not, behavioral economics theory¹⁷ reveals that this sends a clear message to those without offices, not only that they are less important, but that others are *more important* than them. These feelings of negativity are only exacerbated on days when employees who don’t have offices need a private (or conference-sized) space and nothing is available, while many offices assigned to higher-level workers are unoccupied. In such situations, hot desking can potentially deliver a triple whammy to employees’ psyches—making them feel unimportant to leadership in an absolute sense, less valued than others in a relative sense, *and* frustrated by their firm’s inability to manage resources to provide them with the office configuration they need to best perform their duties.

Uncovering the most common pitfalls

So why have well-intentioned office redesign plans often underperformed? Based on organizational



and behavioral literature and our own observations, below are three common pitfalls many companies encounter when redesigning office spaces.

Pitfall No. 1: Making quick decisions or treating workplace transformation as a one-and-done activity. Recent Deloitte research has highlighted how easy it can be for some organizational leaders to be lured by “shiny new objects.”¹⁸ While we applaud firms that are open to incorporating new amenities, configurations, and formats, leaders should be careful before making quick short-term workspace redesign decisions based on fads, such as installing treadmills or café-style coffee areas. Because fads often change, leaders should track the success of such alterations and ensure that they could be easily reversed if proven ineffective. In general, too, leaders should avoid designs that are too “fixed,” such as partitions that cannot be easily moved or meeting rooms that cannot be easily reconfigured.

Ideally, workplace redesign should be a continual, ongoing process, not a single-point-in-time change. However, if a firm cannot afford to make frequent workplace investments, they should consider either making any changes minor, or taking the time to make a more educated decision, such

as determining the likelihood of something being a fad or a longer-term trend. For instance, companies could consider factors such as an innovation’s compatibility with existing routines, work habits, and infrastructure; its flexibility or ability to be personalized; its relative advantage over existing office amenities or formats; and its adoption among similar or dissimilar groups or subcultures—all of which can help leaders discriminate between short-lived crazes and more enduring phenomena.¹⁹

Pitfall No. 2: Failing to incorporate diverse stakeholder input. In their enthusiasm to create a better workplace environment, some leaders may forget to collect input before and throughout the process, or only seek input from a subset of people who will be using the space. Of course, full-time employees who will be working in the office every day should be offered the opportunity to give feedback on its future design. But if the workplace is designed to encourage virtual workers to visit the office more frequently or offer gig or contract workers a place to work, leaders should seek input from these groups as well. And if client meetings will occur regularly in the new space, leaders should also seek client input. Further, with the growth of multicultural workforces in global

organizations, cultural and subcultural differences in terms of work style and norms should be understood and accounted for when planning and designing spaces.

Pitfall No. 3: Failing to clearly articulate the features and benefits of new workspaces. As with all change and execution strategies, getting to the desired outcome is not just about having an implementation strategy; leaders need an accurate messaging strategy, too, to communicate internally and externally about a new office setup and what the company is trying to accomplish by making the changes. Some of the best-laid plans fall flat because plans and intentions were not clearly articulated or were out of line with the hoped-for result. At many firms, it isn't clear to employees how they are supposed to behave or use the space as it was intended. And when employees are confused about how to use the new space, teams often tend to “hack” spaces to revert to the way that they were working in their old office.

Guidelines for effective workplace redesign

How can organizations move forward in a positive manner and avoid these common pitfalls? Below are some steps leaders can take in the planning stages to help ensure redesign intentions become workplace realities.

1. **Prioritize design choices based on the reasons people come into the office.** People come into the office for many different reasons (figure 1). Every workplace environment serves different purposes for a variety of stakeholders. For employees, the office is where they do their own work, but it's also a place where they collaborate, socialize, and network. For an organization's recruiting executives and client-facing executives, the office can also serve as a branding tool, a magnet to help attract talent or close deals. Which of these reasons for being there are the most important and should therefore be weighted more heavily? Is it possible to find an approach that will satisfy different needs equally well? To answer questions like these, leaders' No. 1 priority and first step should be to understand why people are currently and could be coming into the office. They can then factor all these reasons into their decisions about how to configure the space.
2. **Communicate the workplace redesign strategy, plans, and progress.** Once leaders set in place a workplace redesign strategy, they should complement it with a messaging or communication strategy for both internal and external stakeholders. These communications should explain the rollout plan, detailing the changes, process, and benefits. Stakeholders will likely appreciate being informed about these details; just as customers do, employees value authenticity and transparency.²⁰ This also enables leaders to set and manage expectations.
3. **Develop an ongoing data collection and measurement strategy.** Workplace redesign is meant to serve the needs of stakeholders and should be iterative, not a “one and done” process—an evolution versus a revolution. A workplace redesign strategy should include methods to measure what is working and where additional tweaks or revisions (or even reversions to the prior state) may be necessary. Data can be collected in several ways, such as conducting user satisfaction surveys, observing traffic flow, and doing interviews with different stakeholders. Companies can also let the walls do the talking by incorporating sensors and other technologies to track real-time data on user behavior. This can help leaders gauge the effort required to use the space and identify common pain points,²¹ which can help uncover areas that may need to be refined or changed.
4. **Use incentives to encourage trials and build new habits.** Just because you build it

FIGURE 1

People come into the office for many different reasons

Optimal environments



Individual work

Private space, comfortable seat, desk computer access



Collaborative work

Larger space, whiteboards, webinar screens, post-its, teleconferencing and videoconferencing connections



Hybrid work

(individual and collaborative)

Mix of private and shared spaces



Training or learning opportunities

(internal or external)

Comfortable space that accommodates different learning styles



Internal networking opportunity

Inviting, casual space that is conducive to discussion in pairs or small groups, such as lounges



External networking opportunity

Inviting space that reflects the organization's brand and values



Client meetings

Larger, aesthetically pleasing space; access to catering; multiple platform adaptability



IT support

Fast and on-demand access to IT professionals



Community outreach or market-facing activities

A branded space that aligns with corporate image



Team meetings

Appropriately sized meeting room with accessible collaboration and communication technology



One-on-one meetings

Comfortable multipurpose workspace for one person plus a small number of guests

Source: Deloitte analysis.

doesn't mean they will come. Leaders should consider strategies and incentives to encourage trials of new office space formats for employees already in the office. If part of the redesign strategy is to encourage remote workers to come back into the building, leaders could offer incentives such as paying for office parking for commuters, or even counting commute time as "time on the clock." Also, since people learn by observation and are likely to emulate those

above them, leaders could ask senior managers to work in new open spaces or host team meetings in these spaces.

The walls do talk— and say a great deal

Just as a picture speaks a thousand words, so does an enterprise's physical space. Office spaces reveal

where and how various workers of different functions and levels work, and the processes for reserving these spaces give insights into an organization's culture, values, and history. The design and function of an organization's offices also shed light on how much (or how little) an organization's leadership values different stakeholders. Hence, office environments can greatly reinforce—or greatly weaken—an enterprise's purported values and culture. Additionally, offices can have either a motivating or demotivating effect on those who work or visit there. With this in mind, leaders

should ensure that workplace culture and physical workplace design are aligned, remembering that the workplace is there to support the work and workforce, not the other way around.

Embarking on a workplace redesign effort can be a tremendous opportunity for leaders to subtly but clearly communicate their firm's story, history, values, culture, talent objectives, and outlook on their future. For organizations that get it right, what their walls have to say will be music to their—and their stakeholders'—ears. ●

The authors would like to thank **Karen Edelman, Stephen Harrington, Junko Kaji, Abha Kulkarni Kishore, and Negina Rood** for their contributions to this article.

SUSAN K. HOGAN is a researcher with Deloitte's Center for Integrated Research. She is based in Atlanta.

JOHN LUCKER, a Risk and Financial Advisory principal with Deloitte & Touche LLP, is Global Advanced Analytics & Modeling Market leader and a leader for Deloitte Analytics. He is based in Hartford, CT.

ROBBIE ROBERTSON, Deloitte Touche Tohmatsu, is a partner in Deloitte's Sydney digital consulting practice and leads the Deloitte Experience Design practice in New South Wales. He is based in Sydney.

FLAVIE SCHÄFER is a former manager in Deloitte Canada's Human Capital practice. She is based in Montreal.

Read more on www.deloitte.com/insights

Work environment redesign

The way the workplace is constructed—physically, virtually, and managerially—can have a critical impact on employee productivity, passion, and innovation. Explore the case studies online.

Visit www.deloitte.com/insights/work-environment-redesign



Agile, prepared, and confident


PRIVATE COMPANIES FEEL UP TO THE CHALLENGES AHEAD

EVEN WITH THE current economic backdrop clouded by signs of slowing across many parts of the world, most private companies worldwide—74 percent—are confident or highly confident about their organizations' prospects for success over the next two years, according to the 2019 Deloitte Private global survey of private company leaders.

Most of the private companies surveyed also expect their revenues, profits, productivity, and capital investment to go up in the coming year—and 49 percent anticipate growing their full-time workforce, a slightly greater proportion than in 2017.

Respondents' general sense of confidence comes even as they identified a number of risks to their organizations. As a group, the risks respondents were most concerned about were trade barriers,





potential cyberattacks, and the cost of raw materials. Trade barriers were of particular concern to respondents based in Asia-Pacific, 30 percent of whom identified trade barriers as a high or very high risk to growth over the next 12 months.

Competitive threats are also clearly on the minds of private company executives: Half of the survey respondents saw disruption by either a traditional or nontraditional competitor as at least a medium risk, and nearly one in five characterized it as a high risk. But many private companies aim to disrupt the market themselves. Nearly four in 10 respondents say they are exploring opportunities to take advantage of disruption, and a third have organized dedicated teams focused on disruption. On the other hand, more than a fifth of the respondents say there is little focus on disruption at their company or they aren't taking any action at all to get ahead of it.

Asked to identify their sources of competitive advantage, respondents pointed to the development of new products and services, high productivity, business model innovation, and growing existing markets. Many private leaders also view a strong corporate culture as integral to their business's performance. Seventy-seven percent of respondents characterized culture as strategically important to the success of their company, with 35 percent strongly agreeing with that sentiment.

It will be interesting to see whether the coming year tests private companies' ability to preserve their culture, not just because of generally high expectations around corporate combinations, but also due to the preponderance of respondents who believe their company will at least consider an initial public offering in the coming year. More than one-half of our respondents believed that their company was on a path to going public within the next 12 months, a figure that stayed consistent across all three regions. ●

For more insights from Deloitte Private's 2019 survey of private company leaders, read the report *Global perspectives for private companies: Agility in changing markets* at www.deloitte.com/insights/deloitte-private-global-survey.




Innovation in Europe: Alive and well

WITH INNOVATION INTIMATELY linked to the notion of the digital future, Europe is often seen to be at risk of being left behind because of a long-term lack of investment in research, digitalization, and education. But this view fails to give European innovation its due, according to a recent Deloitte survey of innovation decision-makers in 760 companies across 16 European countries.

The survey found that 88 percent of respondents plan to increase innovation budgets over the next two years. Further, 92 percent of respondents saw advances in new technologies as the primary trigger behind innovation. This emphasis on technology is reflected in their investment priorities. Data analytics (69 percent), cloud computing (62 percent), and the Internet of Things (53 percent) topped the list of technologies that respondents had already invested in, while the top technologies for future investment were artificial intelligence (43 percent), augmented and virtual reality (38 percent), robotic process automation (36 percent), and blockchain (36 percent).

In terms of the approach to driving innovation, the survey asked respondents to identify whether their company used one or more of 10 types of innovation described in a widely used framework.¹ Combining five or more types of innovation opens companies up to new possibilities and strengthens innovation, while using four or fewer implies that there are gaps in the strategy and that the company may be missing innovative opportunities. Our survey suggests that European companies generally have robust innovation approaches: One in three European companies uses all 10 types of innovation, and only 10 percent use only four or fewer.



Contrary to the popular view that European companies don't make long-term investments in innovation, **88 percent** of decision-makers at European companies plan to increase their innovation budgets in the next two years.

What could European companies be doing more effectively? Our survey results point to five key actions that business leaders in Europe may wish to consider in their plans for future innovation:

- **Avoid the trap of focusing on technology alone.** Successful innovation requires the right people and the right organizational structures as well as the right technology.
- **Understand the multidimensional nature of innovation.** Significant improvement opportunities may be available to European companies that are not already using all 10 types of innovation.
- **Prioritize skills.** Through strategies such as engaging with universities, European companies could place themselves in a better position to recruit students from the critical science, technology, engineering, and mathematics (STEM) subjects.
- **Transform culture as the underlying essential for innovation.** To overcome cultural resistance to change, mindsets and incentives that support innovation need to be broadly adopted across the organization.
- **Use the power of ecosystem innovation.** There is great potential in collaborating with external partners to share knowledge, stay abreast of developments, expand market reach, and provide complementary expertise. ●

To learn more, read *Innovation in Europe: A Deloitte survey on European companies and how digital technologies can strategically enhance innovation* on www.deloitte.com/insights.

ORGANIZATIONAL TRANSFORMATION

CYBER

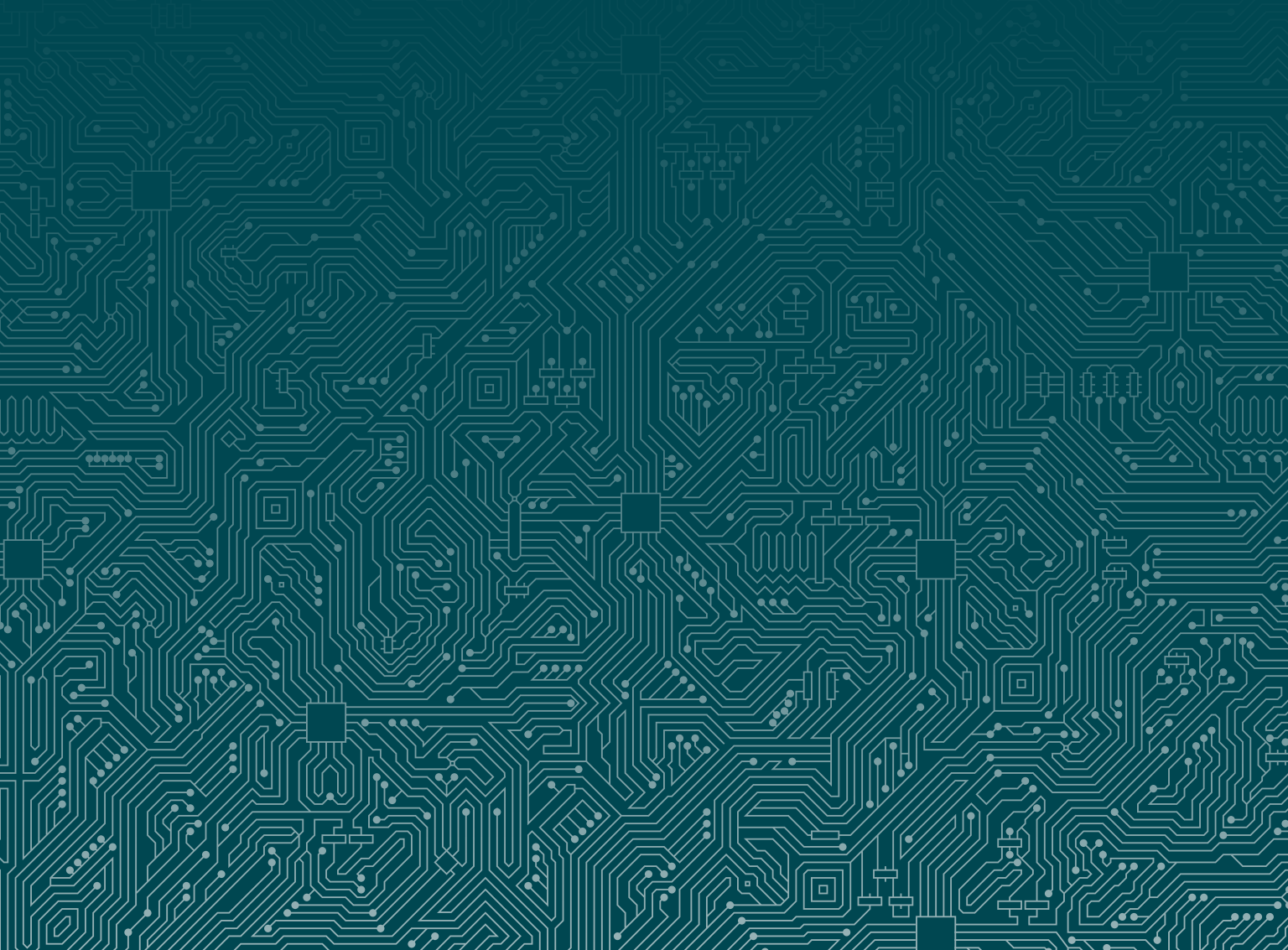
FUTURE OF MOBILITY

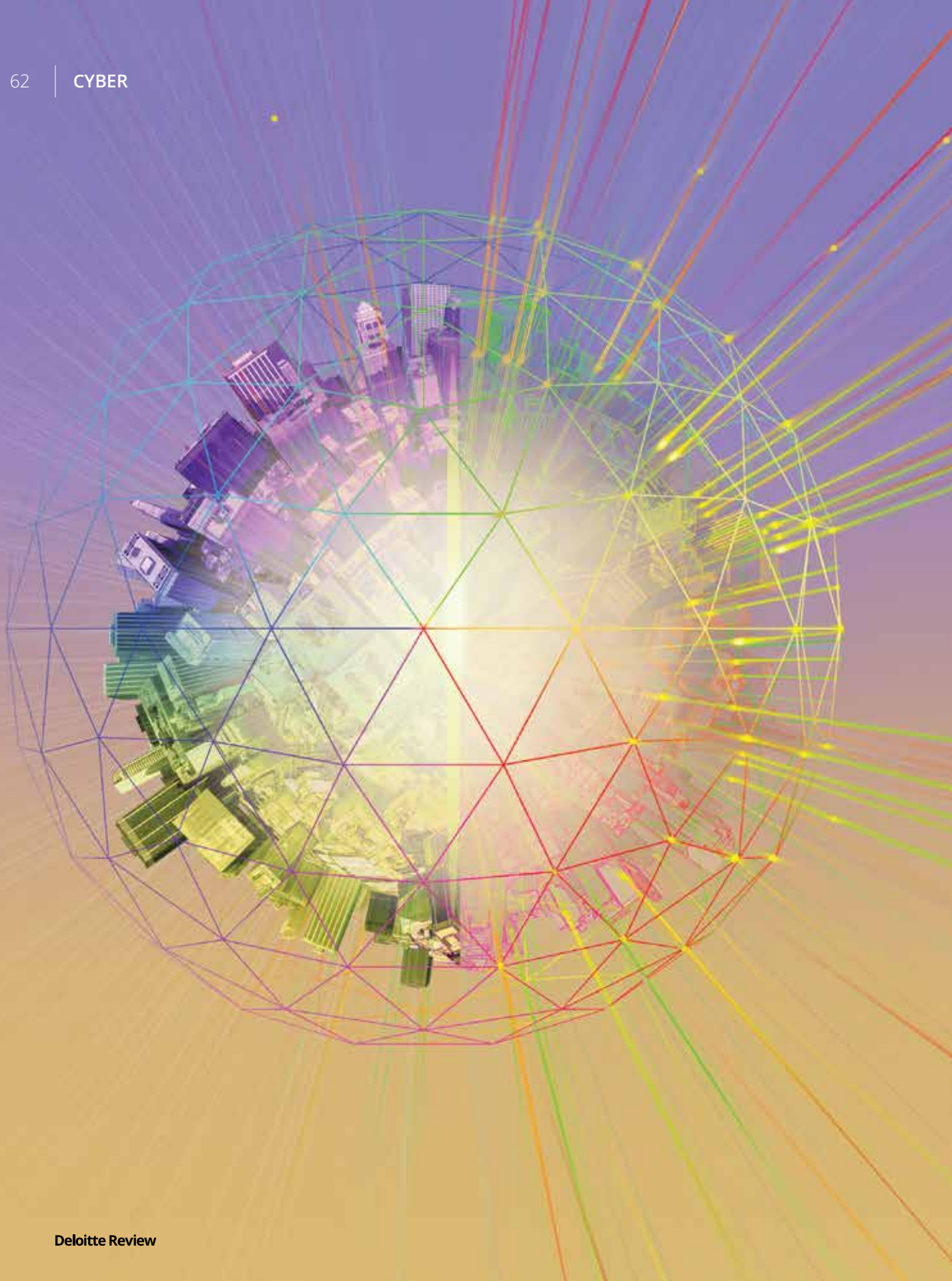
TECHNOLOGY AND SOCIETY



Cyber, cyber everywhere: Is your cyber strategy everywhere too? | 62

By Nick Galletto, Ed Powers, and Tim Murphy





Cyber, cyber everywhere

Is your cyber strategy everywhere too?

BY NICK GALLETTO, ED POWERS, AND TIM MURPHY

ILLUSTRATION BY J. F. PODEVIN

In the 21st century, the connective power of technology is giving rise to a wave of innovative products and services that are transforming the way people live and work. Consider Disney World Parks. Known for pushing the limits of its audience's imagination, Disney World combined sensor technology, cloud computing, and artificial intelligence (AI) to create connected, radio-frequency identification (RFID)-based wristbands that help create more immersive and enjoyable experiences for guests. These wristbands have helped Disney World both improve operations and better serve visitors, enabling organizers to—for instance—deploy special events to remove ride bottlenecks in real time (such as putting on Disney-character shows that hold guests' attention as they wait in long queues).

The technology has made it easier to create personalized guest experiences such as customized hotel accommodations and first-name-basis interactions with characters. And, not least, the wristbands, built with security as a top-of-mind design element, have helped Disney World cultivate safer digital and physical environments for its guests. For example, the wristbands are paired with multifactor identification mechanisms such as fingerprints and personal identification numbers to restrict park access and in-park purchases. And in a venue that caters to thousands of guests daily, the RFID-based wristbands can help security personnel quickly identify and reunite a lost child with his or her family.

To build innovative, connected experiences, businesses need a strong cyber program.¹ Every time a device is connected to a sensor that in turn connects to a network, a new cyber vulnerability emerges at each connection point. On a larger scale, connected technologies increasingly underpin the functioning of the nation's power grids, factories, entertainment venues, and communication and transportation infrastructures. Indeed, cyber vulnerabilities are seemingly *everywhere* these days, and they're only going to become more prevalent in the future.

Yet, just because cyber is everywhere, it doesn't mean that corporate strategies are necessarily

following suit for addressing cross-enterprise risks. In Deloitte's 2019 *Future of cyber survey*, which polled more than 500 C-level executives on cyber issues, more than 90 percent of respondents suggested that less than 10 percent of their cyber budgets were allocated to digital transformation efforts such as cloud migration, AI-driven products, and software-as-a-service (SaaS)—all areas where cyber vulnerabilities are becoming more prevalent.²

The risk isn't just that cyber incidents will destroy value in the classical sense. The opportunity cost of what cyber vulnerabilities can *prevent* organizations from doing can be far greater. The specter of cybercrime and its fallout can cast a shadow over an organization's efforts to turn technology to better use, strangling innovation and slowing digital transformation efforts to a crawl. Though digital and connected technologies are an immensely fertile ground for innovation for organizations in all industries, their potential will go untapped if that ground is perceived to be too risky to be worth exploring.

Many executives are wrestling with this reality even now. In a recent global study on AI initiatives among businesses, 49 percent of respondents, a plurality, cited "cybersecurity vulnerabilities" as their top concern.³ An earlier study polling US executives also revealed that 30 percent of respondents had slowed down an AI initiative to address cyber concerns, and another 20 percent had decided to not even start such initiatives due to their cyber implications.⁴

This is why cyber today is not purely a risk management issue, but is instead a core business enabler. For organizations to fully reap the benefits of new, digitally enabled technologies, they need to view cyber as a digital transformation priority. In an era when technological innovation underpins a business's marketplace performance, organizations that put cyber at the forefront should be better

positioned to drive innovation and, consequently, bottom-line growth. Conversely, in the absence of a well-orchestrated cyber program, new products and services will be exposed to greater financial, brand, and regulatory risks, likely slowing their development and marketplace penetration.

The good news is that, for those looking to redesign their businesses with cyber as a fundamental element, a host of new opportunities is emerging. While this is new ground for almost everyone, organizations can take action today to understand their cyber vulnerabilities, assess the risks, and put protections in place that make technology a safe space for innovation to grow the business.

Not just IT's problem any more

In the past, cyber was viewed as a means of protecting information—financial data, intellectual property (IP), or personally identifiable information. As such, cyber naturally found its organizational home within the information technology (IT) department, traditionally tasked with managing and protecting information.

For those looking to redesign their businesses with cyber as a fundamental element, a host of new opportunities is emerging.

But in today's "everything is connected to everything" environment, the implications of cyber go way beyond IT. A cyber adversary can strike wherever connected technology is deployed—whether it's to hack a server in a data center, an oil rig in the ocean, or a pacemaker implanted in a person—and this makes cyber not only an issue for protecting information, but also a necessity for protecting systems and people, both inside and outside the enterprise. Moreover, the proliferation



of use cases for connected digital technologies, even within a single enterprise—everything from, say, autonomous vehicles to medical implants to assembly-line robots—means that it's unrealistic to expect consistency across either cyber vulnerabilities or security solutions.

These factors have two important implications for an organization's cyber strategy:

- **The number of cyber stakeholders is expanding.** With IT, operational technology (OT), and the end user coming into the picture, cyber has to be an important consideration for executives from across the top ranks of management. It can no longer be relegated into an organization's sublayers, but instead should be represented in the C-suite so that the broader business can better understand the priority and importance of creating a cyber-secure enterprise. Included in the lengthening list of cyber stakeholders are individuals such as the chief supply chain officer (CSCO), the chief innovation officer, the chief marketing officer (CMO), the chief operations officer (COO), the chief risk officer (CRO), chief information officer, and chief information security officer (CISO), plus procurement, facilities managers, plant managers, and even (or especially) employees on the ground. A cyber governance model that starts and ends with the CISO under the confines of IT is no longer enough.
- **Standardization doesn't apply.** On the surface, most IT security solutions are fairly standardized, database structures are uniform, and firewalls still work broadly—regardless of industry or use case. However, how a hospital deploys robotics can be very different from the way a smart factory does. Nowadays, organizations combating cybercrime need to consider IT, OT, *and* customer product environments—all with have their own nuances that often lack a cross-organizational framework. Because of

this, each cyber solution requires a level of bespoke customization that makes every solution set unique.

A cyber strategy that recognizes these principles can help organizations develop approaches to strengthening security that fuel—not throttle—the pace of innovation.

A stakeholder challenge: Getting people to step up

Since cyber is everywhere, cyber awareness needs to be embedded everywhere. That means that cyber must be part of everyone's job in a very literal sense. Converging cyber environments blur the lines of responsibility among stakeholders. No longer does the onus of cyber fall squarely on the CISO; rather, it is—or should be—a cross-functional endeavor.

Take the CMO, for instance. For the typical CMO, striving to build customer appeal and brand equity, cyber is new ground.⁵ Yet CMOs are continually looking to digitize their efforts and enhance the customer experience through technology. To do this seamlessly—and safely—the CMO must incorporate cyber professionals, and their relevant expertise, into the development of customer-facing initiatives.

The CMO is only one of many people who need to be involved. To illustrate how cyber touches nearly everyone's role, consider the major stages of product development:

- **Innovation.** Chief innovation officers regularly look to advanced technologies to fuel new products. If cyber is not adequately considered, these innovations could be halted even before they begin. Or, worse, they could go to market with serious cyber vulnerabilities.
- **Sourcing.** As supply chains increasingly transition to digital supply networks, which transform linear supply chains into interconnected ecosystems,⁶ CSCOs need to ensure that third-party vendors meet the company's required security standards. This is a regular issue for automotive original equipment manufacturers (OEMs), for instance. A vehicle's infotainment unit can consist of multiple components—navigation technology, USB drives, smartphone integration capabilities, and more—sourced from different vendors that may have inconsistent security protocols.
- **Manufacturing.** In today's converging environment, the plant manager's role is not limited to simply coordinating actions between humans and physical machinery. Plant managers are integrating robotics, sensor technology, and even augmented reality (for example, to assist in maintaining and repairing equipment) into their workflows.⁷ Each of these technologies creates a new connective endpoint, each with its own cyber considerations.
- **End-product support.** The final product a customer buys represents a culmination of the first three stages. But cyber considerations don't necessarily end with the sale; many types of products need to be continually protected after they are launched. This may entail safeguarding both data and functionality—especially functions that are automated, such as customer-facing chatbots.

In practice, unfortunately, cross-functional collaboration on cyber issues rarely happens. In the aforementioned *Future of cyber survey*, only 30 percent of respondents indicated their organizations have integrated some form of cyber liaising into their core business functions to facilitate cyber awareness and readiness throughout the organization.⁸ One big reason for this may be the

relatively junior position of many CISOs in the executive suite. The study also highlighted that the CISO is often pushed down the organizational chart, even as the growing importance of cybersecurity would seem to call for the role to be elevated. For example, nearly 80 percent of responding CISOs report to the chief information officer or the chief security officer (CSO), despite the majority of CISOs saying that they were seeking greater access to the CEO (and, thereby, to the rest of the organization).⁹ This poses a real problem for cyber-awareness. With the CISO's influence buried in the depths of the organizational hierarchy, it is difficult to cultivate a cyber-aware mindset across the rest of the C-suite.

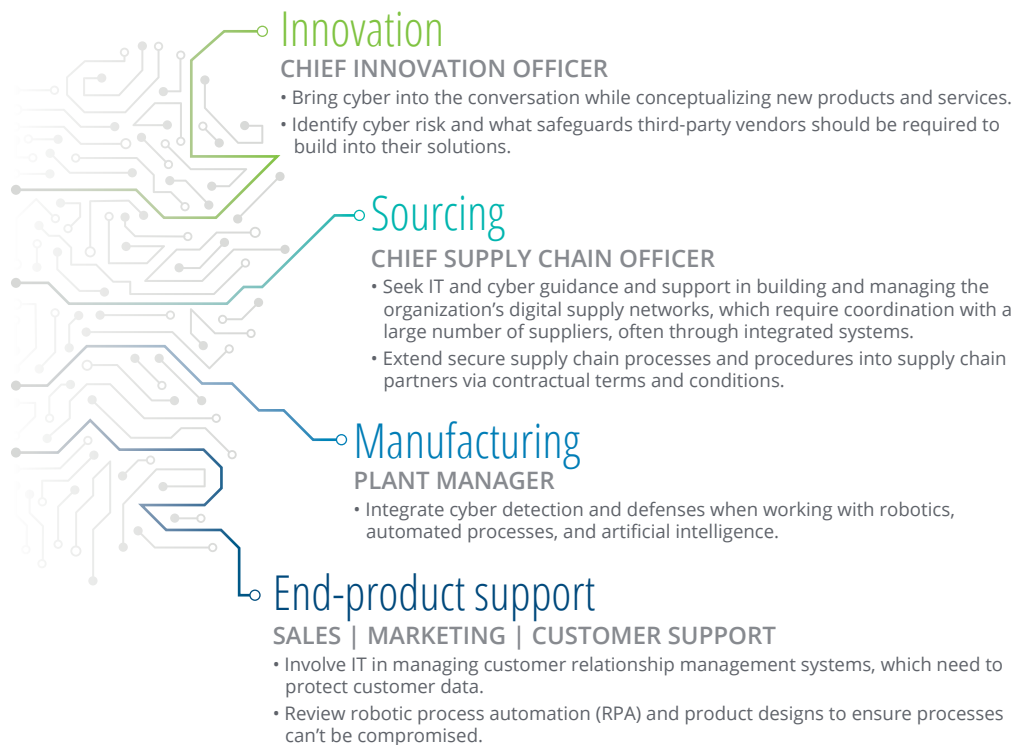
Figure 1 lists some steps that executives in various functions can consider to help achieve cyber awareness and action across the product life cycle.

The standardization challenge: Keeping up with the march of technology

As organizations' collective ambition has grown to push advanced technologies both across the enterprise and into consumers' hands, their cyber environments have expanded to include IT, OT, and customer-facing products and services. And with this expansion has come an ever-increasing variety of technology infrastructures and systems across which cyber must be maintained—and more

FIGURE 1

How leaders across the enterprise can build cyber into the business



Source: Deloitte analysis.

closely integrated. Yet, as organizations integrate IT, OT, and product environments, they are confronted with the reality that each environment has its own unique systems and processes that make finding a standardized solution difficult.

INFORMATION TECHNOLOGY: THE FIRST FRONTIER

As mentioned above, prior to the advent of connected sensors and cloud computing, almost all things cyber fell squarely in the realm of the IT department, which led the charge of protecting an organization's critical technology assets. These assets consisted primarily of core IT systems (for example, servers, networks, and applications) and information: IP, database schematics, and financial and customer data, to name a few.¹⁰

The advent and spreading use of cloud computing, advanced AI, and sensor technology shifted the IT landscape—and pushed organizations' cyber frontier beyond the bounds of the enterprise. New, more nimble competitors started forcing larger IT organizations to reprioritize and redesign their security solutions. Take financial services: Larger incumbent institutions are competing with new entrants that are using technology to change the service offering model by approving mortgage applications at a rate never seen before, for instance. To keep pace and accelerate development, IT functions are sacrificing control of their information to external partnerships and suppliers. Each partnership represents a new "building block" in the development of an IT solution. Thus, any IT solution can now consist of products and services from multiple suppliers.

OPERATIONAL TECHNOLOGY: A NEW AREA OF RESPONSIBILITY

At its core, OT monitors and manages physical devices and processes across a manufacturing operation. Until recently, since the Industrial Revolution, OT devices had traditionally been

isolated from the IT function. But digital technology has changed that.

Consider automotive smart factories, which use sensors to not only measure plant humidity levels but also to redirect production processes when the humidity is too high.¹¹ To do this effectively, IT and OT systems need to integrate at various levels, including in their approach to cybersecurity: If a sensor reading is compromised, for instance, it can shut down the entire production process. Integrating cyber into the manufacturing process can help unlock new capabilities—but neglecting it can expose the production process to enhanced risks.

This issue isn't confined to the manufacturing industry. As another example, many hospitals are increasing the connectivity of clinical technology and medical devices such as in magnetic resonance imaging (MRI) machines. Many hospitals only have access to a single MRI setup, with demand constantly exceeding supply. Sensor technology helps alleviate bottlenecks by giving the hospital a better view of equipment downtime and availability. But like any connected device, medical devices—including MRI machines—are vulnerable to cyberattacks.¹² Without careful cybersecurity design and implementation, these devices can go down at time-sensitive moments—such as when a surgical procedure is contingent on an MRI result.

CONSUMER PRODUCTS: CONNECTIVITY LEADS TO NEW CYBER CONSIDERATIONS

Another major cyber frontier is the consumer environment. Many organizations view advanced technologies as a means to enhance the customer experience. In addition to the massive amounts of consumer information companies may hold, the proliferation of wearables and connected devices has blurred the lines between IT, OT, and the product environment.

The health care industry again provides an example. Many patients today are interacting firsthand with connected products. For instance, some pacemakers now come with software that enables them to be remotely monitored. Wireless technology in the pacemaker alerts both patients and physicians to any issues. Consequently, patients are engaging more with their health, and surviving longer.¹³ However, if security is not designed into the device, cyber adversaries can go as far as buying equipment from third-party suppliers to remotely access and manipulate the data that informs patient treatments—thus negating the powerful benefits originally intended by the connected product.

Likewise, cyber considerations are affecting forthcoming innovations such as autonomous vehicles. To operate, each vehicle contains proprietary software with over 100 million lines of code.¹⁴ As society collectively moves toward self-driving cars, the designers of those cars need to weigh the merits of each technological innovation against the possibility that someone with malicious intent could hack it. Although automotive regulatory bodies have yet to flesh out the cyber standards for vehicle technology, it's possible that forthcoming regulations—if regulators are forced to choose—may prioritize passenger safety and operating efficiency over cyber. Yet while autonomous vehicles may operate safely under ideal circumstances, a single cyberattack can turn a safely operating vehicle into a public hazard.

The convergence of the IT, OT, and consumer product environments pays dividends in terms of innovations to better serve the consumer—but also introduces intricacies that make products vulnerable throughout their life cycle. Moreover, the sheer variety of connected products, along with the proliferation of third parties that may have a hand in developing them, make it impossible to devise a one-size-fits-all solution. These factors make it that much more important for cybersecurity to be embedded into all facets of product development.

Navigating the new frontier

Stretching across environments and stakeholders alike, the scope of cyber is vast, complex, and difficult to coordinate. This growing cyber landscape requires a deliberate strategy and culture that accounts for organizational growth. Businesses evolve, meaning that the people responsible need to continually adjust practices, protocols, training, and contracts to manage risks both proactively and reactively. A leading practice for dealing with ongoing operations is to always be looking at the threat landscape to evaluate the organization's cyber risk posture in real time.

There are three concurrent paths that can be considered when developing solutions that cultivate an innovative—and secure—environment.

PATH 1: ESTABLISH A COORDINATED GOVERNANCE MODEL

While financing a cyberattack can cost as little as US\$34, the cost of an incident to a company can reach into billions of dollars.¹⁵ But even more costly, potentially, is the dampening effect a cyberattack can have on an organization's appetite for pursuing technological innovations. For both these reasons, corporate boards are becoming increasingly aware of the financial toll of cyberattacks. Yet cyber is on only 49 percent of boards' quarterly agendas, and only 4 percent of boards discuss the issue monthly.¹⁶ This may change, however, as regulatory bodies are beginning to hold boards accountable for their knowledge of cyber issues and incidents. The pervasive impact of cyber throughout an organization's ability to execute its strategy shouldn't be underestimated. Boards can require management to provide key risk indicators that can enable them to quickly ascertain the state of cyber in the company.

Apart from raising the board's awareness, one way in which executives can work to raise cyber's profile across the organization is to establish an integrated governance model that is aligned with

key business strategies and supported by consistent cyber frameworks. Such an integrated model seeks to break down silos between the IT, OT, and product environments so that security can be considered and implemented seamlessly across their boundaries.

We've seen this accomplished by a large oil and gas company.¹⁷ While looking to update its remotely located refineries, where connectivity was a challenge, the organization brought together a diverse group of cyber professionals and business leaders to understand the overall business objectives, the refineries' workforce and their technical capabilities, and the limitations (such as sparse internet connectivity). Through bringing the cyber organization into the conversation, the company elevated cyber's importance and directly embedded the appropriate expertise into the work-design process. By diving into the business needs, the cyber professionals were able to identify security gaps and redesign the defenses to better align with the company's business objectives. Having cyber and business leaders work hand in hand also enabled both groups to effectively identify cyber vulnerabilities, and helped to alleviate the organizational knowledge gap where business leaders previously had little experience in navigating cyber design.

The effort netted promising results. First, the company recognized that many of its connectivity issues were due to outdated firewall configurations. By reconfiguring and standardizing the cybersecurity process, it was able to improve connectivity and decrease disruptions. Second, project leaders learned that much of the workforce regularly relied on paper forms and checklists. So, to effectively embed cyber considerations into employees' work, tasks such as monitoring and logging results were added to the refineries' regular checklists to prompt workforce adherence to strong security protocols. The value of the effort to company leaders speaks for itself: After the first successful integration, the company chose to repeat the



process at more than 100 refineries and field operations across the enterprise.

PATH 2: CULTIVATE COMMUNITIES OF LEARNING

Digital transformation, which relies on increasingly open environments, is forcing businesses to break down intra- and interorganizational silos to share both information and the underlying technical infrastructure that supports it. But organizations rarely undergo only a single digital transformation; many implement several transformations simultaneously. This creates new opportunities to spread cyber knowledge and information across groups.

Thanks to digital transformation, departments that previously had little interaction may now be required to work together. The cyber department, in particular, is likely to find itself pulled into a multitude of projects. Cyber professionals may work with marketing to revamp an e-commerce site, for instance, or with sales to enhance a customer-relationship management platform. By committing to greater knowledge-sharing, cyber organizations—armed with years of cyber experience—can help to better integrate and disseminate cyber learnings across the enterprise.

Digital transformations are also changing how organizations interact with—and learn from—outside partners and competitors. This is because they're increasingly relying on external parties to develop and support products. Beyond supplier relationships, we are even seeing companies that previously viewed each other as competitors become partners in certain areas.

Many such new partnerships are forming in the automotive industry. For instance, some automakers have gone from trying to develop their own smartphone integration software to partnering with technology companies to do so. These open environments are paving the way for sharing cyber practices and lessons learned across sectors. The

emergence of Information Sharing and Analysis Centers (ISACs)—member-driven organizations dedicated to enhancing cyber protection—is a primary example of growing industry collaboration around cyber. They provide a forum for member companies to share security threats along with information on how to address them.¹⁸

By expanding the community of learning partners both within and outside the enterprise, organizations can increase their rate of adopting sound security practices that can help them address today's new and growing cyber threats.

PATH 3: INVENTORY THE ORGANIZATION'S CYBER

Hopefully, by now we've established that cyber vulnerabilities are embedded throughout the organization and (potentially) its products—typically not due to carelessness or accident, but simply because of their interconnectivity. A natural follow-up is to inventory critical assets, identify the risk, and pinpoint exactly where those cyber vulnerabilities exist, to the best of the organization's ability. Much of this comes down to “hand-to-hand combat” where leaders across the organization will need to wade through each of their assets to determine if and where potential cyber threats may exist. The good news is that strong governance and communities of learning can help.

A solid first step is to document the organization's critical assets. This can include taking stock of where data is stored, where single points of failure have occurred within supply chains, which processes are automated, and which devices are connected to which networks and servers. Of course, the proliferation of technology can make this an exhausting exercise. To prioritize efforts, leaders can start with identifying “crown jewel” assets. These might be assets that give the organization a competitive advantage (such as IP), help it achieve new efficiencies (such as warehouse

robots), or in which safety is paramount (such as implanted medical devices).

Leaders in different industries and organizations with different objectives will likely, and appropriately, take different approaches to managing their cyber. For instance, established business-to-consumer organizations may want to focus their efforts mainly on products and supply chains. In contrast, a growing startup will most likely embrace a different cyber strategy, perhaps prioritizing creating employee-access protocols and training workers on leading cyber practices. For many startups, these are new areas of consideration that can make them especially vulnerable to attacks.¹⁹ As the startup grows, it will need to establish more formal cyber programs around authentication, access, monitoring, and threat intelligence to match the organization's maturity.

As digital transformations increase in scope and scale, taking a cyber inventory needs to become a regular work process rather than a periodic event. This is because every new technology integration can give rise to new security considerations.

Protecting the ability to innovate

Technology permeates almost everything that organizations do and make these days, and the connectivity that technology creates means that cyber must be a constant and ubiquitous concern. Among other things, a strong approach to cyber entails collaborating, or at least coordinating, with organizationwide peers, external partners, and sometimes even competitors. But while doing this may be challenging, the payoff is considerable: a safe environment for innovation. If an organization's cyber practices are known to be strong, then its leaders can feel empowered to pursue technological innovations, confident in the knowledge that the cyber risks those innovations may create will be appropriately addressed. The imperative is clear: Implementing effective cyber risk management across internal and external organizational boundaries can neutralize cyber threats as an obstacle to innovation—and enable an organization to continue to find ways to turn technology to its own and its customers' better advantage. ●

NICK GALLETTO is the Global and Canada Cyber Risk Services leader. He is based in Toronto.

ED POWERS is the Deloitte Risk and Financial Advisory Cyber Risk Services leader in the United States. He is based in New York City.

TIM MURPHY is a researcher and analytical scientist with the Deloitte Center for Integrated Research. He is based in Milwaukee.

Read more on www.deloitte.com/insights

Is the board on board with your tech strategy?

A tech-savvy board understands how technology can be used for both offense and defense. This guide provides four steps for helping your board be more tech-savvy.

Visit www.deloitte.com/insights/tech-saavy



The more they bet, the more they'll watch

MONETIZING THE "GAMBLING EFFECT" ON TV SPORTS WATCHING



IT WILL BE little surprise to most that young men watch a lot of sports on TV, that they watch more sports than women do, or that they gamble, according to a 2018 global Deloitte study of TV-watching and gambling behavior. What is news, though, is how important TV sports watching is for men aged 18–34, how frequently some of them gamble—and how close the relationship is between gambling frequency and watching more TV sports.

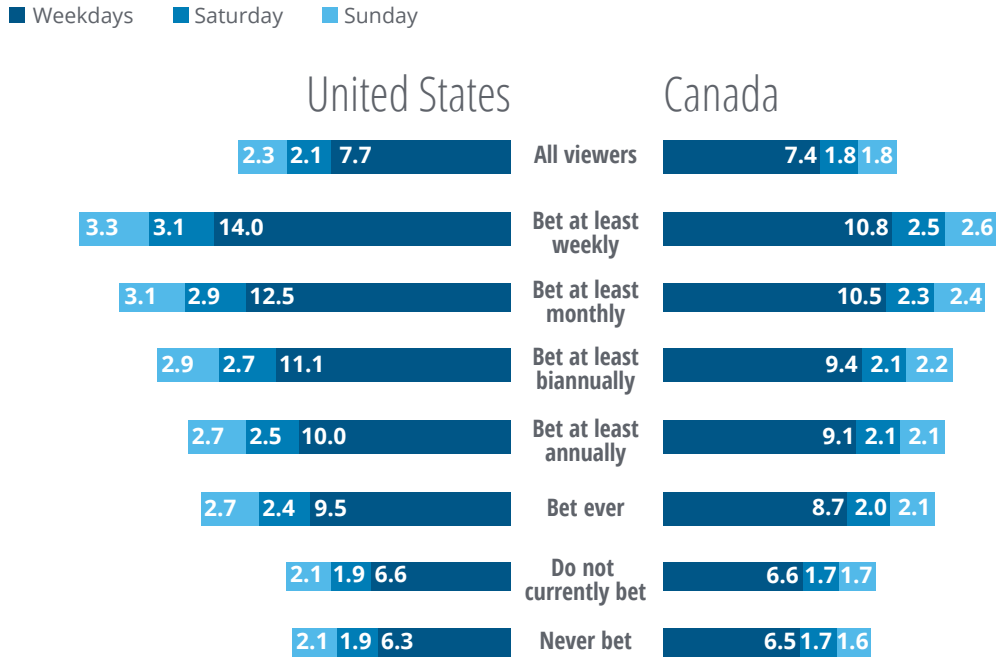
Indeed, our research suggests that in 2019, 60 percent of North American men aged 18–34 who watch sports on TV will also bet on sports. What’s more, the more often they bet, the more TV sports they’ll watch (figure 1).

The clear positive relationship between sports betting frequency and sports TV watching isn’t just of academic interest. The “betting effect” on how much sports TV men watch could mean revenue opportunities for TV sports broadcasters and the gambling industry alike. As a thought experiment, one can imagine a youngish man in the year 2025 watching a football game on TV, smartphone in hand. He can bet on the match at any point, modify his wager, buy back a losing wager, bet on the outcome of individual plays or stats—all in real time, and all tailored to him. Ads could be served that are customized for him, informed by his betting

FIGURE 1

In the United States and Canada, betting on sports drives more hours spent watching sports on TV

Mean weekly hours spent watching TV sports, by betting frequency and day of week, all TV sports watchers in the United States and Canada, 2018



Note: Of 1,062 US TV sports watchers surveyed, 129 bet at least weekly, 186 at least monthly, 266 at least biannually, 362 at least annually, 486 had “ever” bet, 653 did not currently bet, 563 never bet, and 13 did not know (not shown). Of 964 Canadian TV sports watchers surveyed, 111 bet at least weekly, 178 at least monthly, 257 at least biannually, 280 at least annually, 418 had “ever” bet, 621 did not currently bet, 534 never bet, and 12 did not know (not shown). Source: Deloitte global survey, US and Canada data, August 2018.

and attention, and watching would have to be 100 percent live. The broadcaster or betting site could not only charge more for ads seen by such an involved viewer, but even have a share in (or own outright) the profits from the betting/video stream ... at margins much higher than usual for TV broadcasting.

Will services like this come to pass? Will young men use them? Will they drive increased watching of live TV sports matches?

We would bet on it. ●

For more, read *Does sports TV have a future? Bet on it* on www.deloittereview.com.

Government, business, and closing the talent gap

BY JOHN O'LEARY AND
SUSHUMNA AGARWAL

NOT SO LONG ago, the United States' top economic concern could be summed up in three little words: Jobs, jobs, jobs. That's no longer the case. Today, there are more open positions than job seekers—a rare, if not unprecedented, occurrence.¹ Unfortunately, many of these job seekers lack needed qualifications. The new challenge can be summed up as: Skills, skills, skills.

When job seekers lack needed skills, businesses are left scrambling to fill openings. And although the current US unemployment rate of 3.8 percent is one of the lowest in the nation's history,² many workers are employed in low-wage jobs. Therefore, improving skills is important for individuals, companies, and the economy as a whole.



It should be no surprise, then, that workforce development and talent shortages remain a top concern for US government leaders. In fact, 42 of 50 state governors ranked workforce development as their top priority for state-federal efforts.³ At the federal level, in 2018, the White House issued an executive order establishing the National Council for the American Worker and the American Workforce Policy Advisory Board as forums to address workforce issues.⁴

What can government do to close the talent gap? Here are five strategies to consider:

1. **Use evidence-based strategies to improve training delivery.** State governments offer training programs to equip job seekers with employment skills, and the federal government funds many of these programs through the Workforce Innovation and Opportunity Act (WIOA), which also mandates that states have to report back on the impact. Analyzing the evidence provided in these reports offers guidance to state governments on how they could improve their workforce training efforts.

For instance, our analysis of WIOA data shows that customized training, which are programs tailored to meet the specific requirements of an employer or a group of employers,⁵ had the highest impact on employment and wages. Between 2013 and 2015, about 55 percent of the participants in customized training were employed one year after completing the program; in addition, participants earned US\$16,500 more annually than their non-participant peers.⁶

State governments can use such information to identify and scale successful training approaches and customize training by demographic.

2. **Focus on lifelong learning.** According to a 2016 survey by PayScale Inc., close to half of all employers in the United States said that college graduates are not ready for the workplace.⁷ More importantly, even if their four-year degree prepares them for their first job, new graduates will likely need reskilling throughout their career due to technology shifts. Colleges and public universities could rethink their models to help adult learners adapt. For instance, they could adopt a “subscription university” model that would allow students to dip in and out of the curriculum throughout their lifetime.⁸

Similarly, government job training programs could be made more effective for older job seekers. Today, only 29 percent of participants in WIOA programs above age 55 are employed one year after completing the program, compared with 41 percent of participants age 25–54, which suggests there could be opportunities for improvement.⁹

3. **Focus on the available jobs.** To enhance the effectiveness of workforce programs, governments can design training programs that focus more on the skills that companies are looking for—that is, specific jobs in specific industries—instead of adopting a one-size-fits-all approach.

For example, the state of Maryland’s Employment Advancement Right Now program works with the local employer community to design and, in some cases, deliver training that aims to create job-ready employees with skills that match the immediate business needs of different industries. As of June 2018, 81 percent of those trained through this program had found employment.¹⁰

4. **Consider apprenticeships for “middle-skill” jobs.** Apprenticeships in the United States have largely been restricted to mechanical trades such as plumbing, welding, and machining. However, apprenticeships can be valuable for many middle-skill jobs such as lab technicians and even newer, highly skilled roles such as computer programmers and cybercrime analysts.

A traditional four-year college degree may be necessary for some jobs, but opening up middle-skill jobs to individuals who have a two-year degree plus some relevant work experience can help companies tap into a larger pool of workers. For instance, MC2, a nonprofit in St. Louis, has been able to use apprenticeships to fill local cybersecurity positions with people from diverse backgrounds, including retirees, former teachers, and veterans.¹¹





5. **Play a matchmaker role.** With many different stakeholders in the workforce ecosystem, gaps in information-sharing and communication can reduce the effectiveness of the system. Governments can help close these gaps by more closely connecting job seekers, schools and training organizations, and employers so that all parties have access to the information they need. For example, a job search platform called *skillful.com*, launched by the Markle Foundation in collaboration with Microsoft, LinkedIn, and the state of Colorado, aligns employers and educators to help ensure that training programs provide the skills needed by Colorado employers.¹² In Singapore, the government creates “industry transformation maps” that list training courses corresponding to in-demand skills to help individuals make informed training and career choices.¹³

These strategies can help the US government close the skills gap, preparing individuals for the future of work while also ensuring that companies have access to the talent they—and the economy—need. ●

For more, read *Closing the talent gap: Five ways government and business can team up to reskill workers and Reinventing workforce development* on www.deloittereview.com.

ORGANIZATIONAL TRANSFORMATION

CYBER

FUTURE OF MOBILITY

TECHNOLOGY AND SOCIETY



Toward a mobility operating system | 82

By Scott Corwin, Anant Dinamani, and Derek Pankratz

Tempering the utopian vision of the mobility revolution | 94

By Craig Giffi, Joe Vitale, and Ryan Robinson





Toward a mobility operating system

**Establishing a lingua franca for
urban transportation**

BY SCOTT CORWIN, ANANT DINAMANI, AND DEREK PANKRATZ

ILLUSTRATION BY TRACI DABERKO

For 200,000 years, humans were, chiefly, a rural species. Driven by the demands of hunting, gathering, and eventually pastoralism and agriculture, population densities remained low. Great cities served as important hubs for exchange, to be sure—Ur, Thebes, Babylon, Athens, Rome, Chang’an, Tenochtitlan, and others—but they were far from most people’s daily lives.¹

Two and a half centuries ago, as the Industrial Revolution unfolded, that story began to change (figure 1). A variety of economic, political, and technological forces converged, drawing more and more people into cities. As Sidewalk Labs CEO Dan Doctoroff notes, the steam engine, the electric grid, and the automobile “brought people and goods to cities across long distances [and] enabled them to become industrialized on a scale that was not possible before.”² Our great migration from the countryside to ever-larger metropolises has been a defining arc in the human story. In 2010, for the first time, more people lived in urban than rural areas, and our rising urbanization shows few signs of abating.³

These great shifts have been accompanied by tremendous opportunities and challenges. Cities have been engines of ingenuity, innovation, and economic growth. They are the centers of commerce, and they have incubated many of our greatest achievements in the arts and sciences. But they face an increasingly complex set of issues associated with feeding, housing, protecting, employing, and transporting people and goods while providing equitable access for a growing influx of citizens. Saddled by legacy infrastructure and limited

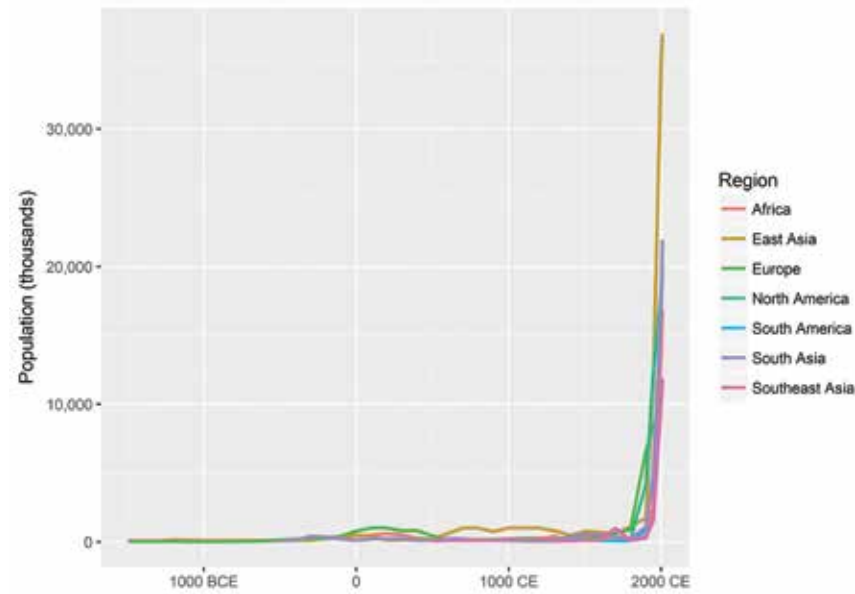
budgets, many urban areas are struggling to keep pace with increased populations and growing volumes of freight, often leading to increased congestion, lower quality of life, lost economic potential, and negative health outcomes. The contours of many cities today look far different than they did when public transit systems were first established, often decades earlier. Young families populate many neighborhoods that once housed factories. Farm fields that grew corn now sprout subdivisions. Yet in many instances, the transportation network serving these areas remains fundamentally unchanged, struggling with unforeseen traffic and ridership.⁴

More recently, and partially in response, a dizzying array of mobility-related innovations has emerged that could help many of those challenges. Many urbanites are flocking to these expanded array of transportation options—carsharing, ride-hailing, bikesharing, e-scooters, greenbelts and pedestrian paths, and others—in many cases substituting them for existing outmoded, inconvenient, and inaccessible transit systems. With the emergence of shared autonomous mobility, connected infrastructure, and smart cities technologies, the prospects for an urban intermodal transportation ecosystem

FIGURE 1

Cities have skyrocketed in size since the Industrial Revolution

Largest settlements by region, 1500 BCE–2000 CE



Source: Deloitte analysis based on Christopher Chase-Dunn et al., “Uneven urban development: Largest settlements since the late Bronze Age,” IROWS working paper #98, August 2015.

that is faster, cheaper, cleaner, safer, and more accessible appear closer than ever.⁵

Realizing this vision, however, is likely to require more than a series of one-off point solutions. Indeed, on their own, new mobility services may only exacerbate the current transportation system’s friction and inefficiencies by adding complexity and additional transaction costs while siphoning off demand from existing modes with slow-to-adjust prices (such as public buses). But there could be a way to achieve a Pareto-improving, more efficient outcome in the near term by overlaying onto today’s transportation system a citywide digital platform to facilitate transparency, interoperability, coordination, and control: a *mobility operating system* (mOS).⁶ Without it, planners will likely struggle to see gains from new forms of

mobility—and from the investments of players across the ecosystem—for a decade or more.

Cities’ mobility challenge

While conditions vary dramatically across the globe, many of the world’s largest cities are straining to meet their citizens’ mobility needs. Fueled by population growth, urbanization, often misaligned transportation systems, and a shortfall of investment in public infrastructure, congestion and other transportation-related challenges are having a deleterious impact on urban life.

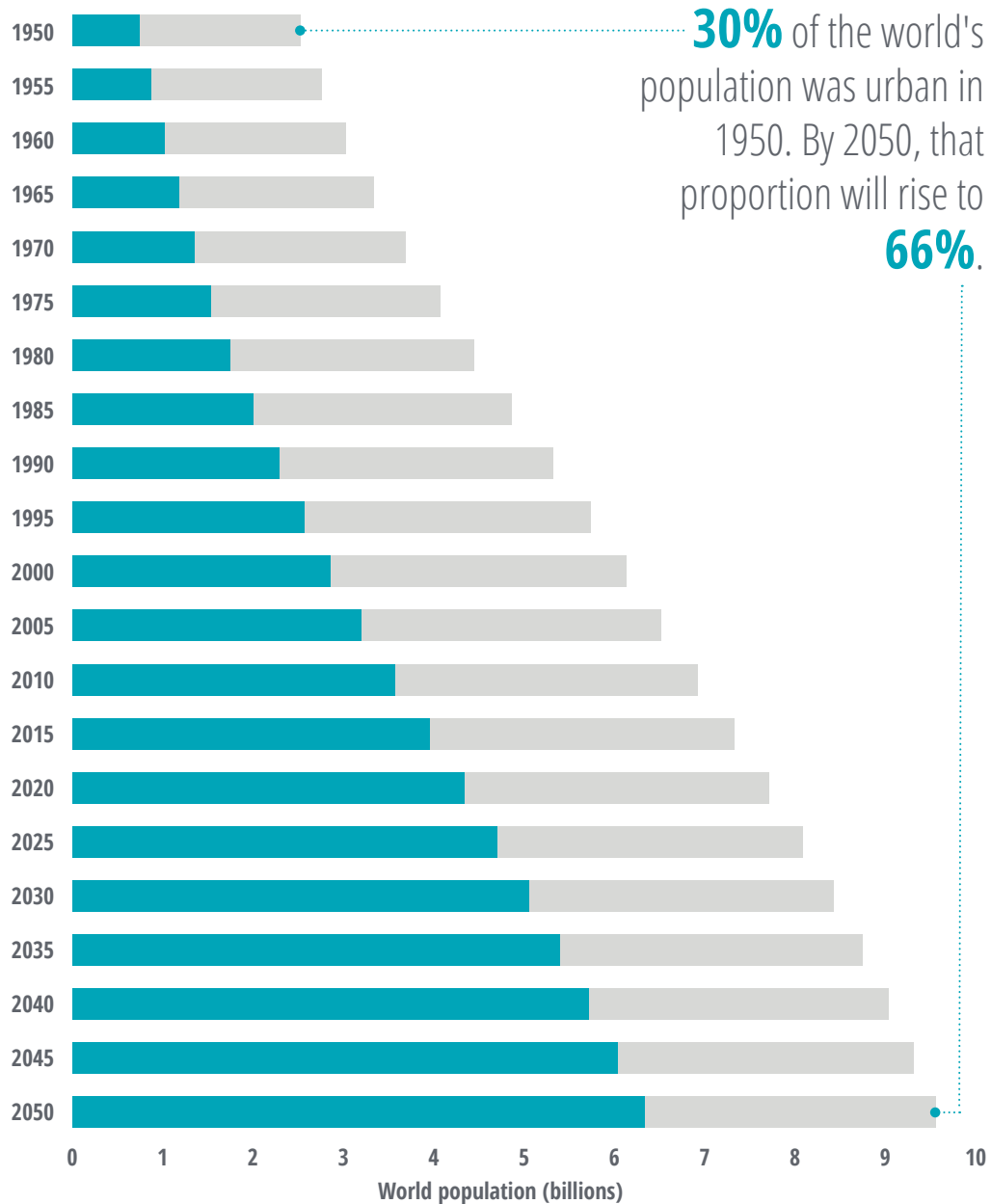
Urban populations have grown steadily since 1950 (figure 2).⁷ Today, roughly 4 billion people live in urban areas, a number the United Nations expects to reach more than 6 billion by 2050—two out of

FIGURE 2

The world's population is steadily becoming more urban

Global urban and rural population, 1950–2050

■ Urban ■ Rural



Source: United Nations, Department of Economic and Social Affairs, Population Division, *World urbanization prospects: The 2014 revision*, 2015.

every three people on earth.⁸ While most cities remain relatively small, more than 500 of them are home to at least 1 million people. By 2030, there could be 41 “megacities” with populations of more than 10 million—there are already 11 such cities in China and India alone.⁹ Unsurprisingly, analysts expect the demand for mobility within cities to increase accordingly, with global urban passenger-miles almost doubling across all modes by 2050 (figure 3).¹⁰ In most cities, public infrastructure and transit systems simply cannot keep pace with the growth. There is already an estimated US\$1 trillion shortfall in US surface infrastructure spending.¹¹ In the absence of major policy and technological changes, by 2050, roughly 15 million additional miles of paved roads and 30,000 square miles of parking spaces could be needed to meet global demand.¹²

Already, many cities are experiencing the downsides associated with overloaded and inefficient roads and transit systems. In the most congested cities, drivers spend between 100 and 200-plus hours per year—two to five entire workweeks—stuck in traffic.¹³ The cumulative impact on US GDP of deteriorating infrastructure could exceed US\$4 trillion by 2025.¹⁴

Analysts expect the demand for mobility within cities to increase accordingly, with global urban passenger-miles almost doubling across all modes by 2050.

Congestion may be the most visible symptom of cities’ mobility-related challenges, but it is by no means the only one. Based on data from roughly 3,000 cities, nearly 80 percent of people living in urban areas are exposed to air pollution—much of it attributable to vehicle emissions¹⁵—that exceeds World Health Organization recommendations, increasing the risk

of a variety of respiratory diseases, heart disease, stroke, and lung cancer.¹⁶ In Organisation for Economic Co-operation and Development (OECD) countries alone, more than 7 million years of life were lost due to ambient air pollution in 2010, about 50 percent of which comes from road transit.¹⁷ The act of commuting itself is associated with poor health outcomes.¹⁸ And research suggests that access to transportation is one of the most important factors for escaping poverty in cities.¹⁹

Harnessing the future of mobility

In most cities, a reincarnation of New York “master builder” Robert Moses’s vision will not solve this problem; simply building more roads is as likely to exacerbate the issues as alleviate them.²⁰ With constrained budgets and finite space, cities must figure out how to enable *greater throughput*—moving more people and goods either through the existing transportation system or by adding additional capacity without creating more traffic—across the entire transportation system. This will likely require significant modernization of the entire network and managing mobility holistically as a

“system of systems.” Today’s system is considered far from optimized; there are massive costs associated with the imbalances between supply and demand. Through a combination of new forms of mobility, more flexible and adaptive pricing, and digitization of the entire system, an extraordinary opportunity exists to reach a new, more efficient equilibrium point that addresses many of

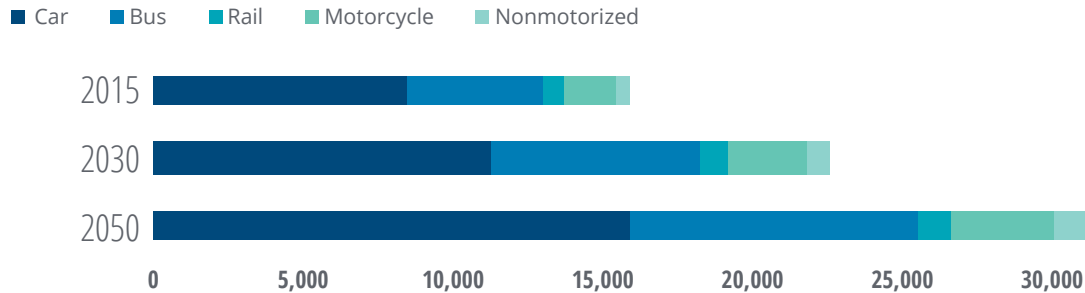
the negative externalities in today’s system.

As many private sector actors have sought to capitalize on the inefficiencies and gaps in existing transportation networks, new mobility-related services and solutions have proliferated. Responding to market need, these new offerings cover the

FIGURE 3

By 2050, global urban passenger-miles will almost double

Urban passenger-miles by mode (billions)



Source: International Transport Forum, *ITF Transport Outlook 2017* (Paris: OECD Publishing, 2017).

gamut of urban concerns: traffic efficiency, public safety, commerce, sustainability, accessibility, equity, and health and welfare. As Ramayya Krishnan, dean of the Heinz College of Information Systems and Public Policy at Carnegie Mellon University, notes, “Technology has transformed and is continuing to enable rapid innovation in mobility services. Government has to innovate on policy but has not done so. In the meantime, people are adopting services based on their individual cost-convenience trade-offs.”²¹ The last several years have seen significant advances in trip planning and dynamic routing; vehicle-to-vehicle and vehicle-to-infrastructure connectivity and smart infrastructure; new modes of mobility, including docked and dockless bikeshare, e-scooters, micro-transit, and ride-hailing; and integrated ticketing and payments.

While promising, “the biggest challenge is getting the policy and regulatory frameworks correct to ensure we arrive at the utopian, not the dystopian vision” for these new mobility solutions, notes John Moavenzadeh, an executive director at Massachusetts Institute of Technology (MIT).²² Deploying uncoordinated and isolated point solutions is likely to leave many of the systemwide benefits unrealized—“imagine a passenger-less autonomous vehicle being sent to pick up dry

cleaning during rush hour.”²³ Indeed, it is possible that adding self-driving cars and other solutions could exacerbate, rather than alleviate, a city’s mobility challenges. Even as ridesharing has grown in New York City, for example, bus ridership is declining and subway delays have climbed, with one-third of the delays attributed to overcrowding. The problems are aggravated by outmoded technologies and assets in dire need of modernization.²⁴ New modes of mobility interact with existing public transit in complex ways and, in some cases, could cannibalize usage or fail to serve populations most in need.²⁵ In New York, 50 percent of ride-hail trips would have otherwise been taken using transit, prompting in part new caps on ride-hailing fleets and a congestion-charging scheme.²⁶

Greater than the sum of its parts: The mobility operating system

To truly harness emerging technologies to solve the most vexing problems, cities would need a comprehensive, integrated system that transcends existing infrastructure, drives standardization and interoperability, enables value creation by key parties, and cultivates technological advancements. In other words, a city would need an mOS: an integrated

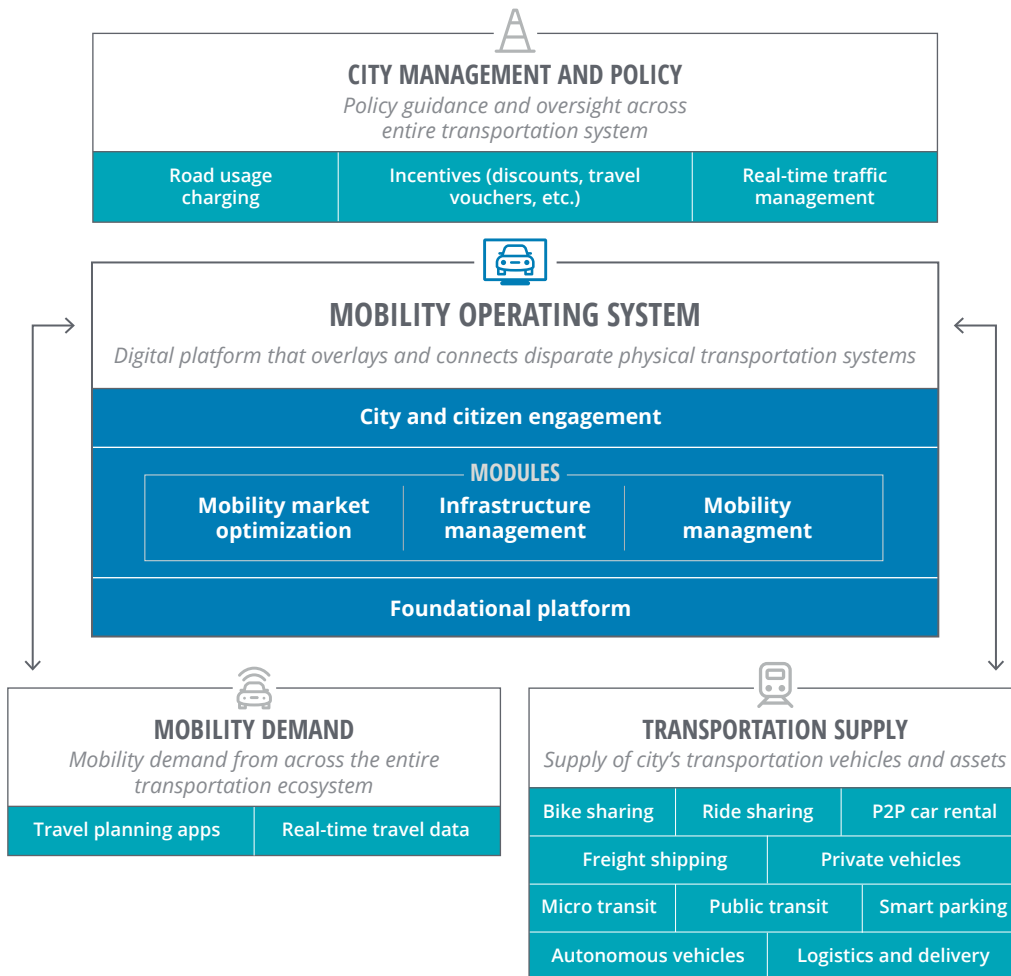
platform that brings together physical infrastructure (roads, rails), modes of transport (cars, public transit, ridesharing, bikesharing, e-scooters and new forms of micromobility, etc.), and transportation service providers (private operators, transportation network companies, aggregators, public transport system) and creates greater throughput and optimization systemwide through market clearing mechanisms (figure 4).

The platform combines advances in Internet of Things (IoT) technology, big data, and cognitive analytics to more efficiently align supply and demand, while catering to individual preferences and optimizing transport resources to improve urban life. At its core, it is enabled by a dynamic nerve center that:

- Provides a central data exchange for the various types of mobility-related data generated by

FIGURE 4

A mobility operating system: Core elements of a digital mobility platform



Source: Deloitte analysis.

sensors, transponders, and via electronic transactions throughout the city

- Creates visibility into network capacity across modes
- Shows real-time consumption of different forms of mobility by mode and location
- Enables historical analyses of supply and demand to adapt the transportation system to be more fit for future purposes
- Creates market-driven incentives to shift consumption choices; practically, that could mean offering discounts for people to opt for less-utilized and perhaps slower routes, or to shift their travel to off-peak times
- Offers a transaction platform that creates a new source of revenue for the city and expands the market for transit service companies and passengers by offering a wider array of choices to seamlessly travel from point A to point B
- Smooths out peaks and valleys in demand, creating greater throughput and system optimization

The capabilities of an integrated mobility platform can benefit a wide range of stakeholders.

City transportation managers can gain a real-time perspective of the entire mobility network, as the system would ingest data from multiple sources, including vehicle- and infrastructure-based sensors (such as GPS-based city bus tracking and smart traffic lights that monitor vehicle flow) and citizens' digital footprints (such as smartphone-enabled geolocation and electronic fare charges by mode). Drawing on that information, the system can then enable the city to equilibrate supply and demand and facilitate traffic throughput by adjusting incentives, most directly by calibrating prices across modes and locations but

also through the use of behavioral nudges such as framing and social proofs (by, for example, highlighting how many of a person's neighbors use public transit to travel a similar route to work).²⁷

The system can utilize such data to conduct predictive analytics, modeling out system capacity and utilization under a variety of conditions (peak traffic or a major sporting event, for example). They can also be used for longer-range scenario evaluation, allowing city leaders to understand the trade-offs inherent in infrastructure, policy, and operational choices and how they might affect the city and its citizens. That could allow for more informed decision-making about, say, whether it would be better to invest in a new light rail system or dynamic shuttles, and where to place those assets. There are also advanced planning tools that could dynamically simulate the impact of alternative configurations of mobility.

An agency's overarching role is planning and operational performance oversight and, relative to an integrated mobility platform, would be mostly oversight of a decentralized system, similar to how buyers and sellers come together via a stock exchange for which the government sets rules and policies around information symmetry, fairness in the transaction, transparency, and fees. The system could also offer multiple avenues to create a valuable municipal revenue source that could offset declining tax revenues, at a time when city governments need funding for critical infrastructure and other projects.

Private sector service providers would be able to reach new markets and consumers, while optimizing the size of vehicle fleets deployed at different times of the day and reducing "empty miles" (miles traveled with no passengers) and costs. A platform-administered unified payment system could facilitate a single payment across modes, simplifying fare collection across mobility providers—until now, a stumbling block in many mobility-as-a-service (MaaS) applications.²⁸ The

A city's mobility platform can help equilibrate supply and demand and facilitate traffic throughput by adjusting incentives, most directly by calibrating prices across modes and locations but also through the use of behavioral nudges such as framing and social proofs.

system and its requisite data clearinghouse can also enable ticketless travel and a variety of payment options, including pay-as-you-go and monthly subscriptions.

That said, an important plank in many private sector mobility providers' business model is the ability to capitalize on inefficiencies in the existing transportation network. Ride-hailing companies, for example, promise to connect riders with drivers more conveniently and quickly and at a lower cost than traditional taxis, while on-demand shared or shuttle buses add more flexibility relative to fixed-route buses. An integrated platform that optimizes across modes could challenge that approach and therefore limit companies' desire to opt in. There will likely need to be incentives to strongly encourage adoption, especially early on when the tangible benefits have yet to materialize.

Finally, **end users** can enjoy a single interface to plan and pay for trips across all available modes of transport. The integrated platform could support MaaS, enabling each traveler to tailor their journey based on their priority, whether price, speed, modality, or some other feature.²⁹ And users would benefit from reduced congestion, faster trips, and improved access to mobility.

Toward a lingua franca for mobility

Mobility figures prominently in everything needed to make a city advanced, attractive, intelligent, responsive, and sustainable. Addressing cities' most pressing challenges and making the most of the exciting advances in mobility likely requires fresh thinking about how urban transportation can work. It starts with moving beyond single-modality management and instead optimizing mobility as a "system of systems." Few city governments are structured in a manner conducive to optimizing the full potential of a 21st-century mobility network. In general, to successfully implement a mOS,

municipalities should move beyond traditional transportation policy and funding frameworks. Some important challenges to consider:

- **What outcome should be optimized?** Participants' goals will almost certainly vary, and agreeing on the key goals for the mOS is likely to require deft negotiation. Articulating a set of design principles can help clarify the trade-offs and evaluate an mOS's performance.³⁰
- **Does political leadership exist?** City leadership with the willingness and ability to incentivize participation and restrict access to the urban transportation market is likely to be key.
- **What levers are available to manage supply and demand** by altering incentives for mobility providers and citizens?
- **How will data be collected, shared, and analyzed?** What legal, security, and privacy concerns must be addressed, and how?
- **How should an urban planning process be revised to sustainably optimize greater throughput?** More infrastructure is simply not enough—urban challenges increasingly require more efficient use of existing assets, land, and the flexible deployment of new services that meet specific needs at times of peak demand.
- **What governance mechanisms are needed?** "Technology is not the constraint," observes Carnegie Mellon's Ramayya Krishnan. Rather, it is the creation of a thoughtful and data-driven "operating model" for cities that is more responsive to mobility-related externalities and that is more enduring than a single leader.³¹
- **Who pays?** Financing is likely to pose a persistent and daunting challenge. Figuring out ways

to incent or secure private investment could be key to implementing a system that delivers societal benefits akin to the advances that made cities into such vibrant centers originally.

- **How do you manage the movement of people and goods?** Any mOS should account in some fashion for the movement of goods. But the optional approach to that accounting will likely hinge on the relative importance and complexity of freight traffic flowing into, out of, and around a city.

A Rosetta Stone for mobility

Two centuries ago, a soldier in Napoleon’s army discovered an artifact from one of the ancient world’s great cities, Egypt’s Memphis. The 2,000-year-old stone was inscribed with the words of a royal decree in two forms of Egyptian hieroglyphs and—crucially—ancient Greek. That object, dubbed the Rosetta Stone, became the key to deciphering Egyptian hieroglyphics and opening up an entirely new realm of knowledge to the modern world.

A similar bridge—helping different types of parties communicate and work together—could greatly help to bring together the diversity of mobility interests in today’s complex urban areas. Twenty-first-century cities face tremendous challenges. As their populations swell, their ability to meet citizens’ transportation needs could be severely tested. Even if budgets were unconstrained, simply adding more roads would not be the answer. New mobility services offer great promise, but lack of coordination could make the problem worse, not better.

To make the most of the future of mobility, cities should harness the remarkable technological innovations of recent years to create a common platform that enables visibility, interoperability, and optimization across the transportation network’s many nodes and modalities. Putting new connected services in context and conversation—helping them work together for the benefit of users, third-party providers, and the city itself—will be key to realizing the benefits of the emerging mobility ecosystem. ●

SCOTT CORWIN is a managing director in Deloitte Consulting LLP and leads Deloitte’s Future of Mobility practice. He is based in New York.

ANANT DINAMANI is a principal with Deloitte Consulting LLP and a leader in Deloitte’s Future of Mobility Analytics and Solutions team. He is based in Austin, TX.

DEREK M. PANKRATZ is a senior research manager with the Center for Integrated Research in Deloitte Services LP. He is based in Denver.

Read more on www.deloitte.com/insights A heliport on every house?

What infrastructure needs will cities have to account for to make urban air transportation a reality? Read how the elevated future of mobility will evolve.

Visit www.deloitte.com/insights/elevated-mobility



Tempering the utopian vision of the mobility revolution

BY CRAIG GIFFI, JOE VITALE, AND RYAN ROBINSON

ILLUSTRATION BY TRACI DABERKO

Most scenarios involving future transportation systems center on the hyperoptimistic view that everyone will take full advantage of integrated, electrified, shared mobility networks that have unfettered the ordinary consumer from the bonds of fossil fuels and personal vehicle ownership. The benefits of this potential future are undeniable, and giving people an idea of what transportation could be like is important. Yet there are still many hurdles to clear.

And perhaps one of the most important, yet often overlooked, is the question of consumer adoption. What proportion of people, for instance, will actually buy an autonomous vehicle (AV) or use shared transportation? Will this proportion be big enough to transform mobility on a large scale? Is it possible that such technologies and behaviors will remain niche phenomena in a future that looks more or less the same as today?

In this article, we look at four automotive trends that are foundational to the future of mobility—vehicle autonomy, electrification, connectivity, and shared transportation—through a global consumer lens using results from the 2019 Deloitte Global Automotive Consumer Study. Our overall takeaway: Significant challenges remain that may be overlooked by industry players so focused on



developing the technology that they forget to ask whether anyone will use it.

Global consumers appear to be pumping the brakes on AVs

One of last year's most interesting study findings was a general warming toward the concept of self-driving vehicles, signaled by a precipitous drop in the percentage of consumers that believe that AVs will be unsafe. This was attributed, in part, to people's increasing exposure to a variety of AV initiatives and real-world pilots via broad media campaigns.

However, in this year's study, something quite unexpected happened. Rather than decreasing

further, the percentage of people viewing AVs as unsafe has all but completely stalled in virtually every market around the world (figure 1).

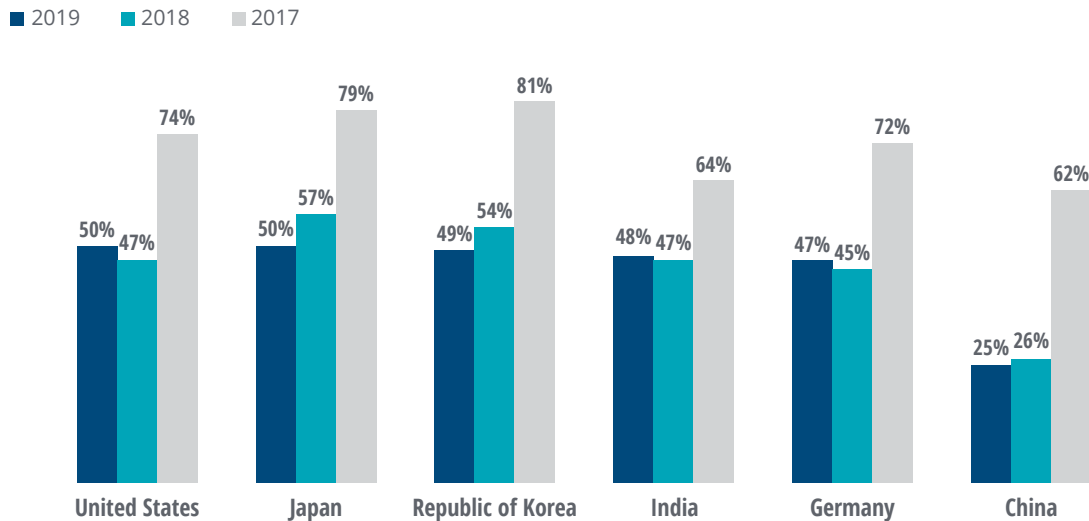
The obvious question: What caused the strong positive momentum toward perceived self-driving vehicle safety to evaporate? The answer could be rooted in the very same media that captured consumers' attention in the first place. Widespread coverage of even the very small number of accidents involving AVs may be shaping public perception, with nearly two-thirds of consumers in the Republic of Korea, the United States, India, and China agreeing that media reports of accidents involving AVs have made them more cautious of the technology.

Consumers also want governments to up their regulation game: An overwhelming percentage of

FIGURE 1

Consumers' safety perceptions of AVs remain largely unchanged since last year

Percentage of consumers who agree that AVs will not be safe



Source: Deloitte Global Automotive Consumer Study.

consumers in most countries indicated they wanted “significant oversight.” In fact, consumer trust in traditional original equipment manufacturers (OEMs) bringing AV technology to market continues to slip. Even in Germany, where trust in OEMs has traditionally been fairly solid, this proportion has dropped to 33 percent from 51 percent in 2017. This may be, in part, to the black eye German automakers suffered in the wake of the “dieselgate” scandal.

Our study results reveal that people are turning to existing technology companies, perhaps because of exactly these reasons. This trend is troublesome for automakers making enormous investments to develop AV features, and fortuitous for new industry entrants that are looking to disrupt the mobility space. Indeed, government standard-setting for, say, data communication and programming outcomes could change consumer perception and help the AV industry.

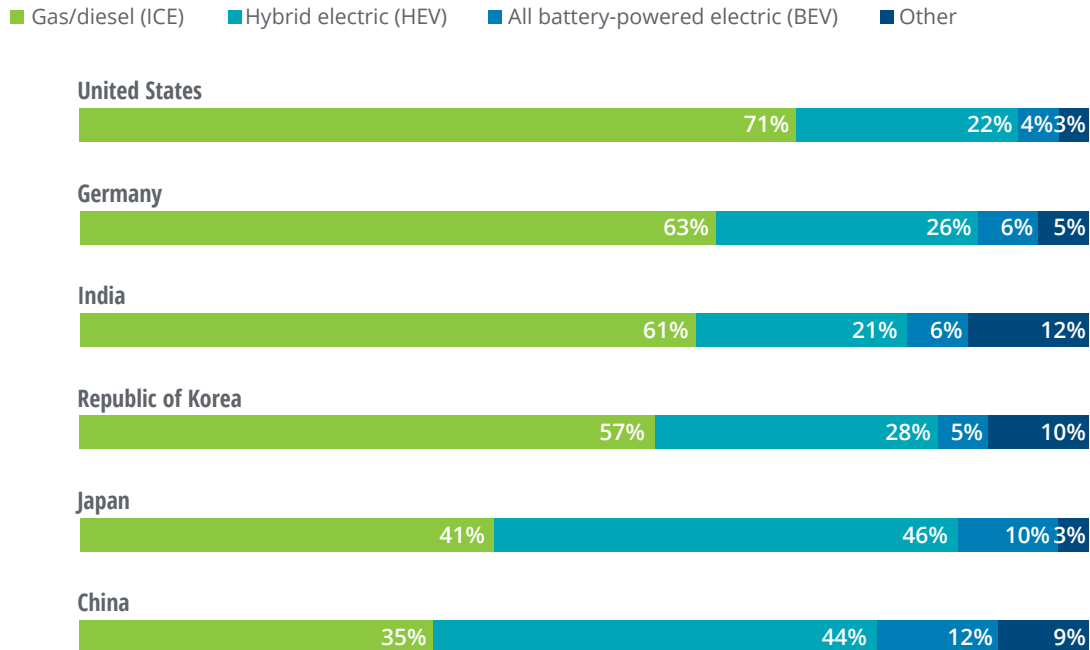
Electrification could make a more immediate impact on global mobility

Study results indicate that many consumers are considering an electrified powertrain as a viable option for their next vehicle (figure 2). However, even though global growth in electrified vehicles (EVs) is expected, it will likely play out somewhat differently depending on the market.¹

- China is strengthening its policy ecosystem to drive EV growth to address domestic pollution concerns, reduce its reliance on imported oil, and stake a claim to leadership in the next era of global mobility.
- The share of diesel vehicles in the EU-15 region declined from a high of 56 percent in 2011 to 45 percent in 2017.² More recently, diesel share in the European Union fell sharply to 37 percent in the first half of 2018 from 43 percent in the

FIGURE 2

Many consumers are willing to consider an electrified powertrain for their next vehicle



Source: 2019 Deloitte Global Automotive Consumer Study.

first half of 2017.³ Some European countries, including Norway, Britain, France, and the Netherlands, have even announced plans to ban the sale of conventional gas- and diesel-fueled vehicles over the next two to three decades.

- EV adoption in North America is likely to lag due to a low-fuel-price environment, relaxed emissions standards, and a tighter tax-rebate policy.

Even if one accepts the most optimistic forecast for global EV sales over the next decade, this number is still a drop in the bucket compared to the more than 1.2 billion fossil-fueled vehicles currently on the road.⁴ With a life expectancy of more than 10 years, these traditional vehicles will likely remain the dominant automobile type for some time to

come. In addition, our study results indicate that consumers in most countries remain hung up on (increasingly unfounded) concerns about battery-electric vehicle (BEV) range, charging time, and safety. Instead, people are looking to hybrid electric vehicles (HEVs) as the interim answer. Interest in HEVs in Japan, for instance, grew from 38 percent of consumers in last year's study to 46 percent this year.⁵

Getting consumers to pay for increased connectivity could be a challenge

Industry estimates suggest that worldwide sales of connected cars will reach 72.5 million units in 2023, up from just 24 million units in 2015.⁶

However, consumers in different markets perceive the benefits of increased vehicle connectivity differently. For example, twice as many people in China and India than in Japan and Germany agreed that increased connectivity will lead to substantial benefits. However, less than half of the surveyed US consumers (47 percent) bought into the idea.

Part of what may be driving concerns about vehicle connectivity is the increasing number and type of sensors to track everything from powertrain performance and operational statistics to geolocation information and occupant wellness. Not all types of data collection are getting a full endorsement from consumers. Sixty-three percent of people in the United States are concerned about biometric data being captured and shared with external parties; 40 percent of people in China and Japan say the same. Nonetheless, interest in connected features such as traffic congestion tracking and road safety alerts is universally high, which strongly aligns with the most important aspect of mobility for at least one-third of consumers—getting to their destination in the least amount of time.

Part of what may be driving concerns about vehicle connectivity is the increasing number and type of sensors to track everything from powertrain performance and operational statistics to geolocation information and occupant wellness.

Are consumers willing to pay to gain access to advanced connected vehicle features? The answer is a resounding “maybe.” In Germany, 43 percent of consumers said they would not pay any more for a connected vehicle, and another 40 percent said

they would only pay up to 600 euros more. A similar story plays out in the United States, where one-third of consumers would not pay more and another 42 percent would only pay up to US\$500 more. And although a far greater proportion of consumers in Japan (72 percent) would pay more, their upper limit was only ¥50,000 (approximately US\$450). Indian (50 percent) and Chinese (43 percent) consumers were willing to pay more than ₹25,000 and CN¥2,500, respectively (roughly US\$350).

The mobility revolution is running up against entrenched consumer behavior

There are a few “immutable truths” about consumer behavior: (1) Consumers are unwilling to compromise, (2) their usage patterns are difficult to change, and (3) they don’t like sharing. For example, study results indicate that 56 percent of Americans are not interested in carpooling services, and German consumers prefer to use their vehicle daily

(47 percent of consumers now and 46 percent three years from now).

Finally, multimodal transfers in one trip are largely an occasional undertaking for most: Thirty-nine percent of US consumers say they never combine different modes in a single trip, and while one-third of Japanese consumers say they do so at least once per week, another 58 percent indicate that this is an ad hoc occurrence.

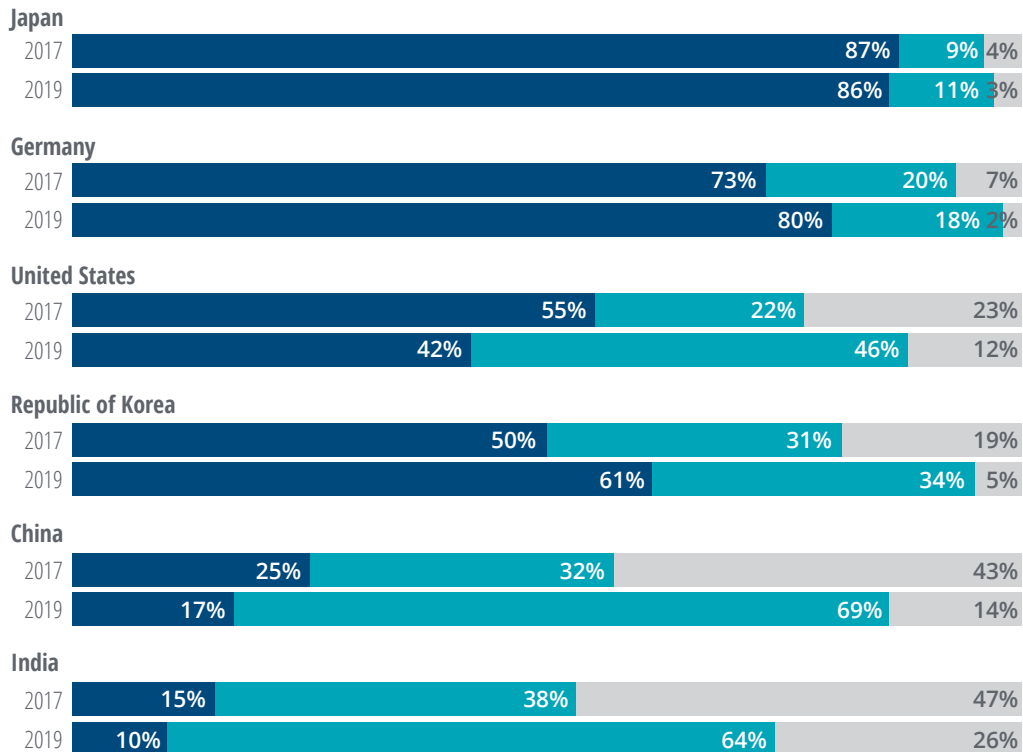
Even ride-hailing, which is often held up as the epitome of the new mobility-as-a-service (MaaS) transportation model, has experienced an interesting transformation over the last few years (figure 3). In 2017, 23 percent of US consumers used ride-hailing at least once a week, and another 22 percent used it occasionally. Fast-forward to the 2019 study results, and the percentage of regular users has

FIGURE 3

Ride-hailing is changing from a regular to an ad hoc behavior

Frequency of ride-hailing usage

■ Never ■ Rarely ■ 1+ per week



Source: 2019 Deloitte Global Automotive Consumer Study.

halved, while that of occasional users has increased twofold. China and India are no different. This could be worrisome to both established and emerging ride-hailing brands, as the window of opportunity to create a dominant market position is likely rapidly closing as traditional competitors race to catch up on the consumer interface and integrated payment fronts.

Addressing these issues could be fairly simple, however, if OEMs and other new mobility players are able to maintain current levels of investment in developing MaaS models. Study results indicate that not only are younger consumers more

interested in using new mobility services than older people, but a greater percentage of them also wonder whether they need to own a vehicle. Focusing on younger consumers to get them to try new, integrated transportation solutions more often may be the key to cementing that behavior until it just becomes the way mobility works.

Companies across the global automotive ecosystem could do well to carefully consider the following points:

- Given that consumer interest in AVs has stalled, governments should provide regulatory

leadership. Establishing critical standards for AV development and use could address safety concerns, and it may also help the industry converge on technology solutions while reducing the cost of regulatory compliance.

- Interest in vehicle electrification is growing, but it will likely take several decades before a wholesale global transformation occurs. A strong government push to encourage EV adoption through strict environmental controls and attractive tax incentives can help EVs find a solid foothold in many markets.
- Consumers may not be prepared to properly compensate OEMs for enhanced connected capabilities, given widespread concerns regarding data security and cost.
- Pushing forward with new visions of integrated mobility systems means tackling some basic human behavior patterns. Encouraging younger consumers to embed new mobility behaviors into their daily routines may be the only way to get to an integrated, electrified, shared future of mobility, assuming industry players can hold out long enough for that transformation to take place. ●

CRAIG GIFFI is vice chairman and national automotive industry leader for Deloitte USA. He is based in Cleveland.

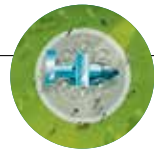
JOSEPH VITALE JR. is a principal with Deloitte Consulting LLP and leader of Deloitte's global Automotive industry practice. He is based in Detroit.

RYAN ROBINSON is the automotive research leader supporting Deloitte's global Automotive practice. He is based in Toronto.

Read more on www.deloitte.com/insights
What's keeping flying taxis grounded?

Explore the technological barriers that need to be overcome before our daily commutes take to the skies.

Visit www.deloitte.com/insights/mobility-elevated





The consumer is changing ... but perhaps not how you think

WHAT DO CONSUMERS want? At least in the United States, the short answer is that they want pretty much what they've always wanted—but they must navigate shifting marketplace and economic circumstances to get it, which sometimes prompts them to act in different ways from previous generations.

It may come as a surprise that the modern US consumer, by and large, is still spending on the same things that their predecessors did. An analysis of share-of-wallet data over a 30-year period revealed few significant shifts in spending across multiple categories—food, alcohol, furniture, food away from home, and housing—with changes being confined to a tight 1–2 percent range.

So, if people are buying the same things as they did 30 years ago, where has the widespread perception of change come from? According to our year-long study of US consumer demographics, spending patterns, attitudes, and preferences, what's really changing is a number of factors in the broader competitive marketplace and in the economic constraints consumers face.

Today's consumer is more diverse than ever in attributes such as race, ethnicity, education, income, and rural-urban residence. These demographic forces have led to increased fragmentation, with the so-called

Contrary to conventional wisdom, there's been no fundamental rewiring of the consumer. The modern consumer is a construct of growing economic pressure and increasing competitive options.

“average consumer” giving way to distinct subsets of consumers with increasingly varied needs. Meanwhile, thanks largely to technology, the barriers to entry for new marketplace players have sharply decreased, leading to the emergence of many smaller enterprises that are creating niche markets with more targeted offerings—and giving consumers a plethora of channels and options to choose from to meet their diversifying needs.

Another major factor driving consumer behavior is the greater financial pressure that many of today's consumers feel due to uneven distribution of income gains coupled with the rising cost of nondiscretionary purchases such as health care and education. Millennials, in particular, have been under financial strain, as many began their working lives during or soon after the Great Recession. Partially as a result, they appear to be deferring key lifecycle milestones, from marriage and children to homeownership, because of the need to play “catch-up” with their finances.

Even so, what mattered most to yesterday's consumer—great products, competitive prices, and convenience—still matters to today's, across age and income groups. Much-touted “millennial” attributes such as core values and personalization fall at the low end of the importance spectrum when it comes to making purchase decisions—even among millennials.

What this means is that the changing consumer can't be separated from the changing environment. They are two sides of the same coin: a reality that retailers and consumer product companies need to recognize to stay ahead of the curve. ●

To learn more, read *The consumer is changing, but perhaps not how you think* on www.deloitte.com/insights

Launching innovative biopharma in China

GAIN THE EDGE IN A
FAST-MOVING MARKET

CHINA HAS SWIFTLY become one of the world's largest markets for biopharmaceutical and medical products. Quicker regulatory approval and widening market access are among the major changes that have made China an attractive market in which to launch innovative medical products. Yet most firms are disappointed by their commercial launches in China. Those that succeed begin preparing and planning early—absorbing a deep understanding of the country's dynamic system, implementing strong organizational capabilities, and developing an agile approach.



China's fast-moving health care industry landscape and unique market characteristics often demand that a biopharma company adopt a "China perspective," with a launch strategy that differs from those used in the west. Four steps are critical to such a strategy:

Rethink market access and reimbursement. Since 2017, following policy changes that included an important new price negotiation mechanism, China has approved a plethora of foreign drugs. Biopharma companies may face a potential trade-off of price and/or volumes that can be sold, but any restrictions may be worth it. Government reimbursement for drugs in China can now occur faster and, what's more, subnational payers and private insurers have been experimenting and piloting programs to enhance patient access. Companies that want to succeed in launching products must stay on top of such changes, continue to explore new access options for patients, and evaluate brand opportunity in a more sophisticated way.

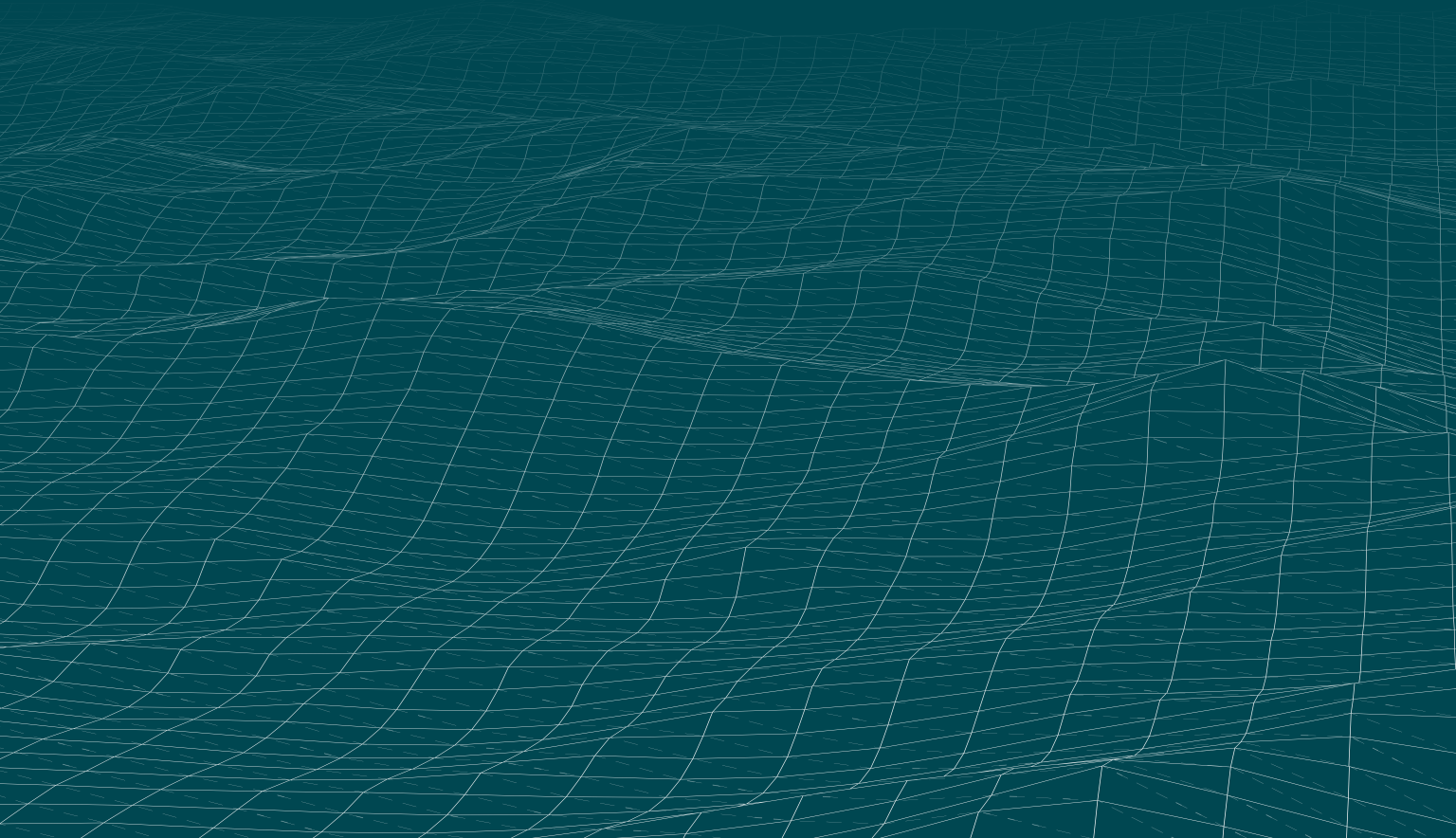
Understand the digital ecosystem. The widespread adoption of smart devices and other digital applications and tools is transforming the way a new product is launched and how patients interact with it. For example, vaccine manufacturers have initiated partnerships with local e-commerce platforms to offer vaccination consultations online. Digital capabilities are now critical to a successful launch. More and more companies are partnering with local digital firms to expand the coverage and depth of market-shaping activities, capture deeper customer insights via "big data," or provide customer solutions that add value beyond the products themselves.

Revisit the Chinese regulatory landscape. Historically, it took an average of five to seven years for a foreign drug to receive approval in China. But recent China Food and Drug Administration regulatory reforms are now accelerating marketing authorization of medical innovations. Among the reforms are a fast-track approval process and a potential local-study waiver for certain products. Companies that do not understand and use the modified processes risk losing competitive advantage. They should consider fielding an active local regulatory development team to engage frequently with local authorities, assessing the likelihood of success down each regulatory path.

Be agile in the fast-moving health care environment. Launch excellence requires the agility to react to the rapidly evolving health care environment in China. Ongoing factors creating uncertainty include Chinese newcomers, the US-China trade talks, deepening health care reform, and the changing payer landscape. In Deloitte's experience, many multinational companies have not yet established an internal structure or systematic launch framework that can properly address such uncertainties in China. After building a more agile collaboration mechanism, companies should implement enhanced capabilities such as scenario-based strategic management to support launch and product cycle management in an ever-changing marketplace. ●

For more, read the full article series on biopharma in China on www.deloitte.com/insights

ORGANIZATIONAL TRANSFORMATION
CYBER
FUTURE OF MOBILITY
TECHNOLOGY AND SOCIETY



Digitalizing the construction industry | 108

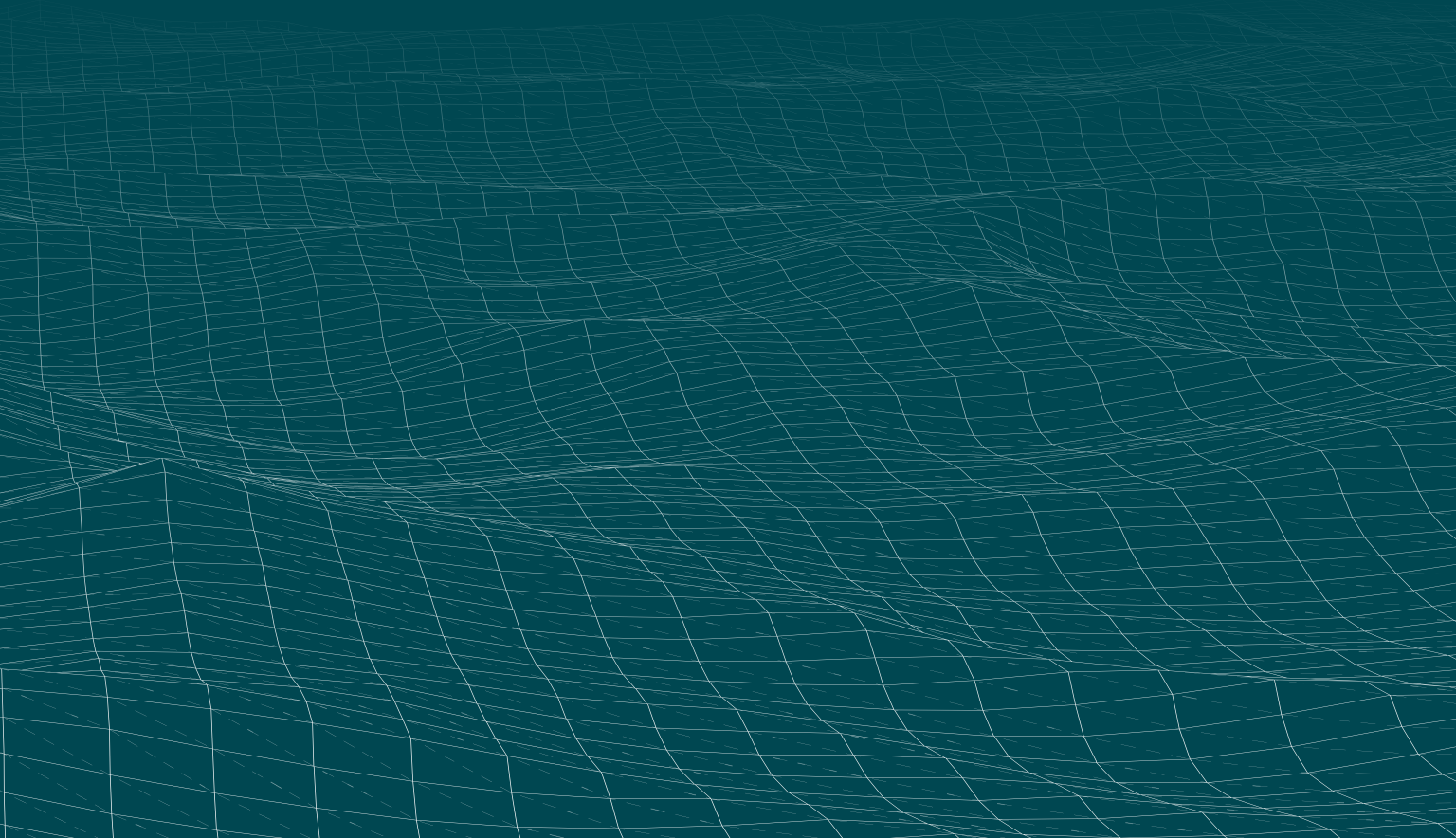
By Peter Evans-Greenwood, Robert Hillard, and Peter Williams

Reimagining customer privacy for the digital age | 122

By Val Srinivas, Sam Friedman, and Tiffany Ramsay

How to begin regulating a digital reality world | 136

By Allan V. Cook, Joe Mariani, Pankaj Kishnani, and Cary Harr





Digitalizing the construction industry

A case study in complex disruption

BY PETER EVANS-GREENWOOD, ROBERT HILLARD,
AND PETER WILLIAMS

ILLUSTRATION BY ALEX NABAUM

The dynamics of disruption are changing from simple disruption due to a specific technological innovation, to complex disruption stemming from a confluence of technological and nontechnological trends. To identify complex disruption, companies can ask: Is the disruption due to the invention of new technology, or is it due to a combination of factors, of which technology is only one? To position a firm to capitalize on such disruption, business leaders should identify and invest in the disruption's key enabling trends in order to give themselves the real option of capitalizing on the opportunity (or not) in the future.

The global construction industry is a massive enterprise, with aggregate sales of more than 1,098,569 million euros and a market capitalization of almost 501,948 million euros in 2017.¹ Like many other industries, builders are wary of “disruptive technologies”: technologies whose adoption significantly changes the way businesses, or entire industries, operate. 3D printing, to pick one example, has been promoted as a potential disruptor in construction.

As we discussed in the article *Your next future: Capitalising on disruptive change*,² it is unlikely that any one particular technology will disrupt construction on its own. Rather, it's more likely that a confluence of trends will enable established technologies to be used in new, disruptive ways. This shift—from simple disruption due to a specific technological innovation to complex disruption stemming from a convergence of technological and nontechnological trends—can be seen across many industries.

The story that follows is one of complex disruption. Its main protagonist, Unitised Building, didn't invent the technologies it is using to build high-rises in places previously thought to be undevelopable. But it, and companies like it, recognized that an otherwise unsolvable problem could be solved if the problem was framed differently, using established technologies and techniques in new ways. Because the new approach—unitized building—was seen to have benefits beyond the first project, it attracted investments that helped it grow and mature, and become more generally applicable.

Today, we might be at the point where this potential disruption is crystalizing into actual disruption, especially because the approach has changed at least one community's expectations—expectations that a regulator is considering making concrete by baking them into regulations, excluding conventional builders from the market in the process.

For the purpose of this case study, we use a narrow definition of construction, one that refers only to the construction of medium- to high-rise buildings of three floors or more for residential, commercial, or mixed use. This excludes the construction of low-rise buildings, individual homes, and suburban apartments. It also excludes infrastructure projects, roads, and unique buildings such as stadiums.

A challenging site, a new approach

A major challenge facing the construction industry is how to bring unproductive sites—sites that are currently too challenging to build on—into productive use. The need is urgent: As societies urbanize,

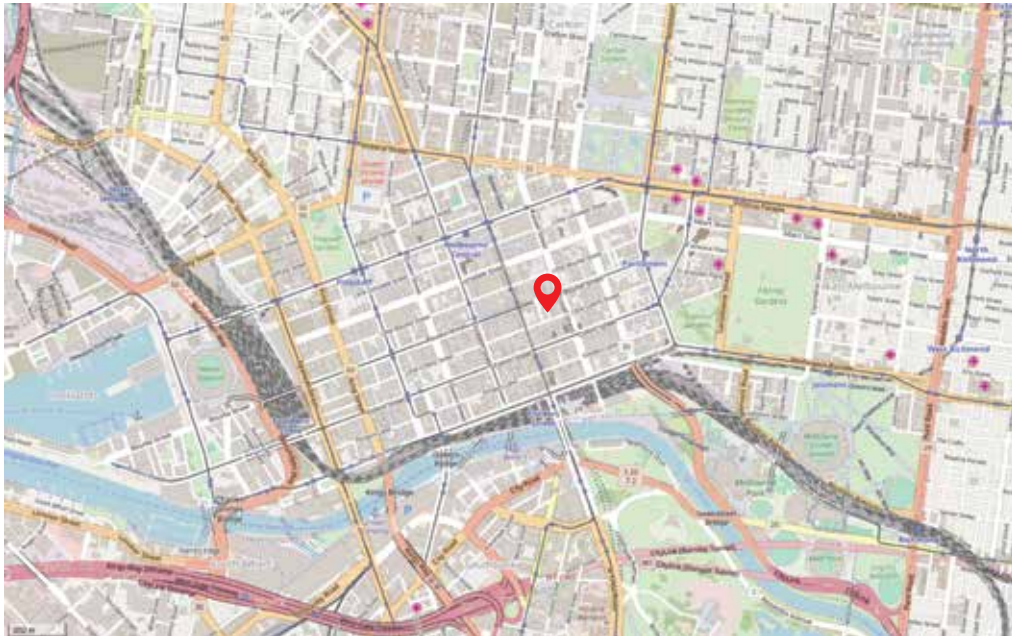
they need to make fuller use of the limited amount of land at their disposal. As more and more land is developed, sites that had previously been too awkward, or even impossible, to build on soon become desirable locations.

One such site was in Melbourne, Australia. Located on Russell Place, close to the middle of the city's central business district (CBD), it was a piece of prime real estate. Numerous developers had acquired it with the intention to build, but none had been able to do so, and all ended up passing the site on.

The problem was that an electrical substation serving a large portion of the CBD was located directly under the site. Any disturbance could cause the substation to trip, leaving many businesses without power. This led to a number of building restrictions.

FIGURE 1

The restrictions on this Melbourne site, directly above a power substation, stymied multiple developers



Source: OpenStreetMap contributors.

First, only the air rights to the site were available, precluding the construction of basements for parking or facilities. Second, weight restrictions constrained the mass of any building constructed on the site, along with any construction equipment that might be needed. Finally, the extent of allowable ground vibration during construction was minimal, as undue vibration could trip the substation.

Around 2008, Nonda Katsalidis, an architect whose prior designs include the Museum of Old and New Art in Hobart and the Eureka and Republic Towers in Melbourne, acquired the site's air rights. Katsalidis had been thinking about the site for some time, envisioning an approach that might enable him to construct a building within its tight restrictions. The approach: to treat the construction of medium- to high-rise buildings as a design-for-manufacture-and-assembly (DFMA) problem, rather than as a building problem.

Design-for-manufacture (DFM) is an established technique whereby products are designed in such a

way that they are easy to manufacture. Katsalidis's particular twist on the technique was to architect the building so that it could be divided into a set of regular units—*unitizing* the building, as it were—that would be manufactured and transported to the site, then quickly assembled. This procedure is more akin to LEGO® Duplo than the IKEA-like approach used by many building systems that involve offsite manufacture. Rather than assembling building elements—walls, for example—to speed construction, the building itself is assembled by stacking completed units.

Executing such an approach would require a digital model to be made of the entire building, accurate down to light fittings, power points, washers, hinges, doors, and doorstops—a building information model (BIM) on steroids. The modeling process would ensure that the connections between building units would be aligned within a few millimeters, making it easy to plug together completed units. The digital model, cut into units, would be used to generate the instructions needed to guide both mechanical and

FIGURE 2

Little Hero's unitized construction complied with all site requirements—and took only four weeks to complete



Source: Hickory Group.

human activity on the unit production line. The finished units would be complete with wiring, plumbing, and furnishings before being transported to the site, and they would be designed to fit inside the envelope of a standard intermodal shipping container—and to attach to standard container connectors—to simplify transport.

This approach seemed tailor-made for the Russell Place site's requirements. The fully assembled building would be lighter than most similarly sized buildings due to the DFMA manufacturing process's preference for steel over concrete. The only heavy machinery required to assemble it would be a crane to lift the building units, and the crane would be located in the lane facing the site rather than on the site itself. Vibration would be effectively eliminated, as the vast majority of the work would be completed on a production line elsewhere. The result would be a building *and* a construction process that worked within the site's restrictions.

Unitised Building for unitized building

Katsalidis formed Unitised Building³ in 2008 to capitalize on this idea. The company partnered with building firm Hickory Group⁴ to create both the tooling required to develop and manipulate the digital models and the production line to build the units themselves. The partners were able to find off-the-shelf products to create both the tooling and the production line, while the decline in the local car manufacturing industry provided convenient access to the manufacturing expertise needed.

The Russell Place site was the first to host a building constructed with Unitised Building's modular method. Completed in 2010, the building, Little Hero, contains 63 one- and two-bedroom apartments and duplex penthouse residences, all of which sit atop seven retail shops, cafés, and restaurants. The unitized process not only complied with

all of the site's restrictions but also reduced construction time by more than six months compared to a conventional approach: The eight-story building took only four weeks to erect, at a cost comparable to that of a conventional process.

What sets unitized building apart

The ideas behind prefabricated buildings, of course, are not new. However, there are three important

FIGURE 3

Unitized building produces high-rises indistinguishable from conventional construction



Source: Hickory Group.

differences between the unitized building approach pioneered by Katsalidis and Unitised Building, and earlier approaches to prefabricated, modular, off-site construction.

First is the focus on medium- to high-rise buildings. Almost all previous prefabricated building efforts have been of low-rise (one- to four-floor) buildings for single dwellings or businesses. Katsalidis's unitized approach supports the construction of buildings of three or more stories (in fact, the need for a crane to lift building units can make a unitized approach uneconomic for buildings under three stories).

Next is the unitized approach's ability to construct custom buildings rather than limiting clients to selecting from a catalog. Previous prefabricated building approaches treated the building as the product: Customers would browse a catalog and select the building that best matched their preferences, or a company (such as a fast food chain) might work with a manufacturer to add its own needs to the catalog. In contrast, the unitized building process takes an architect's design as its starting point—or an architect can even apply their design to the unitized process.

Finally, the unitized approach involves assembling a set of modular units that are “snapped” together onsite. This contrasts with the “kit of parts” approach of other prefabricated building systems, which require more onsite labor to assemble frames, fill out the structure, and integrate services.

For unitized building to become more widely applicable, what had begun as a particular solution to a specific problem had to evolve into a general solution for many problems.

The birth of an industry

Little Hero was an impressive proof of concept, but unitized building had to become more useful more often before it would be more broadly adopted. As with many other disruptions, it wasn't that the new technique didn't have potential; the question was whether its potential was great enough for firms and clients to prefer it to a more conventional approach. And as with other disruptions, the affirmative answer depended on its ability to address widespread needs more effectively than conventional processes.

For unitized building to become more widely applicable, what had begun as a particular solution to a specific problem had to evolve into a general solution for many problems. The volumetric process used on Little Hero, though successful in its niche, had its limitations. Rooms, for instance, were constrained to fit entirely inside a single modular unit. This was acceptable for a residential building, as a building unit could be designed with a living space at one end, a kitchen in the middle, and all the services gathered at the other end where the common hall was located. This requirement would, however, discourage more general adoption. The Little Hero process also finished the interior of each building unit during its manufacture in the factory. This required some of the same tradespeople, such as plasterers and painters, to attend both the offsite manufacturing process and the onsite installation. It would be more efficient for the tradespeople to ply their craft at either the factory or the building site, but not both.

The short story is that both of these problems, as well as other barriers to adoption, have now been solved. Modular DFMA building processes have been developed that are capable of building any medium- or high-rise building that a conventional building process can. Rooms can be split across multiple building units, and buildings can contain large voids such as atriums. The workflow has also improved, removing the need for tradespeople to attend both the manufacturing process and the installation. The resulting buildings are indistinguishable from those built with a more conventional process. For instance, the building on the left in figure 3—La Trobe Tower—was constructed with the Hickory Building System,⁵ a DFMA construction process; at 44 levels, it is Australia's tallest prefabricated building. The building on the right is under construction with a conventional approach. La Trobe Tower was delivered 30 percent faster than the conventional building.

With barriers to adoption reduced, what started with Little Hero in 2010 has since developed into a burgeoning industry, with other firms developing similar processes. An industry body, prefabAUS,⁶ was established in 2013 to provide a forum for industry participants to meet and address common challenges. A research and training body, the ARC Centre for Advanced Manufacturing of Prefabricated Housing,⁷ was also established in 2015 at the University of Melbourne, with the goal of creating a AU\$15 billion prefabricated housing sector by 2020.⁸ The industry can be said to have come of age in that year as well, when Business Victoria named Hickory Group its 2015 Manufacturer of the Year (Large Business) for the Hickory Building System.⁹

Nor is this all. Good ideas rarely emerge in only one location or at one time, and so it is with unitized building. Many builders, and many manufacturers, are experimenting with integrating manufacturing techniques into construction. For instance, Broad Sustainable Building,¹⁰ based in China, is making a name for itself by using a

modular building system to construct ever taller buildings in increasingly shorter time frames. It has built a 30-story building in 15 days and a 220-floor building in just 90 days,¹¹ with time-lapse videos of the process posted on YouTube.¹² Companies in both the United States and Europe are also developing unitized systems, though with mixed success.¹³

The benefits of unitized building

A state-of-the-art unitized building process is cheaper, faster, and safer than a conventional building process, while the resulting buildings are indistinguishable from those built via a conventional process. The approach is cheaper and faster because there is less waste during construction. The majority of the work is done in a controlled environment that is not prone to the weather delays or waste management problems that plague construction sites. Onsite work is also more efficient, with all workflows modeled and tested in virtual reality before going onsite, while once onsite a typical unitized building process is capable of lifting a new unit into place every eight minutes—and once a new layer of building units is complete, the floor below is weatherproof. And with the majority of manual work done in a controlled environment, and the ability to eliminate live edges while the building is being assembled, unitized building is safer than a conventional building. (To date, there have been no deaths on a unitized build.) Another benefit of unitized building is its greater sustainability. The unitized process favors recyclable materials, such as steel, over concrete, enabling a higher proportion of building materials to be reused from decommissioned buildings, while it also enables new, more environmentally friendly materials to be used, such as geopolymers,¹⁴ whose need for oven curing makes them challenging to integrate into a more conventional building process.

Besides the benefits it can deliver to particular construction projects, unitized building also makes possible a new approach to export. This is because the intellectual property (IP) that underlies the process—the general parametric models that encode the foundational engineering knowledge needed to construct a building, and the digital models for particular building designs—can be accessed remotely. Rather than exporting completed building units, or exporting the parametric and building models themselves, it is possible for a firm to retain possession of the models and export only the instructions they generate, to guide the machines and workers in a remote contract manufacturing facility and the remote building site. The models are held domestically, where the engineering talent required to develop and maintain the IP in them is located. The design team, the regulators, the manufacturing facility, the facility’s machines and workers, and the installation team access the model remotely—whether as printed drawings and instructions, an interactive digital representation on a tablet, or an immersive virtual reality (VR) or augmented reality (AR) experience. In effect, this moves the people and machines to the process (virtually)

rather than moving the process to the people and machines.¹⁵ Governments and tax authorities facing such a scenario will need to ask: What is “exported” when a construction firm constructs a building in a remote geography, but where few staff, no materials, components, or building products, and no IP, are sent overseas, and all the significant value-creating work is done domestically?



A step beyond digitization

At this point, it’s worth considering why the development of unitized building is different in kind from simply applying new technology to improve standard construction techniques.

Construction firms are continually refining practices and integrating new techniques and materials, using technologies such as drones, robots, and GPS tracking to streamline and automate building processes. Unfortunately, these investments in technology are likely to result in only incremental improvement. Integrating new technologies into existing building processes has not transformed the building process itself—a process which we might date back to the construction of the pyramids, when a confluence of surveying, design, planning, management, and building practices came together to produce some of the world’s first permanent large-scale structures. A construction firm’s product is the building process, not the buildings; consequently, a builder’s operating model has always been built around this age-old construction process, with their value as a builder depending on the precision of the process rather than different techniques used in the process itself.¹⁶

The greater opportunity is not to merely improve existing building processes, but to explore new and radically different approaches to building as an activity. Rather than simply *digitizing* existing building practices—swapping analog measures and tasks for digital ones to make them more precise and effective—we need to *digitalize* building by shifting the foundation of our operating model to a wholly different premise.¹⁷ Instead of the organization and prosecution of tasks in the construction process, the operating model in unitized building is based on the management of *information* about the building, replacing old methods of sharing and managing information with new ones. Not only does this enable the building process to be arranged in new ways, it

also makes the process malleable—enabling, in turn, the creation of new operating models.

The greater opportunity is not to merely improve existing building processes, but to explore new and radically different approaches to building as an activity.

Digitalization enables existing business processes (and technologies) to be rearranged. One might, for example, choose to inspect and certify a digital model of a building, rather than the building itself.¹⁸ Or the building process might be made quiet and fast enough (by moving noisy activities from the building site to the factory) that construction need only occur at night, minimizing disruption to the lives of surrounding residents. (Both of these things are possible, as we'll see later.)

The right technologies at the right time

A new combination of technologies is rarely sufficient for disruption, however. Instead, the trigger that trips a potential complex disruption into an actual disruption may be a change in the social or economic environment. For example, one of the early barriers to unitized building was the lack of a suitable risk model to support financing.

Established risk models were built around conventional construction processes, with each funding payment dependent on a quantity surveyor verifying that the last payment had been productively spent on the building site. The unitized approach, though, requires a significant portion of the funds upfront to start the manufacturing process, while the building's actual assembly occurs so quickly

that little quantity surveying can take place on the construction site. (Early unitized building projects were at least partly self-funded to overcome this hurdle, while, over time, quantity surveying practices and risk models were developed, such as quantity surveying the work in the factory, to integrate the new building process.)

One possible trigger to shift a complex disruption like unitized building from a potential to actual

disruption can be a change in community expectations. This can happen in the form of more and more clients demanding the new process. Or it could occur indirectly: a regulator changing the rules to favor the new operating model, for instance. The latter is what appears to be happening with unitized building.

In 2017, Hickory was working on a site in Melbourne's CBD where access was awkward. The crane that needed to lift building units into place blocked a narrow laneway, making it difficult for local residents to access their properties. To navigate the problem, the company offered to build only at night: It would lift and position an entire floor of building units outside normal business hours, leaving the laneway free during the day. Both the city council and residents were skeptical that construction work could be quiet enough to happen at night without disturbing the neighborhood. To prove the approach, Hickory ran a trial build one night, which went unnoticed despite the company warning nearby residents about it beforehand. With the council and residents convinced that installing building units at night would work, construction went ahead.

The greatest impact of this project may be on Hickory's conventional competitors. The build's disruption to the local neighborhood was so minimal that the council is considering mandating

similar nighttime builds for all future medium- to high-rise constructions in Melbourne’s CBD. This regulation would implicitly require all new constructions to be done via a unitized building process, as it would not be possible to meet the nighttime noise requirements with a more conventional approach. Nor would a conventional approach be fast enough to construct only at night, and nighttime labor rates would make it uneconomic. With the stroke of a pen, conventional builders could be excluded from the market.

Dealing with complex disruption

It’s common to assume that every disruption is due to a particular disruptor, and that the way to get ahead of a disruption is to identify (and invest in) that disruptor early. But in today’s complex technological environment, this is not always the case. We’re seeing a shift from simple disruption due to a single disruptor to a more complex form of disruption, in which various technological and nontechnological factors come together and enable the creation and spread of new operating models. The unitized building process is a case in point.

This shift from simple, disruptor-driven disruption to complex disruption has significant implications for companies in all industries. Complex disruption is harder to foresee, and even if recognized early, it is more challenging to monitor and understand. It is difficult, if not impossible, to predict the precise shape of the future unitized building operating model, for instance. There are many established technologies to choose from and many equally productive ways to combine them to create a future operating model that has similar benefits. Nor does the timing of the disruption depend on the development of a particular technology. This means that there’s no technology-development S-curve that we can track to determine when to dip our toe into the pond. The social factors that influence the final shape of the model—such as how a digital building

model might be certified rather than the building itself—are also something negotiated with the community, and there is no “right” answer on which we can expect the industry to converge. Consequently, it’s not possible to identify and track the particular future state technologies or regulatory requirements. We also need to be mindful that when the disruption does strike, the transition from the old operating model to new could be quite abrupt, as it won’t be moderated by the need to incrementally improve a new technology.

So how can companies stay ahead of complex disruptions of this sort? If we’re to identify (a potential) complex disruption, we first need to distinguish between it and (a potential) simple disruption. We can do this by critically evaluating the trends shaping our industry or sector. Is the trend due to the invention of new technology, “new math”? Or is it due to a confluence of factors?

Consider artificial intelligence (AI). Many of the “disruptive” technologies emerging from AI, such as deep learning, have long pedigrees: While there are recent developments in the field, the foundational ideas, the “new math,” were set out some time ago. If we turn to the successes ascribed to these technologies, we see that the trigger for many of them was a confluence of environmental trends, rather than improvements in the underlying technique. The mathematical foundations of statistical machine language translation, for example, were laid in the late 1940s,¹⁹ though the approach didn’t



become practical until bilingual texts such as the Canadian Hansard corpus²⁰ and EUROPARL²¹ were made electronically available in the mid-2000s. Similarly, the recent development of autonomous cars depends more on price-performance improvements in computer processors, along with the development of new sensors (such as LIDAR) and centimeter-accurate digital maps, than novel AI algorithms.

We might also consider how well-formed the idea behind the disruption is. Does it refer to a particular technique, or does it refer to a broad family of techniques that are not otherwise strongly related? AI, for example, is a suitcase term packed with all sorts of otherwise unrelated ideas.

This provides us with a three-part test. First, does the potential disruption involve a truly novel idea (rather than one with a long pedigree)?

Second, are the successes ascribed to it due to recent developments in the technique (instead of being due to a confluence of environmental trends)? Finally, is the idea behind the disruption a single, well-formed idea (rather than a suitcase containing many otherwise unrelated ideas)?

If the answer to all three questions is “yes,” then the potential disruption is most likely a simple disruption driven by a particular technological development. Obvious examples include the telegraph and the fax machine. On the other hand, if the answer to one or more of the questions is “no,” then the potential disruption is

likely a complex disruption driven by a confluence of environmental trends. AI, blockchain, and cyber, all of which became commercially significant only fairly recently, are examples.

To anticipate a complex disruption, we need to predict where the confluence of environmental trends behind the disruption might take us. This can be challenging, as it can require us to question deeply held assumptions about the source of our competitive advantage and competence. For instance, unitized building uses parametric models and design for manufacture and assembly to create a new, and more productive, foundation for building as an activity—capabilities that traditional builders formerly found no need for.

It’s not important for our prediction to be precise. What is more important is to identify the underlying environmental trends and understand how they will interact with each other to create value, as well as how they will interact with existing industry practices to create barriers to adoption (such as the way the lack of an appropriate risk model held back unitized building). If we consider AI as a complex disruption, for instance, then rather than focusing on particular AI techniques such as machine learning, we’ll broaden our view to consider other AI techniques that are beholden to the same underlying environmental trends. Consider planning engines, which have a pedigree reaching back to the early 1970s with STRIPS (Stanford Research Institute Problem Solver);²² they enable us to compute the optimal way to sequence a collection of related tasks. The environmental trends that enabled techniques such as machine translation and machine learning to emerge from the lab might also enable a firm to replace their carefully designed but rigid business processes with dynamically generated, optimal ones crafted by a planning engine. This would have broad and deep implications for many aspects of a firm’s strategy and operating model, as it would change the trade-off between simplifying processes to enable



straight-through processing versus increasing process complexity to support mass customization.

Finally, to prepare for a complex disruption, firms need to identify and invest in building their expertise in the key enablers for the disruption. With unitized building, the key enabler was the development of a parametric building model and design for manufacture and assembly. With the AI planning example, it might be the development and documentation of a complete set of business APIs, so that all process tasks can be accessed programmatically. The investment in this capability must be treated as a real option, an investment made in an opportunity to have a real choice to capitalize on the opportunity (or not) in the future, rather than as a productivity improvement exercise.

Creating the real option provides a firm with the room to develop the skill sets and expertise required to operate once the disruption crystallizes. Without these skill sets and expertise, the firm will find itself confused and unable to respond. With

these skill sets and expertise, the firm has the option to either drive the disruption or to be a fast follower. The real option lets us ask the question: What is the value to the firm in the future to have the option of rapidly capitalizing on the complex disruption when it crystallizes, or even the option of causing the disruption to crystallize earlier?

Construction firms, to return to our case study, have been experimenting with building information models for some time—but for many of them, the investment in a BIM was considered a tool to drive onsite productivity. The leap required to develop unitized building was to realize that this digital model could be put at the heart of the construction business. Consequently, digitalization of construction moves the BIM from something that has to be mandated to happen to being something that is required for a builder to succeed, while the flow-on benefits in maintenance, usage, and emergency management that were the focus of adopting a BIM are now merely its byproducts. ●

PETER EVANS-GREENWOOD is a fellow at the Deloitte Center for the Edge Australia.

ROBERT HILLARD is Deloitte Australia's chief strategy and innovation officer.

PETER WILLIAMS is the chief edge officer at Deloitte's Center for the Edge Australia and the chairman of Deloitte Australia's Innovation Council.

Read more on www.deloitte.com/insights

The future of the industrial real estate market

A convergence of factors is reshaping the industrial real estate sector, creating headwinds and uncertainty. Is the golden age of real estate about to draw to a close? Learn the steps market leaders can take to help anticipate and adapt to new conditions.

Visit www.deloitte.com/insights/industrial-real-estate





Reimagining customer privacy for the digital age

Going beyond compliance in financial services

BY VAL SRINIVAS, SAM FRIEDMAN, AND TIFFANY RAMSAY

ILLUSTRATION BY EMILY MOREANO

“New technologies are radically advancing our freedoms, but they are also enabling unparalleled invasions of privacy.”¹

— *Electronic Frontier Foundation*

Getting smarter about privacy

Customer privacy has become an increasingly complex and contentious topic, as the tools and technologies capturing data about every facet of our lives have proliferated. Many consumers now believe they no longer have control of information about themselves² and are starting to pay closer attention to how information about them is collected.

Such concerns are impacting the financial services industry as well, where customer data has always been a core asset. Long before data became the oil that fuels the digital economy, financial institutions have safeguarded customers’ private information and used this data at macro and micro levels to serve clients.

In light of recent regulatory developments, such as the General Data Protection Regulation (GDPR) in the European Union, and advances in technology, customer privacy is becoming an even more intricate challenge—for individuals whose information is at stake, for companies that are expected to

protect this information as well as use it responsibly, and for regulators charged with consumer advocacy who are playing catch-up.

In fact, many regulators around the world are taking an unprecedented interest in privacy and have begun to establish new rules. GDPR is arguably the most notable of the latest developments, offering EU citizens sweeping protections to their personal data. Under GDPR, all companies that handle EU consumer information—including financial institutions—must obtain express opt-in consent to collect their data and promptly notify citizens of data breaches, or risk paying steep fines. Consumers also have a “right to be forgotten,” a stipulation that requires companies to erase all currently maintained personal data upon request or if the data no longer serves the original business purpose.³

The United States, meanwhile, does not have an all-encompassing rule like GDPR. US federal regulations tend to be narrower in scope and generally only protect specific types of data or are sector/industry-specific.

Some trade groups, such as the Association of National Advertisers⁴ and the Internet Association,⁵ have begun to advocate for an all-encompassing federal privacy law like GDPR to avoid having a patchwork of legislation. Lobbyists, too, are beginning to speak up. In 2018, the US Chamber of Commerce called on Congress to adopt a federal privacy framework “to provide certainty and consistency to consumers and businesses alike.”⁶

In the meantime, the lack of a single federal mandate has placed the onus on states to craft their own privacy laws. For example, California passed the Consumer Privacy Act in the summer of 2018, granting consumers sweeping control of all forms of their personal data,⁷ from traditional identifiers such as addresses and phone numbers to nontraditional data sources such as “likes” on social media or interactions with personal assistants. Other states, such as Delaware⁸ and Vermont,⁹ have recently enacted their own privacy laws. As consumers demand more control over their personal data, even though many may not be familiar with existing privacy regulations, more states may follow suit.¹⁰

Adding to this regulatory uncertainty, today’s digital innovations are also reshaping the notion of privacy in unexpected ways. The rapid penetration of digital technologies into almost every sphere of life has revealed how fundamentally limited privacy protections conceived for the analog age are today.¹¹ Our ideas about privacy—what information should be considered private and what should be done to protect one’s privacy—are fast evolving with new digital technologies and the new data they generate.

This situation is further exacerbated by the fact that privacy has no single, universal definition. In fact, several privacy scholars have noted that the very idea of privacy today is “a concept in disarray,”¹² “embarrassingly difficult to define,”¹³ and “an essentially contested concept.”¹⁴ This challenge is due, in part, to the fact that privacy is not just a

social value and “a good to be achieved,” but also a right, with legal ramifications.

There is also debate about data ownership (*whose data is it?*) and data stewardship (*who can best safeguard customer data?*).¹⁵ Both of these challenges have no easy answers.

One can only imagine the breadth and complexity of privacy issues that may be faced a decade from now, when most human interactions, even those now considered private, could be exposed for others to collect, mine, and share. Indeed, could privacy become a “luxury,” as discussed during a panel at the World Economic Forum’s Annual Meeting?¹⁶

Managing privacy in this ever more data-centric world could require new thinking. In this article, we will discuss the following conundrums:

- What should financial services firms do to reimagine privacy in this rapidly evolving digital age?
- How can institutions leverage new sources of data and emerging technologies to benefit both customers and service providers without running afoul of privacy regulations or offending consumer sensibilities?
- How should companies go beyond compliance to make privacy management a competitive differentiator?

A NEW FRAMEWORK TO UNDERSTAND PRIVACY TODAY

The industry will likely need a more robust, expansive, pragmatic, and forward-looking framework to successfully navigate the evolving privacy landscape. This framework should be both tactical and strategic—one that would stand the test of time and continue to adapt to future technological innovations.¹⁷

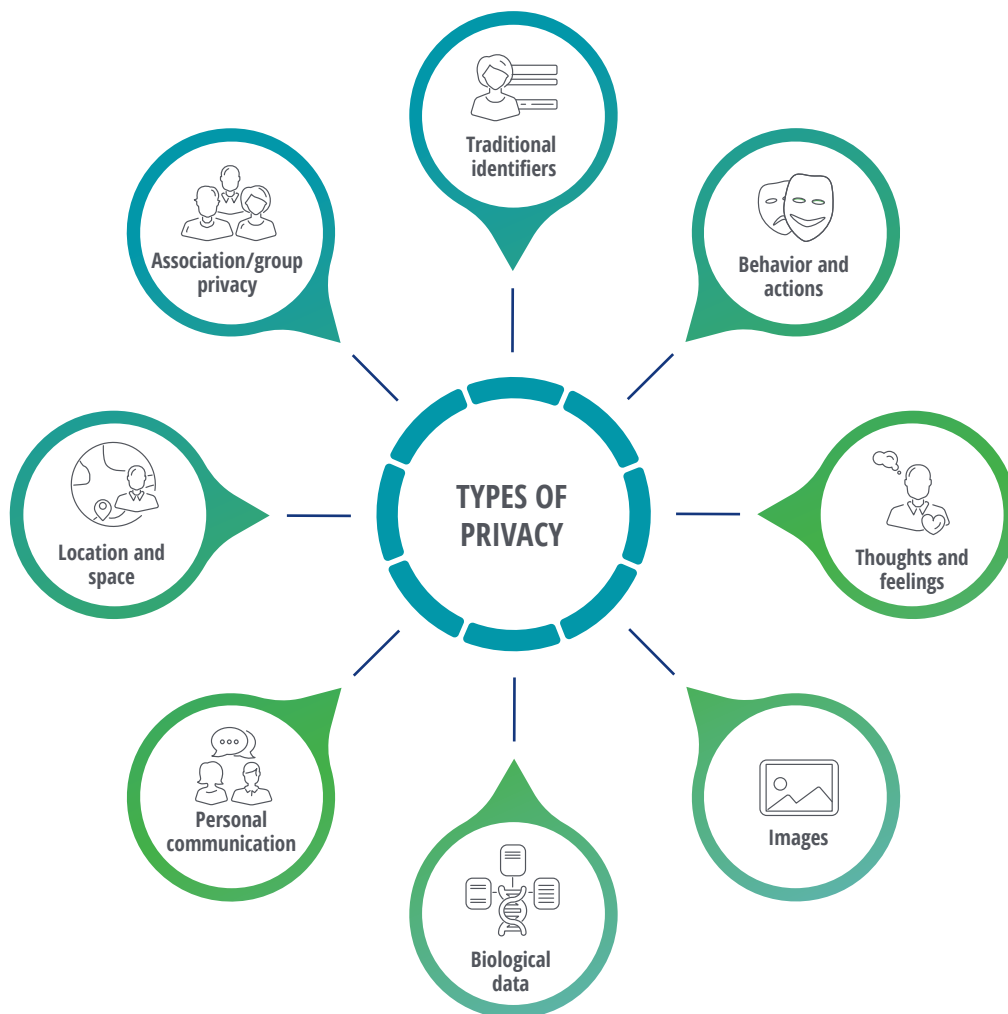
The framework below was inspired by the work of three researchers—Rachel L. Finn, David Wright, and Michael Friedewald—who identified seven different types of privacy—ranging from *privacy of location* to *privacy of association*. For this report, we modified and expanded their typology to encompass relevant privacy issues the financial services

industry currently faces (figure 1). Figure 2 offers more detailed explanations of these eight types.

These eight categories highlight the multidimensionality of privacy today. They underscore the importance for financial services leaders to think differently, and more expansively, about how their

FIGURE 1

The eight types of privacy



Source: Deloitte's modified eight types of privacy is based on the work of Rachel R. Finn, David Wright, and Michael Friedewald, "Seven types of privacy" in Serge Gutwirth, Ronald Leenes, Paul de Hert, and Yves Poullet (eds), *European Data Protection: Coming of Age* (Dordrecht: Springer, 2013). The authors posited seven types of privacy, but we modified their framework to make it more relevant for financial services by altering "data and images" to images only, and splitting "privacy of the person" to "traditional identifiers" and "biological data."

organizations collect, store, process, share, and protect information.

Take, for example, the use of biometric data, like facial-, voice-, and iris-recognition for identification in financial services.¹⁸ Data from these technologies could be combined with other personal information, such as location or social media

posts, to decipher an individual's needs and preferences for financial services. In a privacy context, what are the expectations regarding the use of such data? Do consumers need to be informed that the merging of private information sources is happening, and how this combined profile may be used to serve them?

FIGURE 2

Understanding the eight types of privacy



Traditional identifiers

Any standard/traditional personally identifiable information, including demographic data—such as name, address, date of birth, race, gender, and Social Security number—that the industry has routinely collected.



Behavior and actions

Behaviors undertaken in public, semipublic, or private spaces—such as shopping, financial transactions, purchasing financial products, browsing habits, and other behaviors outside the financial relationship.



Thoughts and feelings

Customers' opinions on a variety of topics, including those expressed about companies or brands; also known as *psychographics* in marketing.



Images

Images taken by individuals, planes/drones, satellites, and robotic devices in private or public spaces.



Biological data

Bodily functions and characteristics, including physical characteristics (such as facial features, irises, voice, and gait), physical and psychological health, and genetic code.



Personal communication

Communications between the customer and the financial institution and other entities—via email, text messages, social media, and phone—as well as Web browsing behavior via cookies.



Location and space

Information about a person's or property's geographic location.



Association/group privacy

Groups and subgroups the customer belongs to or associates with, including political affiliations, personal hobbies, work-related groups, and religious groups.

Source: Deloitte Center for Financial Services.

Such examination would not be possible without a richer, more nuanced understanding of privacy for today's digital world.

Privacy implications of emerging technologies

NEW DATA SOURCES SHOULD BE LEVERAGED WITH CAUTION

Over the next few years, financial institutions are expected to increasingly use evolving technologies to serve their customers, tapping into virtual assistants, personal and commercial sensors, and drones, in addition to already commonplace activities, such as reviewing Web browsing and social media activity.

A major challenge for companies is how to optimize the use of all the data generated by legacy and emerging technologies while remaining within the bounds of privacy regulations.

In many cases, customers are aware that their private data is being collected—for example, when vehicle owners agree to allow insurers to monitor their driving telematically in exchange for discounted auto insurance premiums. But other types of direct data collection and how such information is used might not be as obvious to consumers. This is partly because standard privacy policies usually employ legalistic language and do not offer many details, such as whether companies will use cookies to track Web browsing or check social media for behavioral proclivities when assessing a customer's credit risk.¹⁹

Would investment management clients be okay if their advisory firm scanned their social media postings, geolocation information, or Web browsing history to determine their interest in socially responsible investments, based on data collected about their charity work or an appearance at a rally protesting fossil fuels? Would they feel uncomfortable if their investment advisor knew they browsed astrological websites before making financial decisions? Would credit card customers mind if their banks checked smart wallet spending patterns to detect if they are often at casinos or the racetrack?

Additional privacy concerns might arise if a financial services firm sells customer data to third parties—personal health data from a wearable monitor, for instance. In such cases, consumers may not be aware of the extent of data mining for it to qualify as “informed consent.”

Also, as noted earlier, we might see more cases of consumers and privacy advocates insisting on the “right to be forgotten,” codified under GDPR, where consumers may ask data companies to remove certain digital breadcrumbs from their online history. Consumers may opt in, however, if they are presented with a value proposition that makes it worth their while to share such data.

More generally, though, a major challenge for companies is how to optimize the use of all the data generated by legacy and emerging technologies while remaining within the bounds of privacy regulations. Financial institutions cannot focus on compliance alone. Even if they meet all legal requirements, they need to ensure their data mining from a growing number of sources does not alienate consumers or lawmakers.

TECHNOLOGIES' IMPACT ON PRIVACY WILL VARY

We analyzed eight tools and technologies that either already are, or will likely become, ubiquitous to determine how likely they are to encroach on privacy.

While no area appears to be completely immune from a potential privacy concern (see figure 3), the threat level varies considerably according to the type of tool or technology employed.

Our analysis suggests some technologies are more likely to create privacy concerns than others. Monitoring of Web browsing and social media are most likely to raise objections. Commercial sensors,

wearables, virtual assistants, and drones are others with substantial potential for encroachment.

Biometrics is probably the technology with the lowest potential to invade privacy.

But in looking at the types of privacy, the greatest causes for concern at this point in time are *location and space*, *communications, thoughts and feelings*, and *association and group*. Monitoring of *behavior and actions* could also be a challenge based on our assessment.

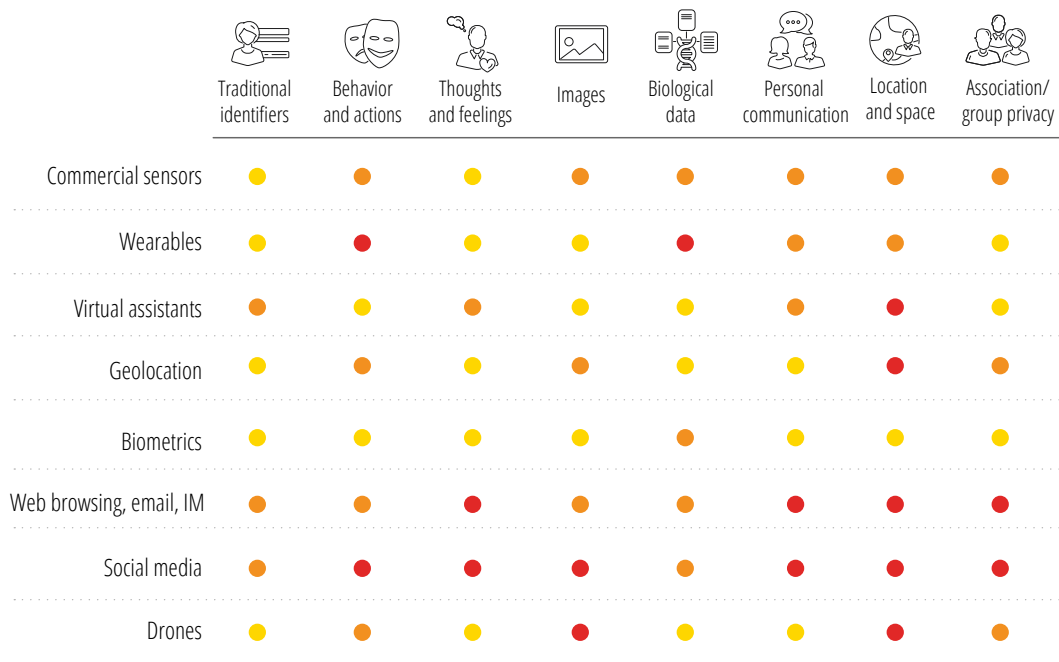
PRIVACY IS ALL ABOUT THE CONTEXT

Beyond how personal data is collected, concerns about privacy are often more about the

FIGURE 3

Potential of technology/tool to encroach on individual privacy, by type of privacy

Level of concern: ● Low ● Medium ● High



Source: Deloitte Center for Financial Services.

context—why, who, when, and where. For example, companies should be sensitive to what many refer to as the “creepiness factor,” where customers might find the way companies gather data about them is too intrusive, such as creating a profile based on an individual’s online activity or marketing to them accordingly.²⁰ Companies need to be cognizant of where to draw the line and clearly communicate to consumers where that line is in their privacy policies.

So, how can financial services leaders determine where that line should be? Here are a few scenarios to think about: A drone might be used to assess the condition of a property for mortgage or investment purposes, or during an insurance claim investigation, but it could also be deployed to surreptitiously determine someone’s location or record what the person is doing (behaviors and actions) at a particular time and place. Similarly, geolocation technology or Web browsing (how you press, scroll, and type on a phone screen or keyboard) can be used to detect actions like fraud,²¹ but also for other potentially invasive purposes, such as tracking one’s location patterns and online habits.

Wearables, another rich source of customer data, are already used by life insurers to motivate policyholders to stay fit in return for lower premiums,²² and by banks for identity authentication or to enable seamless payments.²³ But companies could also use data from wearables to see if a customer is spending more time at fast food restaurants than at the gym, which some might consider too intrusive. Gait analysis is another way to authenticate identity and mitigate against fraud but could also be used to

make inferences about a person’s health, which could be a line-crosser for consumers.

Even more controversial is how data from different emerging technologies could be combined to make even more precise assessments about customers. Biometric data from facial recognition software, for example, could be cross-referenced with social media posts to identify a loan applicant’s risk profile. While privacy policies may imply that a wide variety of tools and technologies are being utilized to gather data, few, if any, explain why or how multiple sources might be correlated as part of a broader data analysis, or the potential implications of doing so.

Most times, however, financial institutions would not have to go to extremes to gather the data they need to make a decision about a consumer. Consider how monitoring social media posts could red flag an applicant who posts pictures from a recent skydiving adventure or trapeze lessons. These could be potentially valuable data points for a lender, insurer, or even an investment management firm, as thrill seekers may also be less risk-averse in their investment choices, or, on the other hand, be too risky for a life insurer to cover.

New York regulators recently gave life insurers the green light to use social media posts as well as other nontraditional data sources to help determine premium charges, provided insurers can prove such data doesn’t unfairly discriminate based on race, gender, color, or sexual orientation.²⁴ Most consumers may not be aware that such intimate, yet easily available information could be accessed by their financial services provider.

However, if consumers are made aware—not just about how their social media postings are used, but about the potential value such monitoring might provide for them—it could make a big difference. In a Deloitte survey conducted in 2016, only 15 percent of consumers were willing to share their Web browsing activity and only 12 percent their social media postings with service providers.²⁵ But if financial institutions fully disclose the source of the data and the reason for collecting it, and clearly communicate the value equation, privacy concerns perhaps could be overcome.

Indeed, another study found about two-thirds of 18- to 34-year-old respondents, and nearly one-half of 35- to 54-year-olds, would be willing to allow insurers to sift through data from social media, smart homes, or even health-monitoring devices if it could lower their premiums.²⁶ But what if such monitoring resulted in higher premiums? What would happen to the value equation then? This is something both institutions and consumers should consider.

Only 15 percent of consumers were willing to share their Web browsing activity and only 12 percent their social media postings with service providers.

Meanwhile, despite the growing popularity and the expansive nature of nontraditional customer data, one should also question whether these sources actually provide differentiated insights. “Not all Internet of Things (IoT)-generated data will be useful, and so companies will likely need to gain experience with some of these new data types ... in order to discern which are predictive in nature, and update their analytical models accordingly,” according to a Deloitte report on the potential opportunities and pitfalls of IoT technology in

financial services.²⁷ One example is usage-based insurance, where it is unclear whether such experiential driving data produces significantly better underwriting and pricing outcomes than using traditional identifiers as proxy factors, such as credit score or age.

Still, generally speaking, consumers may have fewer qualms about the use of data by their financial service providers if there is some meaningful value offered in return. Financial institutions could try to win over consumers by applying a portfolio approach to privacy, showing various scenarios that spell out the possible return customers may receive from sharing various types of data versus the level of risks involved.

Take accelerated life insurance underwriting, where applicants can buy coverage without having to go through intrusive medical exams.²⁸ Insurers typically conduct a precheck by accessing data from medical information bureaus, prescription databases, and even motor vehicle records. They can approve a policy if they are satisfied with what they find but cannot reject a candidate based on third-party data alone. At worst, the carrier can request a full medical workup if they need more information before deciding whether to insure a person, and if so, at what price. Disclosure and transparency prevail, with a clear value proposition for both provider and buyer.

But what happens if consumers don't want financial institutions intruding into their personal lives, whatever digital breadcrumbs they've left in their wake? Might they be penalized in some way by opting out of the connected economy? For example, might usage-based auto insurance expand to the point where consumers who refuse to have their driving monitored in real time are automatically surcharged because insurers cannot assess how safely they drive? How might consumers, and regulators, react to that scenario down the road?

Financial services firms that lack the appropriate strategies, policies, and controls to deal with these new forms of data and respond to such provocative questions could be at risk.

Are existing policies suitable for protecting privacy in the digital age?

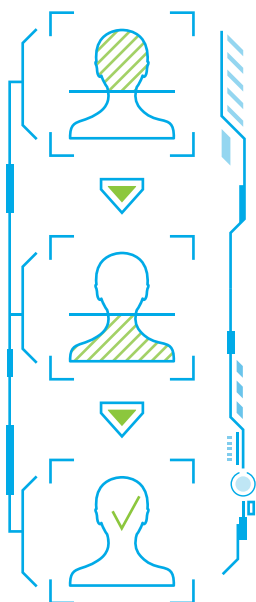
CURRENT STATE OF PRIVACY POLICIES IN FINANCIAL SERVICES

In the next section, we look at how well financial services firms may be currently set up to address the privacy challenges posed by emerging technologies and nontraditional data. We analyzed privacy policies from a random sample of 12 large financial institutions in banking, investment management, insurance, and real estate to determine what data is collected, how it is stored, shared, and protected, and how frequently privacy policies are updated.

What data is collected?

Universally, all companies in the sample collect traditional identifiers including (but not limited to) name, email, address, phone number, and Social

Security number. Data collected by insurance firms, particularly, was most extensive, given the nature of their work and how data is used for risk selection and to make policy pricing and coverage determinations. In addition to personally identifiable information, insurers in the sample also collected more personal data such as medical or driving history, depending on the line of business. All of those sampled also tracked website analytics data, including browser type, IP address, and app usage.



How is data collected?

The institutions we analyzed assert that their primary data collection method is via “voluntarily supplied or disclosed” consumer data—for example, data that consumers manually enter when opening an online account or applying for a loan or insurance policy. Every company analyzed also uses cookies and Web beacons to collect and track Web data. Some also collect data from third-party resources, such as data brokers.

How is data used?

Every financial institution included in our analysis asserts that its use of consumer data is essential to everyday business purposes and operations, and most emphasized that the manner in which they use data is permissible under law. Most also note that data is used to deliver quality services, such as account management, fraud prevention, and marketing.

Is data shared and can customers opt out?

Across the board, all of those sampled share data in some way. The majority stipulate that data is shared within the family of companies and subsidiaries, or across business units to “enhance services.” They disclose that data may be shared with third-party providers as required or permitted by law. Furthermore, for the most part, consumers cannot opt out of this data sharing except when it is used for marketing or advertising purposes.

How is data protected?

Most companies state that they “maintain physical, electronic, and procedural safeguards” in line with industry standards.

Are customers notified of policy changes?

As required by law, insurers send consumers an updated privacy policy annually. The rest of the companies note that they reserve the right to modify their privacy policies at will. Some notify consumers of changes, while others advise consumers to regularly refer to their websites for policy updates.

How frequently are policies updated?

Most of the privacy policies examined had been updated within the prior year. One company—an insurer—had not updated its online privacy policy since 2013.

Have financial institutions gone far enough with privacy disclosures?

Which of the eight elements of privacy outlined in the framework earlier are mentioned in the policies of the sample companies? We performed a second text analysis on their privacy policies to identify which metrics were tracked as they related to the types of privacy described in figure 2.

At first glance, the results looked promising. However, none of the sampled companies accounted for all eight types of privacy, and how they were referenced was arguably superficial. Here's why:

- First, the policies suggest privacy operates on a binary level—whether the company is compliant or not with existing laws—and fail to address the complexities of privacy that have emerged thanks to the latest technological advances.
- Second, none of the policies explicitly mention all the technologies included in our analysis.
- Finally, none of the policies go beyond high-level detail on how or why data is collected and shared, let alone what the potential benefits might be for consumers.

In fact, we found that privacy policies within financial services sectors—banking, insurance, and investment management—were so alike that it was hard to differentiate between firms. This also suggests that current privacy policies are merely “checking the box” to satisfy compliance requirements.

Within the banking segment, for instance, all banks in the sample provided identical, boilerplate factsheets on what, how, and why data is shared. In addition, excluding two investment management firms in the sample that regularly review and adjust their safeguards, most privacy policies are not forward-looking and do not take advances in technology and new data into consideration—a missed opportunity.



As technology continues to advance and new forms of data emerge, how should financial institutions adapt their privacy practices? While traditional forms of consumer data are covered under current financial privacy laws, data from the fusion of new technologies is not. Given the absence of a comprehensive, forward-looking US federal standard, there appears to be a widening chasm of data that financial institution policies do not account for and, most importantly, that companies may not be compelled to account for. Thus, the current state of existing privacy policies may be giving consumers a false sense of comfort, which could be setting the stage for a rude awakening and, subsequently, the potential for a privacy backlash among consumers.

Looking forward: A new way to manage customer privacy

We propose that financial institutions should rethink customer privacy in a more expansive, proactive, and strategic manner. In short, firms should consider the following:

- **Broaden their lens.** Go beyond superficial checkpoints to account for multiple types of privacy and the tools and technologies capable of encroachment. As a first step, financial institutions should become more proactive and

deliberate, exploring how emerging data sources and privacy concerns will likely evolve over time in terms of consumer attitudes, technological innovation, and regulatory constraints.

- **Review and revamp current privacy policies.** Today's policies often include simple disclosure statements to clear regulatory hurdles. Instead, companies should use these policies to earn customer trust by providing enough transparency to demonstrate good faith. Furthermore, institutions could help ease any lingering misgivings about privacy by showing consumers how they could also benefit from the various types of data collection and analysis and including these details in their policies.
- **Be good stewards of the data they collect and purchase.** Companies could improve the quality control, accuracy, and relevance of the data they collect by establishing a more comprehensive privacy governance framework. This would include systematic vetting of data collected in-house and from third parties.
- **Explore new data science techniques to protect sensitive information.** As an example, institutions could add random noise or create synthetic data sets to protect consumers' personal or sensitive information.³³
- **Make positive use of emerging technologies and new data sources.** Financial institutions should look for ways data can mutually benefit providers *and* consumers. Customers should be kept in the loop as companies explore new data sources and analytical methods, and institutions should openly disclose and explain the proposed value proposition to consumers.

- **Finally, chief privacy officers should be empowered to develop new privacy management strategies.** If such positions don't exist, it might behoove the institutions to appoint someone to lead privacy management.

When all is said and done, financial institutions should be able to meet basic regulatory requirements while also honoring consumer sensibilities about the sanctity of their personal information. Such sensibilities are likely to evolve over time and they could differ across segments and various types of privacy.

Rather than assuming that customer perceptions of privacy are immutable and not susceptible to persuasion, financial services firms can shape how customers view the value of their data. They can engender trust by clearly communicating what they're doing with consumer data and by giving something in exchange, such as tailored offerings, new services, better pricing, or reduced time for service delivery.

Financial institutions should become more proactive and deliberate, exploring how emerging data sources and privacy concerns will likely evolve over time.

These steps can help financial institutions get ready for a future marked by ongoing, rapid technological innovation. Armed with this new, more strategic approach, financial institutions should be better prepared to effectively manage privacy in an increasingly digital world, to differentiate themselves, and, most importantly, to more effectively serve their customers. ●

VAL SRINIVAS is the banking and capital markets research leader at the Deloitte Center for Financial Services. He is based in New York.

SAM FRIEDMAN is the insurance research leader at the Deloitte Center for Financial Services. He is based in New York.

TIFFANY RAMSAY is a senior market insights analyst at the Deloitte Center for Financial Services. She is based in New York.

Read more on www.deloitte.com/insights
Cybersecurity at financial institutions



Financial firms are stepping up their efforts to stay ahead of cyber and business threats. Our latest Deloitte and FS-ISAC survey reveals what differentiates the strongest cybersecurity programs from the rest.

Visit www.deloitte.com/insights/cyber-financial



How to begin regulating a digital reality world

**Businesses and governments should guide
augmented reality development**

BY ALLAN V. COOK, JOE MARIANI, PANKAJ KISHNANI, AND CARY HARR

ILLUSTRATION BY DAN PAGE

Imagine you are walking down the street, looking for a restaurant. You slip on your augmented reality (AR) glasses to see reviews in real time as you stroll. At a crosswalk, you glance up at a billboard and notice that it is an animated ad for the laundry detergent that you just put on your shopping list. Flipping up the glasses, you see that the physical billboard is a car ad. The detergent ad was just for you, digitally overlaid in the augmented experience.

On the next block, you see a promising Thai restaurant. It is inexpensive, quiet, and has good reviews. But then, on the wall next to the entrance, you notice some graffiti complaining about food poisoning. “I wonder why they don’t clean that off the wall,” you think, but a quick flip up of the glasses again reveals that, while the wall is real, the graffiti only exists in the digital world. The restaurant cannot erase it—in fact, it may not even be able to see it.

These new situations may seem like science fiction, but they are very real and are happening today. AR use is increasingly moving from fringe innovators and gamers to the mainstream, with more than 1 billion users predicted by 2020.¹ With such rapid growth, the industry is still feeling its way around how current rules apply in these new, virtual scenarios.² Physical objects and digital information can increasingly coexist, interact, and complement each other through the layering of content, applications, and technical infrastructure over real-world locations. In other words, AR merges the physical

and digital worlds visually, defining a new space called the **spatial Web**, or **Web 3.0**.

For businesses, this opens new avenues for products, services, advertising, and a wide variety of other experiences from gaming to learning to the creation of user communities that generate their own content. It carries the potential to create value in myriad ways; in fact, we are already seeing multiple real-life examples. Rather than sifting through massive maintenance manuals, workers can use AR to see the relevant specs for the part they are looking at—with some current use cases demonstrating efficiency gains as high as 34 percent.³ Customs agents can see detailed information about shipping containers to determine if any pose a smuggling risk and should be inspected.⁴ First responders arriving at the scene of a car crash can see information about the emergency, and even determine where to cut that particular model of the car to extract the injured.⁵

For AR to expand and continue to achieve its potential, both businesses and governments must address questions about how current regulations apply to the spatial web—and whether additional, new regulations are needed. Individuals must know the rules of the road for AR; businesses must know how they can monetize it; and governments must know how they can protect citizens and businesses without stifling innovation. To do so will require the cooperation of businesses using AR and of the governments regulating it.

With new opportunities come real challenges

Despite the multitude of opportunities, some real risks and regulatory challenges exist.

CHALLENGES FOR PROPERTY AND SPEECH RIGHTS

As the digital and physical worlds converge, tension between property and free speech rights is emerging, already leading to several legal disputes. Depicting a physical space differently,⁶ damaging public property,⁷ and trespassing and creating nuisances on a private property⁸—these all have led to legal battles between AR developers and relevant parties. For example, thousands of players in Milwaukee flocked outside to play a mobile AR game, and in the process damaged a park.⁹ Further, residents of the nearby area complained of littering, traffic congestion, and late-night activity.¹⁰ That prompted Milwaukee County to pass an ordinance requiring AR developers to take permits if the games include park locations. However, Candy Lab, the developer of an AR-based poker game, sued the county, arguing that this violated its right to freedom of speech.¹¹ The federal district court judge ruled in favor of the company, and the county

agreed to a permanent injunction against enforcement of the original ordinance.

However, this ruling does not provide a single permanent solution for all such disputes.¹² It was decided on the basis of freedom of speech, and so has limited scope, especially as it relates to advertising or business-to-business applications.¹³ While this case and other early precedents around AR may clarify small corners of the larger issue of owning augmented spaces, future AR solutions will undoubtedly raise many new ethical challenges around intellectual property, privacy, and safety, which will demand broader solutions.¹⁴

QUESTIONS ABOUT PRIVACY AND COPYRIGHT

As AR environments become more widely adopted, more data will be collected and recorded about individuals and their surroundings. This could create many privacy issues around who owns the data, how it should be stored securely, and who has the right to access it. And further, do individuals have the right to decline being recorded while AR-mounted glasses are scanning the surroundings?

As the digital and physical worlds converge, tension between property and free speech rights is emerging, already leading to several legal disputes.

Copyright issues are also coming into play. Much of the value of AR comes from its ability to contextualize information through the overlay of text, images, and other artifacts—potentially infringing on a copyright owner’s exclusive rights to reproduction and alteration. In one example, an app developer created an experience where the image

of a famous movie villain was virtually replaced by the face of a public figure.¹⁵ Nothing was altered on the movie poster itself, but it raised many questions, including concerns about how much of the original poster was reproduced within the app, whether there was any commercial intent, and whether the application complied with fair use. Further, issues may arise about how this capability could be used with respect to private citizens—an issue that regulators in many countries are still working to get a full handle on, even in the primarily Web-based form it takes today.¹⁶

THREAT TO REPUTATION

In a recent consumer survey, 85 percent of respondents said they read online reviews, and 57 percent said they prefer to use businesses with four or more stars—making poor reviews on the Web a legitimate worry for businesses today.¹⁷ With AR, this becomes even more challenging. Unlike Web-based comments that must be sought out, with AR, these comments could be revealed automatically, without an intentional search by the user. In other words, a business could find itself “tagged” in a virtual, augmented space, having comments written directly on walls where negative reviews of the business would populate for the patron instantly. The immediacy and physical presence of those comments in AR are likely to give them much greater weight in the eyes of a viewer.¹⁸ The outsized impact of these AR comments could tempt

those with more malicious intent as well. Already, online comments can be a haven for those seeking revenge or competitive advantage against a person or business. This could potentially evolve still further, tempting some to post fictitious negative reviews with the aim of forcing a business to pay to have them removed.¹⁹

RISKS TO REVENUE STREAMS

The blending of physical and digital space in AR can offer new opportunities for advertising and monetization. For example, a business could reap the benefits of an augmented experience within its location, working closely with a third-party AR designer to add curated content to a physical space. These AR experiences could serve as an enticement to visit—enhancing an existing location or making a new experience for frequent visitors—bringing new customers to a store or encouraging old customers to return more frequently.

But such a symbiotic relationship between physical spaces and AR experience can quickly turn into a parasitic one. For example, iconic landmarks or company logos could be used as augmented markers and modified to meet the needs or desires of someone outside the organization. At best, this could lead to a third party overlaying its advertising over existing physical advertising, actively taking away ROI from an ad placement; at worst, it could turn cultural landmarks into crowded digital

A business could find itself “tagged” in a virtual, augmented space, having comments written directly on walls where negative reviews of the business would populate for the patron instantly. The immediacy and physical presence of those comments in AR are likely to give them much greater weight in the eyes of a viewer.

advertising boards. Imagine the Eiffel Tower or the Louvre covered in hundreds of ads or logos for a race car. In such cases, the owners of the physical location reap little benefit from augmented experiences and may even experience harm.

Technology safeguards: What is possible today?

As we've seen, AR may have any number of unintended consequences on property values and environmental damage to reputation and revenue damage. So how can a business ensure that its customers only get the desired experience, augmented or otherwise? And how can they protect themselves from unwanted experiences visible in the spatial Web?

GEOFENCING: THE PROS AND CONS

Perhaps the most obvious solution is simply technological, finding a way to assign "rights" to owners of physical locations so they can control the augmented experience that is displayed within the property owner's locale. Like the current system of domain names on today's Web, this strategy would allow the business owner to control digital content displayed within the physical walls of their business through geofencing technology.

CURRENT APPROACHES: GPS OR IP ADDRESSES

While this geofenced approach seems like a reasonable and quick solution to the problem, there are technological and practical challenges. Practically, how do you control physical spaces that change in three dimensions as you move around within a given location? How do you manage multiple owners, such as different owners of floors in an office building? Or even space that changes with time, such as different uses of an event space by time of day? Questions such as these demonstrate the

enormous complexity surrounding what at first seems like a simple solution.

Even if you solve those challenges, technical issues still exist. Unlike the Web, where a single protocol controls most of the experience that is presented to users, controls on a physical space will be more complex. Layered content, native applications, and other yet unforeseen technologies will be difficult to restrict using traditional Web technologies and protocols. For example, applications could use recognizable landmarks as markers, allowing them to launch an experience regardless of where a device is located. Thus, rather than relying on location data, an app could recognize the image of, say, the Eiffel Tower and launch content related to Paris, effectively bypassing any geofencing protocols.

More complex solutions seek to blend geofencing of locations with a "handshake protocol"—the process that sends information back and forth between two devices to establish a connection. In this blended approach, when a device wishes to use an app, it would not only validate the device and any user credentials, but also check the reported location of a device against the rights of the AR application provider. Similar solutions are already being trialed in New Jersey for gambling applications to ensure that digital gamblers are legally located within the physical boundaries of the state. This strategy uses a variety of checks, including GPS location finding and Wi-Fi network positioning, to ensure users' locations.²⁰ While a significant advancement, this approach is not foolproof and could fall victim to spoofing depending on the exact method of verifying location.

EVOLVING APPROACHES: DIGITAL ADDRESSES FOR PHYSICAL SPACES

Other solutions take a different approach, attempting to apply a rigorous, uncopyable categorization scheme to physical space, much like IP addresses on today's Web. In this scenario, a storefront could be identified by a unique number, potentially

allowing it to prevent competitors' experiences from launching there. Apartments above the store would have different identifying numbers, allowing another set of experiences to launch. These categorized 3D spaces could help to regulate who can publish where and the types of AR that can live within each space.

Protocols are already beginning to emerge using a combination of geolocation and blockchain technologies. Organizations such as Verses have recruited Web protocol veterans and have begun teaming with geo-blockchain organizations to map the globe and put a framework around 3D space-and-time protocols.²¹ This framework will theoretically allow partitioning of real-world environments and allocating permissions to augmented content. However, this too is no silver bullet, with the challenges of uniquely identifying every physical space being quite significant.

It's clear that technology can and should play a role, but these capabilities are still developing and can't solve the problem alone.



Regulating as AR technology evolves

While the emerging challenges are clear, in the early days of any technology, it's important for regulators and businesses to work together to strike the right balance between encouraging innovation and protecting against negative consequences and externalities. As with the emergence and ongoing innovation of current Web capabilities, augmented technologies will likely be widely unregulated at the outset, as they are today, and then begin to self-regulate over time. By looking at positive and negative lessons learned from transformative technologies such as social media, we can attempt to avoid past pitfalls. Our previous work on *The future of regulation* looked at many similar complex cases, and found a few key themes to help regulators successfully manage emerging AR technologies.

REVIEW AND UNDERSTAND EXISTING REGULATIONS

Before developing new regulations, both businesses and government should thoroughly review current applicable laws, regulations, and rules. In some cases, existing regulations may already adequately protect against the largest threats from a new technology. In other cases, new technology may change the underlying dynamics such that new rules are necessary—such as when the proliferation of small drones forced amendments to the existing “model aircraft” regulation that had previously governed their use.²² For a technology such as AR, government will likely need to have a comprehensive review of various existing policies. Some of the policies that will likely need review and potential reconsideration include property laws, privacy regulations, and copyright and intellectual property rights.²³

TAKE AN ADAPTIVE APPROACH TO REGULATION

Like other emerging technologies, AR is advancing rapidly in ways we can't always predict. Hence, using an adaptive approach will help regulators respond to changes in the technology. This approach relies on an iterative process of feedback loops, where outcomes can contribute to revisions of that regulation to help make it more effective. These feedback loops allow regulators to assess policies against set benchmarks, which then can be used as input for revisions. Regulators and businesses can use many tools to get such feedback, including setting up policy labs, creating regulatory sandboxes, crowdsourcing policymaking, and providing representation to industry in the governance process via self-regulatory and private standard-setting bodies. For example, the National Highway Traffic Safety Administration (NHTSA) took an iterative approach to crafting policies for autonomous vehicles, which allowed technology and auto companies to test new regulations and respond, ultimately resulting in significantly revised guidance for 2017.²⁴

ENCOURAGE ADOPTION OF SOFT LAWS

Soft law mechanisms—instruments that are not directly enforceable, such as codes of conduct, standards, or guidelines—offer another tool for shifting to more adaptive regulation. Unlike hard law requirements such as treaties and statutes, soft laws can include guidance, a push for industry self-regulation, best-practices codes, codes of conduct, and third-party certification and accreditation. Soft laws allow regulators to quickly respond to technology changes as they do not have to go through regulatory processes, whereas hard laws do. As a great deal within the AR space is still developing, use of soft laws can give regulators the flexibility to respond—no matter what direction the technology takes as it evolves.

Businesses and regulators can work together to apply soft laws by defining the scope of issues to be addressed, and developing industry standards and codes of conduct in response. The internet of today is built upon standards such as IP addresses and domain names that were forged by governments and industry. AR may develop similarly. For example, organizations such as the Institute of Electrical and Electronics Engineers (IEEE) and the Standards Association and Consumer Technology Association (CTA) are looking to build consensus on AR/VR standardization among device manufacturers, content providers, service providers, technology developers, government agencies, and other relevant stakeholders for AR/VR technology advancement. One of the standards focuses on quality assurance and testing of environmental safety when the virtual world may interact with the physical environment.²⁵ Platforms like these have the potential to bring together regulators and AR developers to build consensus on a regulatory framework for AR.

To harmonize standards and collaborate effectively, governments can consider creating a multistakeholder governance model such as the Internet Corporation for Assigned Names and Numbers (ICANN). ICANN is a not-for-profit partnership made up of people from all over the world who helped to develop policy and created the standard system of Web addresses.²⁶ An ICANN-like body for AR could be responsible for coordinating and maintaining databases of spatial addresses for AR experiences to help provide a secure AR experience.

TEST REGULATORY APPROACHES IN SANDBOXES

For technologies such as AR where many stakeholders have a financial, reputational, or other interest in its use, predicting the exact outcome of a proposed regulation can be difficult. To mitigate

this risk, businesses and governments can consider launching a regulatory sandbox for AR developers to test ideas before they launch it in the market. Sandboxes are controlled environments allowing innovators to test products, services, or new business models without having to follow all the standard regulations.²⁷ It allows government and business to partner in technology experimentation, while simultaneously testing the effects of proposed regulations. By working collaboratively, government and industry players can develop appropriate rules and regulations for emerging products, services, and business models based on AR.

The sandbox format has been adopted by developers of autonomous vehicles, virtual currencies, and fintech regulators to provide a safe environment to encourage innovation and also protect consumer safety.²⁸ For example, the United Kingdom's Financial Conduct Authority launched the first fintech regulatory sandbox in June 2016. This sandbox allows fintech players to test innovative products and services in a safe, live environment, with the appropriate consumer safeguards, and, when appropriate, is exempt from some regulatory environments. After its first year of operation, 90 percent of firms that completed sandbox testing in the first cohort were continuing toward a wider market launch, and more than 40 percent received investment during or following their sandbox tests.²⁹ The Hong Kong Monetary Authority has also launched a similar sandbox, which seeks to engage innovators developing fintech products based on augmented reality.³⁰

These regulatory tools can allow government agencies to begin to get a grip on technology even before its widespread adoption. But there are implications for businesses too. The collaborative nature of these tools means that businesses cannot simply sit back and wait for final regulations. They need to be engaged with government agencies throughout the process from start to finish.

Where do businesses and governments start?

There may be few clear answers for how the ownership of augmented spaces will play out, but that is no reason for companies and governments alike not to begin realizing AR's benefits.

- **Start now.** As with other emerging technologies, we shouldn't underestimate AR's potential to disrupt business and society. It's only through broad participation of business and government from the beginning that we can hope to promote its advantages, consider its deep implications, and prevent negative outcomes as much as possible before it's too late.
- **Convene cross-functional/cross-agency AR working groups.** The impact of AR technology will surely be broad, and staying on top of it will require broad perspectives. Governments should work with other agencies to make sure that they are covering all the technological, economic, and legal implications of AR. Businesses should identify a small team from different divisions in their organizations that can be tasked with monitoring and evaluating AR technology for its potential opportunities and challenges. This should include members from the IT team, but extend well beyond and into the product, marketing and PR, sales, and customer service teams and other core business functions. As this technology emerges, a large part of your organization will need to respond to it in different ways—from monitoring and responding to negative reviews in the spatial Web to working with government regulators to develop reasonable standards that allow for innovation and business growth.
- **Encourage external partnerships.** Understanding and influencing the impact of AR technology is an important economic and policy issue. Both businesses and governments

should make sure they are following the evolution of AR, through connections with each other as well as ecosystem partners, such as academic and startup communities. Governments should use these connections to invite industry participation in the regulatory process through policy labs, regulatory sandboxes, and crowdsourced policymaking, and by providing representation via self-regulatory and private standard-setting bodies.

Fear of uncertainty and technical complexity can be major barriers, but abandoning AR to others may only ensure that companies miss out on its benefits and governments are caught off guard by its impact on citizens.³¹ Neither business nor government can solve these issues alone. It's only through deep partnership and an understanding of lessons learned from past technology transformations that we can shape the regulatory evolution of AR in a way that promotes continued growth and innovation. ●

ALLAN V. COOK is the digital reality business leader for Deloitte Consulting LLP. He is based in Los Angeles.

JOE MARIANI is a research manager with Deloitte's Center for Government Insights, Deloitte Services LP. He is based in Chicago.

PANKAJ KISHNANI is a researcher with the Deloitte Center for Government Insights, Deloitte Services LP. He is based in Mumbai.

CARY HARR is a senior manager with Deloitte Consulting LLP's Digital practice. He is based in New York City.

Read more on www.deloitte.com/insights
A new age of storytelling

While still new, using digital reality to tell a story is already delivering big results for brands. View steps for marketing to take now.

Visit www.deloitte.com/insights/storytelling



The digital workforce experience

page 10

1. Bluewolf, "See how the best companies are using Salesforce. Now.," accessed May 14, 2019.
2. Corporate Leadership Council, *Driving performance and retention through employee engagement*, 2004.
3. UNC Kenan-Flagler Business School, *Powering your bottom line through employee engagement*, accessed May 14, 2019.
4. Erica Volini et al., *From employee experience to human experience: Putting meaning back into work*, Deloitte Insights, April 11, 2019.
5. Sierra-Cedar, *Sierra-Cedar HR systems survey*, 2018.
6. Josh Bersin, *The employee experience platform market has arrived*, accessed May 14, 2019.
7. Bob Furniss, "Employee engagement strategy improves customer experience," SearchCustomerExperience, accessed May 14, 2019.
8. Josh Bersin, "HR technology in 2018: Ten disruptions ahead," joshbersin.com, November 3, 2017.

Pivoting to digital maturity

page 18

1. Deloitte Digital Transformation Executive Survey 2018, Deloitte analysis.
2. Ted Schadler, "The sorry state of digital transformation in 2018," Forrester, April 24, 2018.
3. Other authors have identified dozens of attributes or activities said to be the hallmark of a digital enterprise. In our approach, we have opted for a simplified framework that classifies all digital transformation activities into one of seven digital pivots.
4. As mentioned earlier, scope is defined as the execution or application of more digital pivots within more organizational functions.
5. Doug Palmer, *Coming of age digitally: Learning and leading in new ways*, Deloitte Digital, June 5, 2018.
6. Deloitte Digital Transformation Executive Survey 2018, Deloitte analysis.
7. Bill Briggs et al., *The new core: Unleashing the digital potential in "heart of the business" operations*, Deloitte Insights, December 5, 2017.
8. Deloitte Digital Transformation Executive Survey 2018, Deloitte analysis.
9. Ibid.
10. Palmer, *Coming of age digitally*.
11. Ibid.

-
12. Deloitte Digital Transformation Executive Survey 2018, Deloitte analysis.
 13. IDC, "Worldwide spending on digital transformation will be nearly \$2 trillion in 2022 as organizations commit to DX, according to a new IDC spending guide," press release, November 13, 2018.
 14. Khalid Kark, Anjali Shaikh, and Caroline Brown, *Technology budgets: From value preservation to value creation*, Deloitte Insights, November 28, 2017.
 15. To learn more about the growing importance of cloud-based artificial intelligence software, see Jeff Loucks, *Artificial intelligence: From expert-only to everywhere*, Deloitte Insights, December 11, 2018. See also Maribel Lopez, "AB InBev turns to the cloud and AI for digital transformation," *Forbes*, October 29, 2018; Business Wire, "Guardian Life Insurance selects AWS as its preferred cloud provider," November 28, 2018; Adrian Bridgwater, "Microsoft 'solidifies' Azure cloud for drones," *Forbes*, November 7, 2018.
 2. Petri Kettunen and Maarit Laanti, "Future software organizations—agile goals and roles," *European Journal of Futures Research* 5, no. 1 (2017): p. 16.
 3. Deloitte Insights, *Agile in government: A playbook from the Deloitte Center for Government Insights*, 2017.
 4. Josh Bersin et al., *The employee experience: Culture, engagement, and beyond*, Deloitte Insights, February 28, 2017.
 5. Kent Beck et al., "Principles behind the Agile Manifesto," agilemanifesto.org, February 2001.

If these walls could talk

page 46

- ### Stepping stones to an agile enterprise
-
- page 36
1. Jeff Sutherland, *Scrum: The Art of Doing Twice the Work in Half the Time* (Random House, 2016).

1. Stephanie Sarkis, "How your open-plan office is killing your privacy and safety," *Forbes*, January 27, 2019; Elaine Moore, "Open-plan offices: Time to bring back the cubicle?," *Financial Times*, January 15, 2019; Allison Duncan, "We've managed to invent something even worse than open offices," *Fast Company*, September 27, 2018; Katharine Schwab, "The subtle sexism of your open plan office," *Fast Company*, May 7, 2018.
2. Yeoman Lowbrow, "5 major ways the office has changed since the 1970s," Flashbak.com, September 12, 2014.
3. Ibid.
4. Ibid.

-
5. BBC News, "Goldman Sachs relaxes dress code for all employees," March 6, 2019.
 6. Katharine Schwab, "Everyone hates open offices. Here's why they still exist," *Fast Company*, January 15, 2019.
 7. *Economist*, "Open offices can lead to closed minds: Some workplace designs are more about cost-cutting than collaboration," July 28, 2018.
 8. Meghan Walsh, *Is anyone listening?*, Korn Ferry Institute, November 19, 2018.
 9. Ethan Bernstein and Stephen Turban, "The impact of the 'open' workspace on human collaboration," *Philosophical Transactions of the Royal Society B: Biological Sciences* 373, no. 1753 (2018): DOI: <https://doi.org/10.1098/rstb.2017.0239>.
 10. Ibid.
 11. Moore, "Open-plan offices"; Jesus Diaz, "'60s cubicles are back to destroy your open office," *Fast Company*, October 24, 2018.
 12. *Economist*, "Open offices can lead to closed minds."
 13. Minda Zetlin, "Why you need to be your real self at work: Does the image you project at work match your true self? If not, it can cost you," *Inc.*, March 18, 2014.
 14. Fleximation Systems, "Hoteling verse hot-desking: When should you use them?," April 21, 2017.
 15. *Economist*, "Open offices can lead to closed minds."
 16. Duncan, "We've managed to invent something even worse than open offices."
 17. Dan Ariely, *Predictably Irrational* (HarperCollins, 2009).
 18. John Lucker, Susan K. Hogan, and Brenna Sniderman, *Fooled by the hype: Is it the next big thing or merely a shiny new object?*, Deloitte Insights, July 30, 2018.
 19. Ibid.
 20. Carolyn O'Boyle and Susan K. Hogan, "Engaging workers as consumers," *Deloitte Review* 24, January 28, 2019.
 21. Deloitte, *The future of the workplace*, 2018.

Innovation in Europe: Alive and well

—————
page 58

1. This framework was developed by Doblin, the innovation practice of Monitor Deloitte within Deloitte Consulting. Learn more at www.doblin.com/ten-types.

Cyber, cyber everywhere

—————
page 62

-
1. In this article, we use the term “cyber” to convey the implications of connecting technologies. These can be the vulnerabilities and attacks that emerge, or the opportunities and solutions that strong cyber programs create.
 2. Deloitte, *The future of cyber survey 2019: Cyber everywhere. Succeed anywhere.*, accessed May 6, 2019.
 3. Jeff Loucks et al., *Future in the balance? How countries are pursuing an AI advantage: Insights from Deloitte’s State of AI in the Enterprise Survey, 2nd Edition*, Deloitte Insights, May 1, 2019.
 4. Jeff Loucks, Tom Davenport, and David Schatsky, *State of AI in the Enterprise, 2nd edition: Early adopters combine bullish enthusiasm with strategic investments*, Deloitte Insights, October 22, 2018.
 5. Deloitte, *Why CMOs should care about cyber risk*, accessed May 6, 2019.
 6. 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.
 7. Rick Burke et al., *The smart factory: Responsive, adaptive, connected manufacturing*, Deloitte University Press, August 31, 2017.
 8. Deloitte, *The future of cyber survey 2019*.
 9. Ibid.
 10. Robin M. Ruefle, “Critical asset identification (part one of 20: CERT Best Practices to Mitigate Insider Threats Series),” Carnegie Mellon University Software Engineering Institute, April 12, 2017.
 11. Brenna Sniderman, Monika Mahto, and Mark J. Cotteleer, *Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises*, Deloitte University Press, February 22, 2016.
 12. BBC News, “Medical devices vulnerable to hackers,” September 29, 2015.
 13. Ken Demith, “Remote monitoring proven to help prolong life in patients with pacemakers,” Heart Rhythm Society, May 8, 2014.
 14. Leon Nash et al., *Securing the future of mobility: Addressing cyber risk in self-driving cars and beyond*, Deloitte University Press, April 4, 2017.
 15. Deloitte, “Black market ecosystem: Estimating the cost of ‘Pwnership,’” December 2018.
 16. Deloitte, *The future of cyber survey 2019*.
 17. Deloitte analysis.
 18. National Council of ISACs, accessed May 6, 2019.
 19. Ralph Tkatchuk, “Seven things startups need to know about cybersecurity,” *CIO*, August 15, 2017.
-
- ## Government, business, and closing the talent gap
- page 76
1. Bureau of Labor Statistics, “Job openings and labor turnover survey highlights January 2019,” March 15, 2019.
-

-
2. Bureau of Labor Statistics, "The employment situation—March 2019," April 5, 2019.
 3. Axios, "Trump gets early start on 2020 fundraising," accessed April 8, 2019.
 4. The White House, "President Donald J. Trump's administration is taking action to equip American students and workers with the skills they need to succeed," July 19, 2018.
 5. Department of Labor and Regulation, "Customized training," April 1, 2017.
 6. Deloitte Center for Government Insights analysis of WIOA data. For details, see John O'Leary, Scott Malm, and Sushumna Agarwal, *Reinventing workforce development: Making job training more effective*, Deloitte Insights, August 30, 2018.
 7. PayScale, "Leveling up: How to win in the skills economy," May 17, 2016.
 8. For details, see Jeffrey Selingo, Cole Clark, and Dave Noone, *The future(s) of public higher education: Five new models for state university success*, Deloitte Insights, October 23, 2018.
 9. Deloitte Center for Government Insights analysis of WIOA data. For details, see O'Leary, Malm, and Agarwal, *Reinventing workforce development*.
 10. John O'Leary, China Widener and Sushumna Agarwal, *Closing the talent gap: Five ways government and business can team up to reskill workers*, Deloitte Insights, November 2, 2018.
 11. Schuyler Velasco, "Cyber apprenticeships: Old solutions to a new problem," CXO Magazine, February 14, 2018.
 12. Microsoft, "The Markle Foundation and Microsoft partner to accelerate a skills-based labor market for the digital economy," press release, June 27, 2017.
 13. Skillsfuture, "About Skillsfuture," accessed April 8, 2019.

Toward a mobility operating system

page 82

1. Christopher Chase-Dunn et al., "Uneven urban development: Largest settlements since the late Bronze Age," IROWS working paper No. 98, August 2015.
2. Scott Corwin, "The urban optimist: Daniel Doctoroff on the future of cities," *Deloitte Review* 20, January 23, 2017.
3. Chase-Dunn et al., "Uneven urban development."
4. Emma G. Fitzsimmons, Ford Fessenden, and K.K. Rebecca Lai, "Every New York City subway line is getting worse. Here's why," *New York Times*, June 28, 2017; Victor Luckerson, "The great gridlock groundswell," *Ringer*, November 7, 2016.
5. Scott Corwin et al., *The future of mobility: How transportation technology and social trends are creating a new business ecosystem*, Deloitte University Press, September 24, 2015; Scott Corwin et al., *The future of mobility: What's next?*, Deloitte University Press, September 14, 2016.

-
6. A Pareto improvement is a change that leaves no party worse off. For an application to mobility, see Yang Liu, Xiaolei Guo, and Hai Yang, "Pareto-improving and revenue-neutral congestion pricing schemes in two-mode traffic networks," *Netnomics* 10, no. 1 (2009): pp. 123–40.
 7. United Nations, Department of Economic and Social Affairs, Population Division, *World urbanization prospects: The 2014 revision*, 2015.
 8. Ibid.
 9. United Nations, *The world's cities in 2016: Data booklet*, accessed August 4, 2017.
 10. International Transport Forum, *ITF Transport Outlook 2017* (Paris: OECD Publishing, 2017).
 11. American Society of Civil Engineers (ASCE), *Failure to act: Closing the infrastructure investment gap for America's economic future*, 2016.
 12. John Dulac, *Global land transport infrastructure requirements*, International Energy Agency, 2013.
 13. Graham Cookson and Bob Pishue, "INRIX global traffic scorecard," February 2019.
 14. ASCE, *Failure to act*.
 15. Federico Karagulian et al., "Contributions to cities' ambient particulate matter (PM): A systematic review of local source contributions at global level," *Atmospheric Environment* 120 (2015): pp. 475–83.
 16. World Health Organization, "WHO global urban ambient air pollution database," 2016.
 17. OECD, *The cost of air pollution: Health impacts of road transport*, 2014.
 18. Erik Hansson et al., "Relationship between commuting and health outcomes in a cross-sectional population survey in southern Sweden," *BMC Public Health* 11, no. 1 (2011): p. 834.
 19. Raj Chetty and Nathaniel Hendren, "The impacts of neighborhoods on intergenerational mobility: Childhood exposure effects and county-level estimates," Harvard University and NBER, May 2015.
 20. Gilles Duranton and Matthew A. Turner, "The fundamental law of road congestion: Evidence from US cities," *American Economic Review* 101, no. 6 (2011): pp. 2616–52.
 21. Authors' interview with Ramayya Krishnan, Carnegie Mellon University, Pittsburgh, May 25, 2017.
 22. Authors' interview with John Moavenzadeh.
 23. Ibid.
 24. Henry Grabar, "The astounding collapse of American bus ridership," *Slate*, July 21, 2016; Fitzsimmons, Fessenden, and Lai, "Every New York City subway line is getting worse. Here's why."
 25. Alejandro Henao, "Impacts of ridesourcing—Lyft and Uber—on transportation including VMT, mode replacement, parking, and travel behavior," PhD dissertation defense, University of Colorado, January 19, 2017.
 26. NYC Department of Transportation, *New York City mobility report*, June 2018.
 27. Timothy Murphy and Mark J. Cotteleer, *Behavioral strategy to combat choice overload*, Deloitte University Press, December 10, 2015.
-

-
28. Warwick Goodall et al., “The rise of mobility as a service,” *Deloitte Review* 20, January 23, 2017.
 29. Ibid.
 30. Authors’ correspondence with Ramayya Krishnan, September 2017.
 31. Authors’ interview with Ramayya Krishnan, May 25, 2017.

Tempering the utopian vision of the mobility revolution

page 94

1. Ryan Robinson and Srinivasa Reddy Tummalapalli, *Plugging into the future: Electrifying the global automotive industry*, Deloitte Insights, December 2018.
2. European Automobile Manufacturers Association, “Share of diesel in new passenger cars,” accessed September 24, 2018.
3. Ron Bousso, “European diesel car sales plummet,” Reuters, October 12, 2018.
4. Statista, “Number of passenger cars and commercial vehicles in use worldwide from 2006 to 2015 in (1,000 units),” accessed December 5, 2018.
5. Deloitte, *2019 Global Automotive Consumer Study*, 2019.
6. IHS Markit, “The connected car,” accessed December 5, 2018.

Digitalizing the construction industry

page 108

1. Javier Parada et al., *GPoC 2017: Global powers of construction*, Deloitte, June 2018.
 2. Peter Evans-Greenwood and Devan Leibowitz, *Your next future: Capitalising on disruptive change*, Deloitte University Press, May 1, 2017.
 3. Unitised Building, founded in 2008, is a leader in the development of modular and prefabricated—unitized—medium- and high-rise buildings. Unitised Building website, accessed January 23, 2019.
 4. Hickory Group was founded in 1991 by fourth-generation builders Michael and George Argrou, and has evolved into one of Australia’s preeminent construction groups. Hickory Group website, accessed January 23, 2019.
 5. Hickory Group, “Hickory building systems,” accessed January 23, 2019.
 6. prefabAUS is the peak body for Australia’s off-site construction industry and acts as the hub for building prefabrication technology and design in Australia. prefabAUS website, accessed January 23, 2019.
 7. Centre for Advanced Manufacturing of Prefabricated Housing, University of Melbourne, “Unlocking the potential growth of Australia’s prefabricated building industry,” accessed January 23, 2019.
-

-
8. Philip Hopkins, "ARC Centre for Advanced Manufacturing of Prefabricated Housing builds up sector," *Sydney Morning Herald*, September 29, 2015.
 9. Business Victoria, "Manufacturer of the Year," accessed January 23, 2019.
 10. Broad Group, "CTS Slab: Brief introduction," October 18, 2018.
 11. Jesus Diaz, "China will build the tallest building in the world in just 90 days," Gizmodo, November 21, 2012.
 12. SkyCity, "SkyCity challenge 17," YouTube, accessed January 23, 2019.
 13. Lloyd Alter, "Brooklyn's modular tower: What a long strange trip it's been," Treehugger, October 13, 2016.
 14. A geopolymer is an inorganic, typically ceramic, noncrystalline material, and is used for fire- and heat-resistant coatings, high-temperature ceramics, toxic and radioactive waste encapsulation, and cements for concrete.
 15. The use for virtual reality to support a new approach to export could represent a step into the next, fifth phase of globalization, as outlined by Richard Baldwin, which he expects will be triggered by a dramatic reduction in the cost of moving people. The prior two significant transitions were due to the dramatic reduction in the cost of transport, and information management (communication). See Richard Baldwin, *The Great Convergence: Information Technology and the New Globalization* (Cambridge: Harvard University Press, 2016).
 16. Aki Pekuri, Laura Pekuri, and Harri Haapasalo, "Business models in construction—Construction managers' viewpoint," Diversity, Technology, and Innovation for Operational Competitiveness: Proceedings of the 2013 International Conference on Technology Innovation and Industrial Management, ToKnowPress, 2013.
 17. It's becoming more common to distinguish between "digitization" and "digitalization." Rodney Brooks provides a good working definition of the difference between the two terms: "Digitization of documents originally allowed them to be stored in smaller lighter form (e.g., files kept on a computer disk rather than in a filing cabinet), and to be sent long distances at speed (e.g., the fax machine). Digitalization of office work meant that the contents of those digital representations of those documents were read and turned into digital representations of words that the original creators of the documents had written, and then the 'meaning' of those words, or at least a meaning of those words, was used by programs to cross index the documents, process work orders from them, update computational models of ongoing human work, etc., etc. That is the digitalization of a process." See Rodney Brooks, "The productivity gain: Where is it coming from and where is it going to?," *Robots, AI & other stuff*, February 25, 2018.
 18. One of the authors was involved in a recent modular project that utilized a BIM via VR headsets to identify any design and noncompliance issues prior to commencing any works onsite or in the factory. The building certifier was able to walk through the building in its as-built form and highlight
-

where issues needed addressing that would cause delays during construction and at completion for handover.

19. Statistical machine translation was first proposed in 1947 by Warren Weaver, in a letter to Norbert Wiener. Following urging by his colleagues, Weaver published a simple memorandum on the approach in 1949. See Warren Weaver "Translation," Rockefeller Foundation, 1949.
20. The Canadian Hansard is the English-French permanent record of proceedings of the Canadian parliament.
21. EUROPARL is the permanent record of the proceedings of the European Parliament. It is provided in the 11 official languages of the European Union: Danish, Dutch, English, Finnish, French, German, Greek, Italian, Portuguese, Spanish, and Swedish.
22. Stanford Research Institute Problems Solver (STRIPS) is an automated planner developed in 1971 by Richard Fikes and Nils Nilsson while at SRI International. See Richard E. Fikes and Nils J. Nilsson, "STRIPS: A new approach to the application of theorem proving to problem solving," *Artificial Intelligence* 2, no. 3 (1971): pp. 189–208.
1. Electronic Frontier Foundation, "Privacy," accessed March 4, 2019.
2. Lee Rainie, "Americans' complicated feelings about social media in an era of privacy concerns," Pew Research Center, March 27, 2018.
3. EU GDPR, "The EU General Data Protection Regulation (GDPR) is the most important change in data privacy regulation in 20 years," accessed March 5, 2019.
4. Alexandra Bruell, "Advertisers' top trade group pushes for Federal Data Privacy Regulation," *Wall Street Journal*, December 19, 2018.
5. Internet Association, "Internet Association proposes privacy principles for a modern national regulatory framework," press release, September 12, 2018.
6. US Chamber of Commerce, "US Chamber privacy principles," accessed April 8, 2019.
7. Californians for Consumer Privacy, "What does the California Consumer Privacy Act do?," accessed April 22, 2019.
8. Bryan Cave and Leighton Paisner, "The top three privacy takeaways of the New Delaware Online Privacy and Protection Act," August 3, 2016.
9. Harry Valetk, Brandon Moseberry, and Bernard L. Hengesbaugh, "Vermont enacts first US Data Broker Privacy Law," *Lexology*, August 3, 2018.
10. Deloitte Canada, "Privacy for sale: To the highest bidder," accessed April 8, 2019.

Reimagining customer privacy for the digital age

page 122

-
11. Will Thomas DeVries, "Protecting privacy in the digital age," *Berkeley Technology Law Journal* 18, no. 1 (2003): pp. 283–311.
 12. Daniel J. Solove, "A taxonomy of privacy," *University of Pennsylvania Law Review* 154, no. 3 (2006).
 13. William M. Beaney, "The right to privacy and American Law," accessed April 8, 2019.
 14. Deirdre K. Mulligan, Colin Koopman, and Nick Doty, "Privacy is an essentially contested concept: A multidimensional analytic for mapping privacy," Royal Society Publishing, December 28, 2016.
 15. Carissa Véliz, "What if banks were the main protectors of customers' private data?" *Harvard Business Review*, November 20, 2018.
 16. World Economic Forum, "World Economic Forum annual meeting," accessed April 8, 2019.
 17. Val Srinivas, "Privacy in the post-GDPR world: How should banks and other financial institutions rethink customer privacy and make it a differentiator?," QuickLook blog, Deloitte Center for Financial Services, March 14, 2018.
 18. Matt Burgess, "Your next bank card will have a fingerprint scanner built-in," *Wired*, May 2, 2018.
 19. Scram Software, "Does my internet activity affect my insurance and credit ratings," March 18, 2015.
 20. Knowledge@Wharton, "Privacy on the Web: Is it a losing battle?," June 25, 2008.
 21. Tanaya Macheel, "Are you really there? US bank tries geolocation to stop fraud," *American Banker*, October 17, 2016; Stacy Cowley, "Banks and retailers are tracking how you type, swipe and tap," *New York Times*, August 13, 2018.
 22. Lisa F. Carver, "Why life insurance companies want your Fitbit data," *Medical Xpress*, September 24, 2018.
 23. Avin Arumugam, "Paying with wearables: The next big thing in IoT," Visa, accessed February 28, 2019.
 24. Jessica Baron, "Life Insurers can use social media posts to determine premiums, as long as they don't discriminate," *Forbes*, February 4, 2019.
 25. Gina Pingitore et al., *To share or not to share: What consumers really think about sharing their personal information*, Deloitte University Press, September 5, 2017.
 26. Tim Sandle, "Are you happy with digital spying for reduced insurance prices?" *Digital Journal*, June 21, 2018.
 27. Jim Eckenrode, *The derivative effect: How financial services can make IoT technology pay off*, Deloitte University Press, October 13, 2015.
 28. Greg Lacurci, "Technology is streamlining the process of issuing life insurance policies," *InvestmentNews*, January 10, 2018.
 29. John Lucker, Susan K. Hogan, and Trevor Bischoff, "Predictably inaccurate: The prevalence and perils of bad big data," *Deloitte Review* 21, July 31, 2017.
 30. *Ibid.*
 31. *Ibid.*
-

-
32. Ibid.
33. Sachin Gupta and Matthew Schneider, "Protecting customers' privacy requires more than anonymizing their data," *Harvard Business Review*, June 1, 2018.

How to begin regulating a digital reality world

page 136

1. Bernard Marr, "9 powerful real-world applications of augmented reality (AR) today," *Forbes*, July 30, 2018.
 2. Jim Gato, "Virtual advertising: Uncharted legal waters," *AdAge India*, November 11, 2016; Sam Collingwood, "Augmented reality: Legal issues to consider," Charles Russell Speechlys, August 23, 2017.
 3. Magid Abraham and Marco Annunziata, "Augmented reality is already improving worker performance," *Harvard Business Review*, March 13, 2017.
 4. Corianne Egan, "DHL: Augmented reality could change logistics business," *JOC.com*, June 26, 2014.
 5. Greg Nichols, "California firefighters use augmented reality in battle against record infernos," *ZDNet*, August 17, 2018.
 6. Gato, "Virtual advertising."
 7. *Wisconsin Gazette*, "Milwaukee County sued by game developer over park-permit requirement," April 24, 2017.
 8. Don Behm, "Milwaukee County panel recommends \$83,000 payment to mobile app game creator to settle lawsuit prompted by Pokémon Go," *Milwaukee Journal Sentinel*, November 30, 2017.
 9. Matt Wild, "Milwaukee is still talking about Pokémon Go, and still trying to make it (and future games) pay up," *Milwaukee Record*, January 24, 2017.
 10. Behm, "Milwaukee County panel recommends \$83,000 payment to mobile app game creator to settle lawsuit prompted by Pokémon Go."
 11. Ibid.
 12. Ibid.
 13. University of Missouri Kansas City, "Government regulation of commercial speech," accessed December 4, 2018.
 14. Brian Wassom, "Augmented reality law, privacy, and ethics," *Safari*, accessed on December 4, 2018.
 15. Brian D. Wassom, "IP in an augmented reality," *American Bar Association*, June 29, 2017.
 16. Kate Lyons et al., "Online abuse: How different countries deal with it," *Guardian*, April 12, 2016.
 17. BrightLocal, "Local consumer review survey," accessed December 4, 2018.
-

-
18. Poppy Laurretta McLeod et al., "The eyes have it: Minority influence in face-to-face and computer-mediated group discussion," *Journal of Applied Psychology* 82, no. 5 (October 1997): pp. 706–18.
 19. Ryan Erskine, "You just got attacked by fake 1-star reviews. Now what?," *Forbes*, May 15, 2018.
 20. Martin Derbyshire, "What is geolocation and how it works on gambling websites in NJ," NJ Gambling Websites, April 9, 2018.
 21. For more information on how this system works, see Verses.
 22. Les Dorr, "Fact sheet—small unmanned aircraft regulations (part 107)," Federal Aviation Administration, July 23, 2018.
 23. Mark A. Lemley and Eugene Volokh, "Law, virtual reality, and augmented reality," *University of Pennsylvania Law Review* 166, no. 5 (April 2018).
 24. NHTSA'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.
 25. IEEE Standards Association, "IEEE announces virtual reality (VR) and augmented reality (AR) standards projects in advance of participation at Augmented World Expo," May 9, 2017.
 26. ICANN, "What does ICANN do?," accessed December 4, 2018.
 27. William D. Eggers, Mike Turley, and Pankaj Kishnani, *The future of regulation*, Deloitte Insights, June 19, 2018.
 28. *Ibid.*
 29. *Ibid.*
 30. Charltons Quantum, "HKMA regulatory sandbox," accessed on December 4, 2018.
 31. According to recent research, the most common type of fear among consumers when facing new technology is the fear of technical complexity. For more, see Susan H. Higgins and William L. Shanklin, "Seeking mass market acceptance for high-technology consumer products," *Journal of Consumer Marketing* 9, no. 1 (December 1992): pp. 5–14.
-



Sam Chivers



Eva Vázquez



Yann Sadi



Marco Wagner



Pablo Caracol



Dongyun Lee



Anna Godeassi



J. F. Podevin



Mike Ellis



Neil Webb



Neil Webb



Traci Daberko



Traci Daberko



Kevin Weier



Mike Ellis



Alex Nabaum



Emily Moreano



Dan Page

THE END NOTE

{ What we said then }

"The rise of the CMO title came around the time that the Web rose to prominence and ushered in the digital era. In the digital era, there was a leap in customer-centricity. Marketing would never be the same ... Now companies must really, every day and hour, listen and respond to their customers."

In "From Mad Man to Superwoman: The inevitable rise of the chief marketing officer in the age of the empowered consumer," published July 1, 2012

{ What we think now }

“TODAY'S CMOS, EVEN more than in 2012, can use a wealth of data on preferences, habits, and activities to represent the customer. That data can make CMOs the expert on the customer; they can guide the rest of an organization on what to do with the customer. Much of a CMO's job is to make sure an organization is consistently delivering a stellar experience across all touch points with the customer, whether it's through customer service, online or in-store purchasing, or orchestrating an ecosystem of partners to reinforce an organization's brand and purpose to the customer. Quite often, this



JENNIFER VEENSTRA
Leader, Deloitte's Chief
Marketing Officer Program

means the CMO needs to get things done through influence rather than authority. They don't own all aspects of all customer touch points, but they can set the tone and the type of experience that they would like customers to have.

The good news, we've found, is that the rest of the C-suite typically has faith in their CMO to play a significant role in business strategy. CMOs should take that license to lead conversations around how an organization can outperform the competition in ways that customers care about the most. In this way, the CMO can have more opportunity than ever before to make an impact on the business. ● ”

Deloitte Review is printed by a company that has been a long-term leader in environmental responsibility.

The facility uses vegetable-based inks and alcohol-free chemistry in the pressroom. Computer-to-plate technology replaces film and photographic chemicals in prepress operations, with all metal plates collected and recycled.

The company was among the first printers in western Canada to recycle its water-miscible waste solvent, resulting in a reduced environmental impact. A chemical distiller allows the facility to distill, recycle, and reuse the chemicals from its presses, eliminating the need to send out hundreds of barrels of contaminated chemicals per year to be disposed of or recycled.

Its paper-baling equipment recycles up to 40 tons per month of trimmings, vastly reducing waste while capturing paper dust that affects air quality as well as product quality.

This issue of *Deloitte Review* is printed on Anthem Matte, resulting in these savings:*


Wood consumption:	Reduced by 9.9 tons
Net energy use:	Reduced by 27 million BTUs
Wastewater generation:	Reduced by 30,350 gallons
Solid waste production:	Reduced by 1,910 pounds
Greenhouse gases:	Reduced CO ₂ by 6,682 pounds

*Source: Environmental Paper Network, papercalculator.org.

Deloitte.

Insights

 Follow @DeloitteInsight #DeloitteReview

 www.linkedin.com/company/deloitte-insights



Download the Deloitte Insights app

Subscribe to receive email updates at www.deloitte.com/insights