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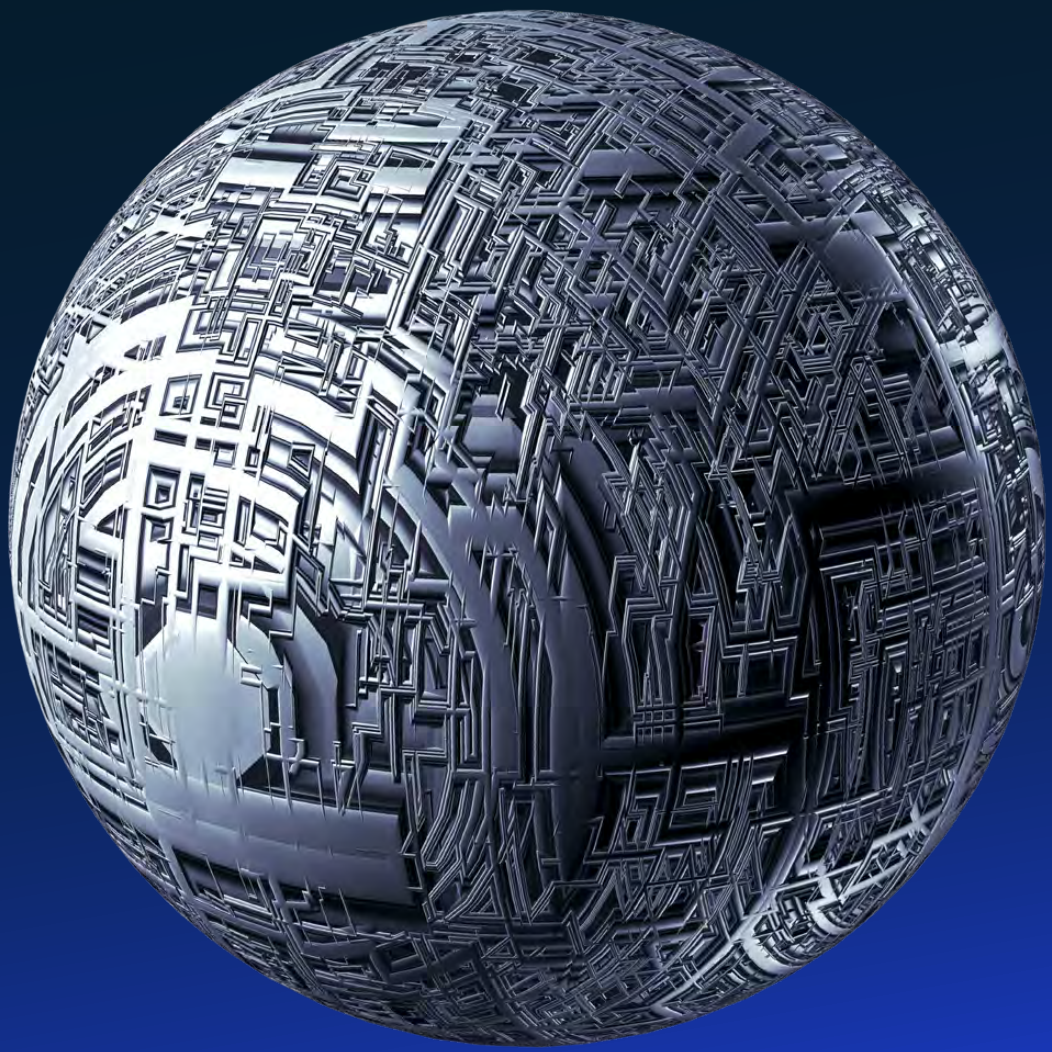
The Next Normal

The recovery will be digital

Digitizing at speed and scale



August 2020

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Introduction

Welcome to the “next normal”—the new reality emerging from the ongoing COVID-19 pandemic. How will life, public health, and business continue to change? We’ve chronicled our response in a wide-ranging series of publications—more than 500 articles and counting since the outbreak began.

This volume is the first of five edited collections produced to accompany our multimedia series, airing on CNBC, examining the forces and themes shaping the next normal.

This collection focuses on the vital role of digital in today’s businesses. Many organizations were already in the throes of digital transformations pre-pandemic, before COVID-19 accelerated the pace of business across the globe. Some sped up efforts already under way; others implemented digital capabilities for the first time—as a matter of survival.

In these pages, we have collected some of the best insights we published during these hectic months—on how top executives have led on digital initiatives, what specific companies across industries have done differently, and the special challenge of cybersecurity. We have also included content that has resonated particularly powerfully on McKinsey.com, plus a number of articles authored by Kate Smaje, global leader of McKinsey Digital and anchor of the digital segment of our multimedia series on CNBC. We hope you find these insights useful as you continue to navigate your way into the evolving next normal.

Over the next few months, look for additional collections to accompany this digital compendium and complement forthcoming segments on CNBC. Topics include organization, transformation, sustainability, and resilience. You can download this and other collections in this series as they become available at McKinsey.com/thenextnormal, where you will also find our entire collection of coronavirus-related insights.

Raju Narisetti
Publisher
McKinsey Global Publishing

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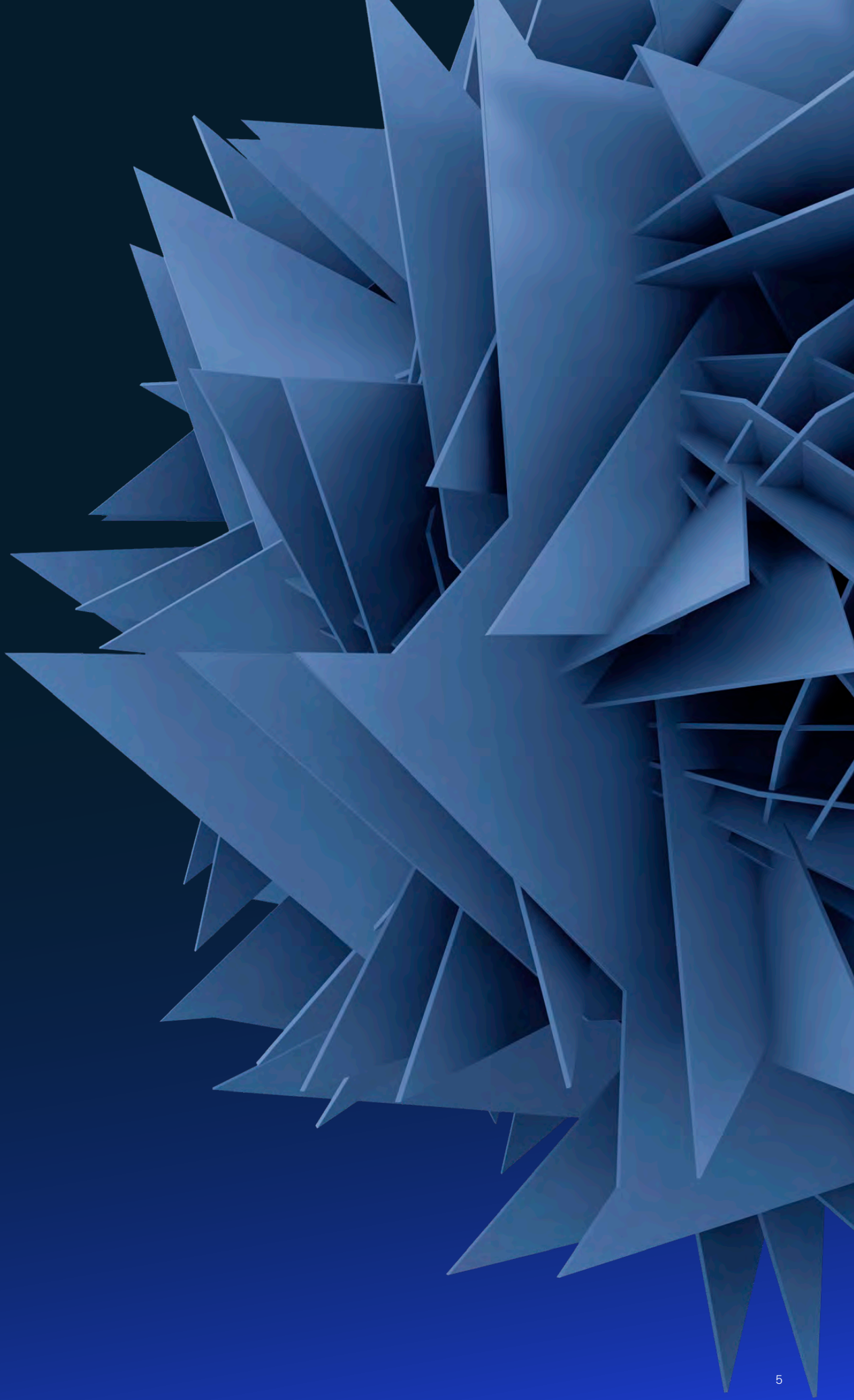

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Three actions CEOs can take to get value from cloud computing

Leaders need to accelerate their journey to the cloud in order to digitize quickly and effectively in the wake of COVID-19.

by Chhavi Arora, Tanguy Catlin, Will Forrest, James Kaplan, and Lars Vinter

If you are a CEO, you already know what the cloud can do for your business in a post-COVID-19 world. You've probably even told your organization to get you there already. So why is your move to the cloud[1] coming along so slowly, even though you may have been talking about it for years? It might be because you and your management team have yet to take a sufficiently active role, or provide the air cover your chief information officer (CIO) and chief technology officer (CTO) need.

CIOs and CTOs are on the front foot right now thanks to their crucial role during the COVID-19 pandemic. That makes this a good moment to further elevate top-team support for the cloud enablement needed to accelerate digital strategy, the digitization of the company, its channels of distribution, and its supply chains—all of which already needed to be moving more quickly than they were.

The CEO's role is crucial because no one else can broker across the multiple parties involved, which include the CIO, CTO, CFO, chief human-resources officer (CHRO), chief information security officer (CISO), and business-unit leads. As we explain in this article, the transition to cloud computing represents a *collective-action problem*—one that requires a coordinated effort across the team at the top of an organization. It's a matter of *orchestration*, in other words, and only CEOs can wield the baton.

To get to cloud more quickly, CEOs should ask their CIO and CTO what support they need to lead the organization on the journey. Chances are good that three interventions will emerge:

1. establishing a sustainable funding model to support the investments required to get business value from the cloud

2. developing a new business-technology operating model[2] that exploits cloud for speed, agility, and efficient scalability

3. putting in place the HR, compensation, and location policies required to attract and retain the specialized engineering talent required to operate in the cloud

Together, these interventions will help the executive team unite around a coherent point of view about the business-driven value that the cloud represents, how to capture that value, and how to evolve the company's operating model accordingly. Without this perspective, your company may continue to move too slowly toward cloud computing[3] for a post-COVID-19 "next normal"—creating the risk of disruption from nimbler attackers.

Invest for business value

During the past 20 years, IT organizations have adopted a range of innovations—for example, virtualization and Linux—that have made running business applications much cheaper and that have required only modest investments. Cloud adoption has a different economic profile. While exploiting cloud requires investment in building capabilities and migration applications, it's more efficient in the long term, sometimes markedly so for companies that have not fully optimized their technology environment.

The biggest benefits accrue to the business from faster time-to-market, simplified innovation, easier scalability, and reduced risk. Cloud platforms can help deploy new digital customer experiences in days rather than months and can support analytics that would be uneconomical or simply impossible with traditional technology platforms.

Unfortunately, technology-funding mechanisms can stymy cloud adoption—they prioritize features requested by the business now rather than critical infrastructure investments that will allow companies to add functionality more quickly and easily in the future. Each new bit of tactical business functionality built without best-practice cloud

[1] In this article, we use "cloud" to refer to the public cloud rather than companies' private clouds, in which they attempt to create highly automated and virtualized application-hosting environments on premises.
[2] An integrated operating model organizes technology teams around user-facing products and the underlying platforms that enable them. For more, see Ross Frazier, Naufal Khan, Gautam Lunawat, and Amit Rahul, "Products and platforms: Is your technology operating model ready?," February 2020, McKinsey.com.
[3] Nagendra Bommadevara, James Kaplan, and Irina Starikova, "Leaders and laggards in enterprise cloud infrastructure adoption," October 2016, McKinsey.com.

architectures adds to your technical debt[4]—and thus to the complexity of building and implementing anything in the future.

CEOs can help the senior team recognize that infrastructure investments in cloud platforms represent a source of competitive advantage rather than a cost to be managed. Once the top team gets that right, a lot else falls into place, including your technology-funding process, which begins shifting toward *products* or *platforms* rather than *projects*. Projects are one-time investments funded in a yearly boom-and-bust cycle. Products in general (and cloud platforms in particular) require more stable, ongoing funding and consistent "ownership" to optimize new functionality and mitigate technical debt.

The top-team conversation will benefit, too, from a prioritized, sometimes multiyear road map of domains in which the cloud will accelerate performance and digital transformation. This will help prioritize investments—and avoid defaulting to applications that are technically easiest to migrate. By asking which business domains (such as order capture, billing, or supply-chain optimization) would benefit most from the speed, innovation, and scalability that cloud platforms can provide, top teams can arrive at the highest-priority areas for movement to the cloud.

Inevitably, resource-allocation issues will arise. Growth businesses, for example, may be most likely to benefit from the cloud, but they are the least likely to have high margins or excess cash to pony up for a cloud investment. More mature business units may have higher margins, but where, exactly, should they get the money needed for the cloud—by spending less on tactical functionality this year and next, or by reducing marketing expenditure? Does a legacy business have the legs to support a long-lived cloud investment? Should the CEO transfer money from one business unit to another, or accept lower margins when a business invests in the cloud? Such questions are unlikely to be asked, much less answered, without serious engagement from the CEO and other members of the top team.

A big financial-information provider, for example, determined that moving applications in its customer-facing business domains to the public cloud could enable much faster and less expensive entry into promising markets. Hosting these applications in the cloud meant that technology operations in a new country could be set up in a couple of weeks at a negligible cost, versus a couple of million dollars of up-front investment for each country. A health-insurance carrier, meanwhile, examined its current project portfolio and found that it could speed up the capture of several billion dollars in additional revenue by adopting the cloud. Moving the systems that help the insurer interact with healthcare providers was especially attractive because of the opportunity to accelerate the onboarding of new providers.

Then, once the investment is made, it's up to the CEO to demand higher business performance in return for the cloud investment—no more deflecting blame for subpar outcomes to a subpar technology environment. If the strategic case for the cloud is real, it should translate into better performance. The CEO must demand that it does.

A new operating model

Once the funding model is straightened out, companies must ground the new partnership between IT and the businesses in an operating model that reflects and supports their growing investment in the cloud.

Here, it will help to think about an integrated system rather than a set of individual technologies. Doing so implies organizational change across all of IT, and many of the business units and functions as well. This operating model combines cloud-based digital technologies and agile operational capabilities in an integrated, well-sequenced approach that can rapidly accelerate digital strategy and transformation. The model helps to coordinate end-to-end operations across silos—supporting customer and employee journeys, for instance—while taking technology out of quarantine and making the most of it across all lines of business.

A cloud-ready business-technology operating model has many requirements. Here, we focus on the few that need intervention from the CEO.

If your company is to gain value from the cloud, your IT department must become more agile, if it isn't already.

Improving business interaction

Achieving the speed and agility that cloud platforms promise requires frequent interaction—for instance, to define and optimize customer journeys—between IT managers and their counterparts in the business units and functions, particularly those who own products and capability areas. CEOs need to encourage business leaders to appoint knowledgeable decision makers as product owners for each business capability.

Too often, business units appoint product owners who are too new or too junior, and who lack either the knowledge or the organizational throw-weight to make their decisions stick. Many of these product or capability owners are "process jockeys," whose expertise is coordinating stakeholders and tasks. Look instead for more senior folks capable of thinking broadly and strategically.

Going agile in IT

If your company is to gain value from the cloud, your IT department must become more agile, if it isn't already. That involves more than moving development teams to agile product models. Agile IT also means bringing agility to your IT infrastructure and operations by transforming infrastructure and security teams from reactive, "ticket driven" operations into proactive models in which scrum teams develop the application program interfaces (APIs) that service businesses and developers can consume.

Counterintuitively, you should avoid inserting translators between IT and the businesses. Instead, look to organizational groupings that unite business, technology, governance, process, and people management. These quickly moving *modular platforms* should be run by a platform owner who takes end-to-end responsibility for providing a solution and operating the platform as a service.

Accounting for the risks

Everything in enterprise technology implies risk. To mitigate security, resiliency, and compliance concerns relating to the adoption of the cloud, companies must be clear-eyed about these risks. Among other things, that means holding rigorous discussions about the best mechanisms for aligning the appetite for risk with decisions about the technology environment. Getting the organization to take the right tone on risk will require particular attention from the CEO. It's easy to let worries about security, resiliency, and compliance stop a cloud program in its tracks. Instead of letting risks derail progress, CEOs should insist on a pragmatic risk appetite that reflects the business strategy, while placing the risks of cloud computing in the context of the existing risks of on-premises computing and demanding options for mitigating risks in the cloud.

Companies that get the operating model right can see dramatic improvements. These include better target-state economics and lower transition costs. They will also see improved agility and ability to innovate. One natural-resource company implemented agile ways of working for business-application development, infrastructure, and security. In particular, it invested in creating automated, API-based services that developers could use to provision workloads on cloud platforms securely and resiliently. As a result, the company started releasing new capabilities in days rather than months, while limiting risk and technical debt.

Revisit talent

As your cloud investment picks up speed, supported by a new, cloud-ready operating model, your CIO will no doubt be asking for the talent needed for cloud. Although cloud computing can dramatically boost the productivity of technology, it requires specialized and sometimes hard-to-find technical talent—full-stack developers, data engineers, cloud-security engineers, identity- and access-management specialists, and cloud engineers. Such talent can be hired externally or upskilled from within. Just make sure current HR policies and approaches don't hobble your approach. The basis of performance management and promotion, for example, should be expertise rather than the number of direct reports someone oversees.

If your HR policies are not up to speed, you may need to provide some air cover for your CIO with the CHRO. Some policies, put in place a decade ago to contain IT costs, can get in the way of onboarding cloud talent. Over the years, companies have adopted policies that limit costs per head and the number of senior hires, for example, and that require the use of outsourced resources in low-cost locations. Collectively, these policies produce the reverse of what the cloud requires, which are relatively small numbers of highly talented and expensive people who may not want to live in traditional low-cost IT locations. The location issue is why CEOs who are serious about the cloud have suggested that their CHROs reverse policies encouraging the use of low-cost, commoditized tech talent. In some cases, this new direction takes the form of newly established tech centers, in places such as the US West Coast, which are specifically designed to attract cloud talent.

CEOs must also make sure their technology leaders get sufficient voice in senior forums and management process given the increasingly fast integration of digital and business strategy. At many companies, CIOs and CTOs have been among the heroes of the COVID-19 response by pivoting their organizations to enable pervasive remote working, often in a matter of days. The cloud allows CIOs and CTOs to play an even more critical role in making business strategies successful.

Compared with traditional IT managers, successful CIOs and CTOs in this environment will be both more plugged into a company's digital transformation and more technologically savvy. In a post-COVID-19 next normal, these executives cannot rely on vendors to figure everything out for them. They must be open to new ideas and willing to learn, to take risks, and to fail fast and then quickly correct course when necessary. It helps if they're compelling communicators who can inspire both business partners and their own teams to undertake dramatic change.

The COVID-19 pandemic has heightened the need for companies to adopt digital business models—and only cloud platforms can provide the agility, scalability, and innovation required for this transition. Although there have been frustrations and false starts in the enterprise journey to the cloud, companies can dramatically accelerate their progress by focusing investments in it where they will provide the most business value and by building cloud-ready operating models.

But they have to get there first. And that's where CEOs have an important role to play—first by becoming more technologically savvy than they have been in the past and next by addressing the collective-action problem that often prevents companies from embracing new strategic roles for IT. If companies are to be successful in a digital next normal, their CEOs must ensure that their management teams understand the specific ways that cloud computing can raise revenue growth and margins and how, in close alignment, those teams will rally to capture value.

This article was a collaborative effort between **Chhavi Arora** (associate partner in McKinsey's Seattle office), **Tanguy Catlin** (senior partner in the Boston office and leader of McKinsey Digital in the Northeast), **Will Forrest** (senior partner in the Chicago office and, as the CTO for McKinsey Technology, leader of McKinsey's CloudNow initiative), **James Kaplan** (partner in the New York office and chair of the McKinsey Technology Knowledge Committee), and **Lars Vinter** (partner in the Copenhagen office).

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Digital strategy in a time of crisis

Now is the time for bold learning at scale.

by Simon Blackburn, Laura LaBerge, Clayton O'Toole, and Jeremy Schneider

If the pace of the pre-coronavirus world was already fast, the luxury of time now seems to have disappeared completely. Businesses that once mapped digital strategy in one- to three-year phases must now scale their initiatives in a matter of days or weeks.

In one European survey, about 70 percent of executives from Austria, Germany, and Switzerland said the pandemic is likely to accelerate the pace of their digital transformation. The quickening is evident already across sectors and geographies. Consider how Asian banks have swiftly migrated physical channels online. How healthcare providers have moved rapidly into telehealth, insurers into self-service claims assessment, and retailers into contactless shopping and delivery.

The COVID-19 crisis seemingly provides a sudden glimpse into a future world, one in which digital has become central to every interaction, forcing both organizations and individuals further up the adoption curve almost overnight. A world in which digital channels become the primary (and, in some cases, sole) customer-engagement model, and automated processes become a primary driver of productivity—and the basis of flexible, transparent, and stable supply chains. A world in which agile ways of working are a prerequisite to meeting seemingly daily changes to customer behavior.

If a silver lining can be found, it might be in the falling barriers to improvisation and experimentation that have emerged among customers, markets, regulators, and organizations. In this unique moment, companies can learn and progress more quickly than ever before. The ways they learn from and adjust to today's crisis will deeply influence their performance in tomorrow's changed world, providing the opportunity to retain greater agility as well as closer ties with customers, employees, and suppliers. Those that are successfully able to make gains "stick" will likely be more successful during recovery and beyond.

Now is the time to reassess digital initiatives—those that provide near-term help to employees, customers, and the broad set of stakeholders to which businesses are increasingly responsible and those that position you for a postcrisis world. In this world, some things will snap back to previous form, while others will be forever changed. Playing it safe now, understandable as it might feel to do so, is often the worst option.

A crisis demands boldness and learning

Every company knows how to pilot new digital initiatives in "normal" times, but very few do so at the scale and speed suddenly required by the COVID-19 crisis. That's because in normal times, the customer and market penalties for widespread "test and learn" can seem too high, and the organizational obstacles too steep. Shareholders of public companies demand immediate returns. Finance departments keep tight hold of the funds needed to move new initiatives forward quickly. Customers are often slow to adjust to new ways of doing things, with traditional adoption curves reflecting this inherent inertia. And organizational culture, with its deeply grooved silos, hinders agility and collaboration. As a result, companies often experiment at a pace that fails to match the rate of change around them, slowing their ability to learn fast enough to keep up. Additionally, they rarely embrace the bold action needed to move quickly from piloting initiatives to scaling the successful ones, even though McKinsey research shows bold moves to adopt digital technologies early and at scale, combined with a heavy allocation of resources against digital initiatives and M&A, correlate highly with value creation (Exhibit 1).

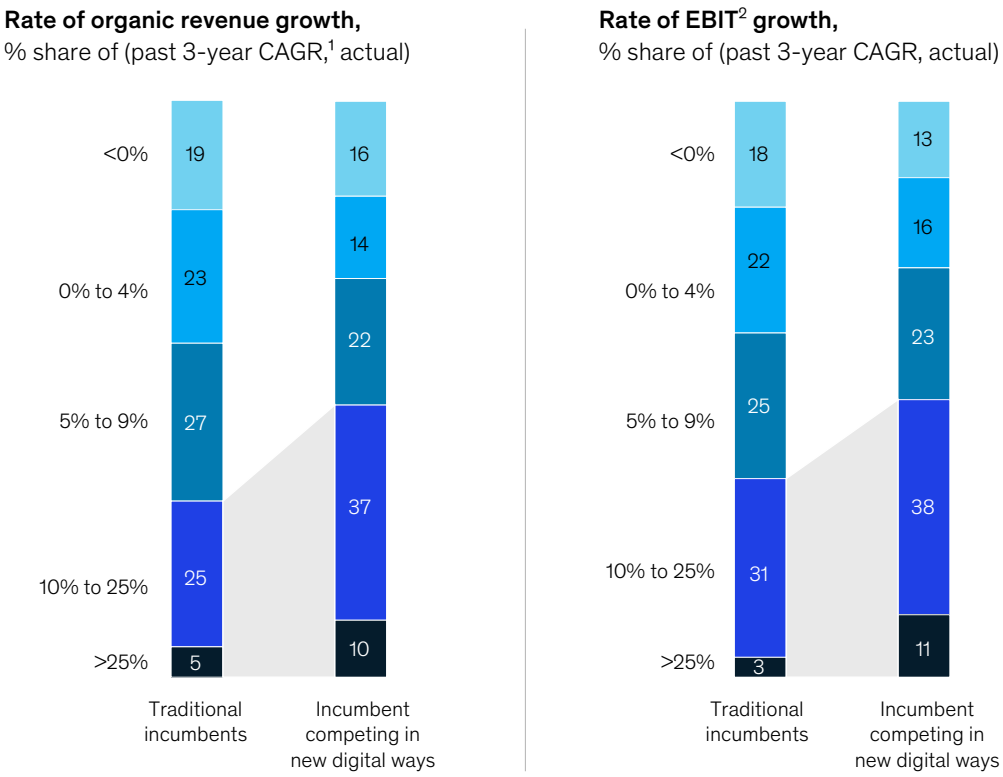
As the COVID-19 crisis forces your customers, employees, and supply chains into digital channels and new ways of working, now is the time to ask yourself: What are the bold digital actions we've hesitated to pursue in the past, even as we've known they would eventually be required? Strange as it may seem, right now, in a moment of crisis, is precisely the time to boldly advance your digital agenda.

A mandate to be bold

What does it mean to act boldly? We suggest four areas of focus, each of which goes beyond applying "digital lipstick" and toward innovating entirely new digital offerings, deploying design thinking and

Exhibit 1

Bold, tightly integrated digital strategies are the most effective approach to digital transformations.



Note: Numbers may not sum to 100, because of rounding.
[1] Compund annual growth rate.
[2] Earnings before interest and taxes.

Source: 2017 Digital Strategy Survey

technologies like artificial intelligence (AI) at scale across your business, and doing all of this "at pace" through acquisitions (Exhibit 2).

New offerings

By now you've likely built the minimally viable nerve center you need to coordinate your crisis response. This nerve center provides a natural gathering point for crucial strategic information, helping you stay close to the quickly evolving needs of core customer segments, and the ways in which competitors and markets are moving to meet them. Mapping these changes helps address immediate risks, to be sure, but it also affords looking forward in time at bigger issues and opportunities—those that could drive significant disruption as the crisis continues. Just as digital platforms have disrupted value pools and value chains in the past, the COVID-19 crisis will set similar "ecosystem"-level changes in motion, not just changes in economics but new ways of serving customers and working with suppliers across traditional industry boundaries.

In the immediate term, for example, most organizations are looking for virtual replacements for their previously physical offerings, or at least new ways of making them accessible with minimal physical contact. The new offerings that result can often involve new partnerships or the need to access new platforms and digital marketplaces in which your company has yet to participate. As you engage with new partners and platforms, look for

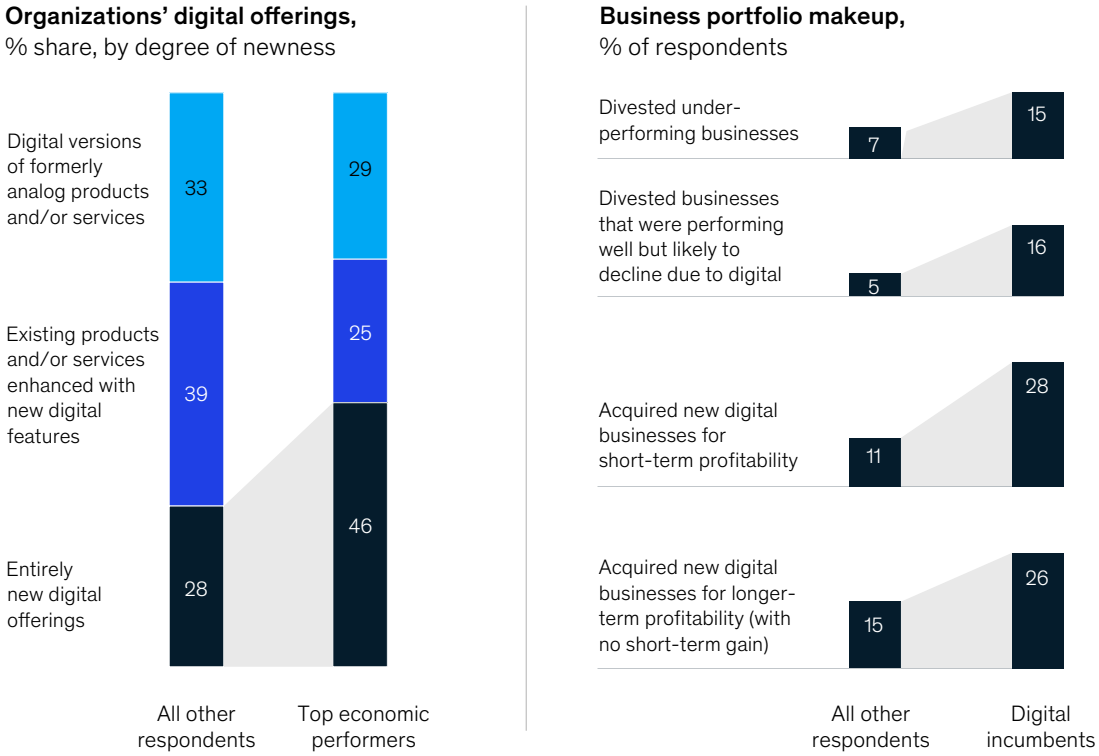
opportunities to move beyond your organization's comfort zones, while getting visibility into the places you can confidently invest valuable time, people, and funds to their best effect. Design thinking, which involves using systemic reasoning and intuition to address complex problems and explore ideal future states, will be crucial. A design-centric approach focuses first and foremost on end users or customers. But it also helps make real-time sense of how suppliers, channel partners, and competitors are responding to the crisis, and how the ecosystem that includes them all is evolving for the next normal emerging after the immediate crisis fades.

Reinvent your business model at its core

Going beyond comfort zones requires taking an end-to-end view of your business and operating models. Even though your resources are necessarily limited, the experience of leading companies suggests that focusing on areas that touch more of the core of your business will give you the best chance of success, in both the near and the longer

Exhibit 2

Organizations that are able to leverage things like design thinking into their new offerings during the crisis will see significant first-mover advantage.



Technology adoption being used at scale,[1] by business type, % of respondents

[1] For example virtual assistants, computer vision, voice recognition.
[2] At scale in 1 business unit or function, or organization-wide.

Source: 2017 Digital Strategy Survey

Organizations that make minor changes to the edges of their business model nearly always fall short of their goals. Tinkering leads to returns on investment below the cost of capital.

term, than will making minor improvements to noncore areas. Organizations that make minor changes to the edges of their business model nearly always fall short of their goals. Tinkering leads to returns on investment below the cost of capital and to changes (and learning) that are too small to match the external pace of disruption. In particular, organizations rapidly adopting AI tools and algorithms, as well as design thinking, and using those to redefine their business at scale have been outperforming their peers. This will be increasingly true as companies deal with large amounts of data in a rapidly evolving landscape and look to make rapid, accurate course corrections compared with their peers.

While the outcomes will vary significantly by industry, a few common themes are emerging across sectors that suggest "next normal" changes to cost structures and operating models going forward.

— *Supply-chain transparency and flexibility.* Near-daily news stories relate how retailers around the globe are experiencing stock-outs during the crisis, such as toilet-paper shortages in the United States. It's also clear that retailers with full supply-chain transparency prior to the crisis—as well as algorithms to detect purchase-pattern changes—have done a better job navigating during the crisis. Other sectors, many of which are experiencing their own supply-chain difficulties during the crisis, can learn from their retail counterparts to build the transparency and flexibility needed to avoid (or at least mitigate) supply-chain disruption in the future.

— *Data security.* Security has also been in the news, whether it's the security of people themselves or that of goods and data. Zoom managed to successfully navigate the rapid scaling of its usage volume, but it also ran into security gaps that needed immediate address. Many organizations are experiencing similar, painful lessons during this time of crisis.

— *Remote workforces and automation.* Another common theme emerging is the widely held desire to build on the flexibility and diversity brought through remote working. Learning how to maintain productivity—even as we return to office buildings after the lockdown ends, and even as companies continue to automate activities—will be critical to capturing the most value from this real-world experiment that is occurring. In retail, for example, there has been widespread use of in-store robots to take over more transactional tasks like checking inventory in store aisles and remote order fulfillment. These investments won't be undone postcrisis, and those that have done so will find themselves in advantaged cost structure during the recovery.

Boldly evolve your business portfolio

No company can accelerate the delivery of all its strategic imperatives without looking to mergers and acquisitions (M&A) to speed them along. This is particularly true with digital strategy, where

M&A can help companies gain talent and build capabilities, even as it offers access to new products, services, and solutions, and to new market and customer segments.

More broadly, we know from research into economic downturns that companies that invest when valuations are low outperform those that do not. These companies divested underperforming businesses 10 percent faster than their peers early on in a crisis (or sometimes in anticipation of a crisis) and then shifted gears into M&A at the first sign of recovery.

In more normal times, one of the main challenges companies face in their digital transformations is the need to acquire digital talent and capabilities through acquisitions of tech companies that are typically valued at multiples that capital markets might view as dilutive to the acquirer. The current downturn could remove this critical roadblock, especially with companies temporarily free from the tyranny of quarterly earnings expectations. Because valuations are down, the crisis and its immediate aftermath may prove an opportune time to pick up assets that were previously out of reach. We are already seeing many private-equity firms actively looking to deploy large swaths of capital.

Learning at the pace of crisis

Moving boldly doesn't mean moving thoughtlessly, however. Bold action and the ability to learn are highly interrelated. The real-time ability to learn during a crisis is in fact the one ingredient that can turbocharge your ability to scale quickly.

Find a new cadence

In situations of extreme uncertainty, leadership teams need to learn quickly what is and is not working and why. This requires identifying and learning about unknown elements as quickly as they appear. Prior to the crisis, leading companies had already been increasing the cadence of their learning as part of a quickened organizational metabolism (Exhibit 3). Companies can look to their example as they work to adapt to change more rapidly during crisis times—and beyond.

Four areas of intervention can help companies learn more quickly during the crisis and the next normal that follows.

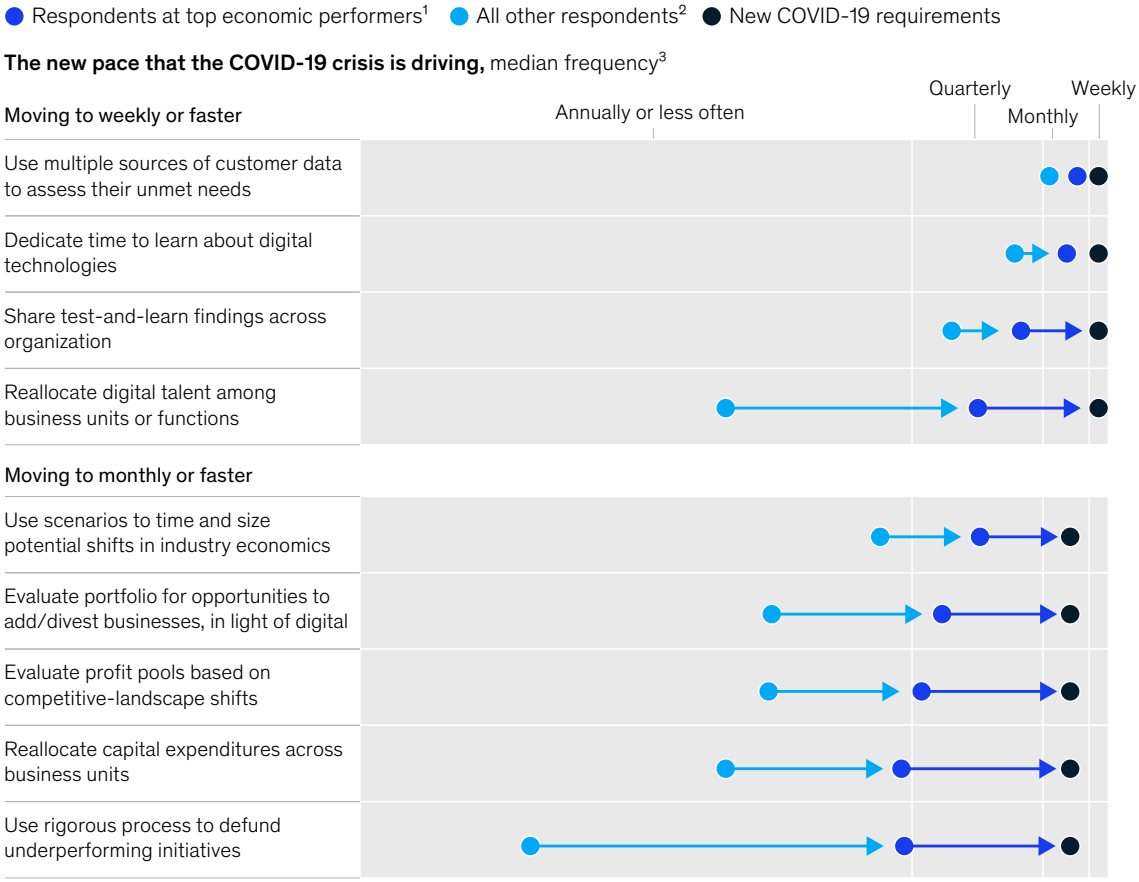
Quicken your data reviews

Start by evaluating the frequency with which you review the available data. You should be reviewing multiple sources of data on a weekly (or more frequent) basis to evaluate the shifting needs of your customers and business partners—as well as your own performance. Look to your crisis nerve center as a single source of truth for newly emerging data about your employees, your customers, your channel partners, your supply chains, and the ecosystems in which your company participates. Then turn to secure file-sharing technologies to remotely share and discuss insights from this faster pace of data review.

Because valuations are down, the crisis and its immediate aftermath may prove an opportune time to pick up assets that were previously out of reach.

Exhibit 3

The COVID-19 crisis is causing a need for acceleration beyond what we had seen before, going from three tiers of speed down to two.



[1]Respondents who say their organizations have a top-decile rate of organic revenue growth (ie, of 25% or more in past 3 years), relative to other respondents; n = 138.
[2]n = 1,304.
[3]Frequencies shown are the median values from a histogram, which was constructed by assigning "weekly" responses a value of 1, "monthly" responses 2, "quarterly" responses 3, "annually" responses 4, "every few years" 5, and "never" 6. The question also asked about the frequency of evaluating M&A opportunities as part of strategy-setting discussions. These responses are not shown, because M&A typically requires a longer time frame than the other 10 operational practices tested, often due to regulatory reasons.

Focus on technology

The abrupt shift to virtual operations and interactions, both inside and outside your organization, also provides an opportunity to accelerate your pace of learning about, and adoption of, technologies with which your organization might have only begun to experiment. As experimentation scales, so does learning. The rapid shift to digital can also reveal potential trouble spots with your organization's current technology stack, giving you a sneak preview of how well your technology "endowment" is likely to perform going forward. Here are some factors to keep an eye on as you more quickly learn about and adopt new technologies:

— *Data security.* Are you experiencing breaches as you move to remote working and data sharing?

— *Scalability.* Where are the breaks and crashes happening as 100 percent of your interactions

with customers, employees, and business partners go virtual?

— *Usability.* Right now customers and business partners often have little choice but to access your products or services through your new digital offerings. Their options will expand as we move beyond the crisis. How well will your new offerings stand up? If your current usability is low, experiment to improve it now, while you still have a captive audience to partner with and learn from.

Test and learn

In normal times, experimentation might sometimes seem a risky game. Changing the working models to which employees, customers, or business partners are accustomed can seem to risk pushing them away, even when those experiments take aim at longer-term gains for all concerned. The COVID-19 crisis, however, has made experimentation both a necessity and an expectation.

Start with the customer-facing initiatives that, while more complex, offer a larger upside. Use automation and predictive analytics to quickly and effectively isolate difficulties. Look for opportunities to standardize what you're learning to support scaling digital solutions across core business processes. Standardization can help accelerate projects by reducing confusion and creating common tools that broad groups of people can use.

Learning while scaling

As companies increase their rate of metabolic learning, they need to quickly translate what they're learning into at-scale responses. Scaling what you learn is always an obstacle in a digital transformation. We've had plenty to say regarding scaling up analytics, scaling up quality, or innovating at speed and scale. Here we'll simply highlight the role learning plays in your ability to scale your digital initiatives.

While companies frequently pilot new digital initiatives with the intention of learning from them before they roll out broadly, these experiments and pilots, in normal times, only test one dimension at a time, like the conversion/engagement/satisfaction rates of individual customers, the unit economics of a single transaction, or the user experience of a given digital solution. Whether they want to or not, companies in crisis mode find themselves in a different type of pilot: one of digital programs at massive scale. The rapid transition to full scale in many types of digital operations and interfaces has brought with it many challenges (for example, building and delivering laptops in under two weeks to all employees to enable 100 percent of them for remote working versus the 10 percent that were previously remote). But it also brings opportunities. At the broadest level, these include the prospect for real-time learning about where value is going in your markets and industry, the chance to learn and feed back quickly what's working in your operations and your agile organizational approach, and the opportunity to learn where it is you're more or less able to move quickly—which can help inform where you might need to buy a business rather than build one.

Observing interaction effects

Since scaling quickly requires changing multiple parts of a business model or customer journey simultaneously, now is a valuable time to observe the interaction effects among multiple variables.[1] For example, healthcare providers are facing an increased demand for services (including mental health and other non-COVID-19 presentations) at the same time that their traditional channels are restricted, all in the context of strict privacy laws. This has caused many providers to rapidly test and adopt telehealth protocols that were often nonexistent in many medical offices before, and to navigate privacy compliance as well as patient receptivity to engaging in these new channels. Providers are learning which types of conditions and patient segments they can treat remotely, at the same time that they're widely deploying new apps (such as Yale Medicine's MyChart) to accelerate the digital medical treatment of their patients.

Similarly, when a retailer rolls out, within a week, a new app for country-wide, same-day

[1] Interaction effects occur when two or more independent variables interact with at least one dependent variable. The effect of all the interactions together is often either substantially greater (or lesser) than the sum of the parts.

delivery, it's testing far more than one variability at a time, such as the customer take-up of that new channel. Because of the scale, it can learn about differences in adoption and profitability by region and store format. It can test whether its technology partners can scale across 1,000 stores. It can test whether its supplier base can adapt distribution to handle the new model. Shifting multiple variables simultaneously, however, also increases the degree of difficulty when it comes to interpreting the results—because you're no longer isolating one variable at a time. Companies who have already invested in AI capabilities will find themselves significantly advantaged. Making further investments now—even if you've yet to get going—with continue to pay out postcrisis as well.

Simplify and focus

Given the degree of complexity created by scaled experimentation, organizations need to find ways to simplify and focus to avoid being overwhelmed. Some of that is done for them as the crisis closes many physical channels of distribution and makes others impossible to access. But further streamlining is required along the lines of what is working, what isn't, and why. This is perhaps the first global crisis in which companies are in the position to collect and evaluate real-time data about their customers and what they are doing (or trying to do) during this time of forced virtualization. Pruning activities and offerings that are no longer viable while aggressively fixing issues that arise with your offerings will help increase the chance of keeping a higher share of customers in your lower-cost, digital channels once the crisis passes

Don't go it alone

Research indicates that people and organizations learn more quickly as a result of network effects. The more people or organizations that you add to a common solution space, in other words, the more quickly learning occurs—and the faster performance improves. Some argue that these network effects occur in a so-called collaboration curve.

At a time of crisis, changing needs drive rapid shifts in employee mindsets and behaviors that play out as a greater willingness to try new things. Consider how you can best support the ways your talented employees learn. One option is to build or tap into platform-based talent markets that help organizations reallocate their labor resources quickly when priorities and directions shift—and help talented employees increase their rate of learning. Be sure to look not just within the boundaries of your own company but across enterprises to include your channel partners, your vendors, and your suppliers. Chances are they will be more willing than ever to collaborate and share data and learnings to better ensure everyone's collective survival.

It's often the case in human affairs that the greatest lessons emerge from the most devastating times of crises. We believe that companies that can simultaneously attend to and rise above the critical and day-to-day demands of their crisis response can gain unique insights to both inform their response and help ensure that their digital future is more robust coming out of COVID-19 than it was coming in.

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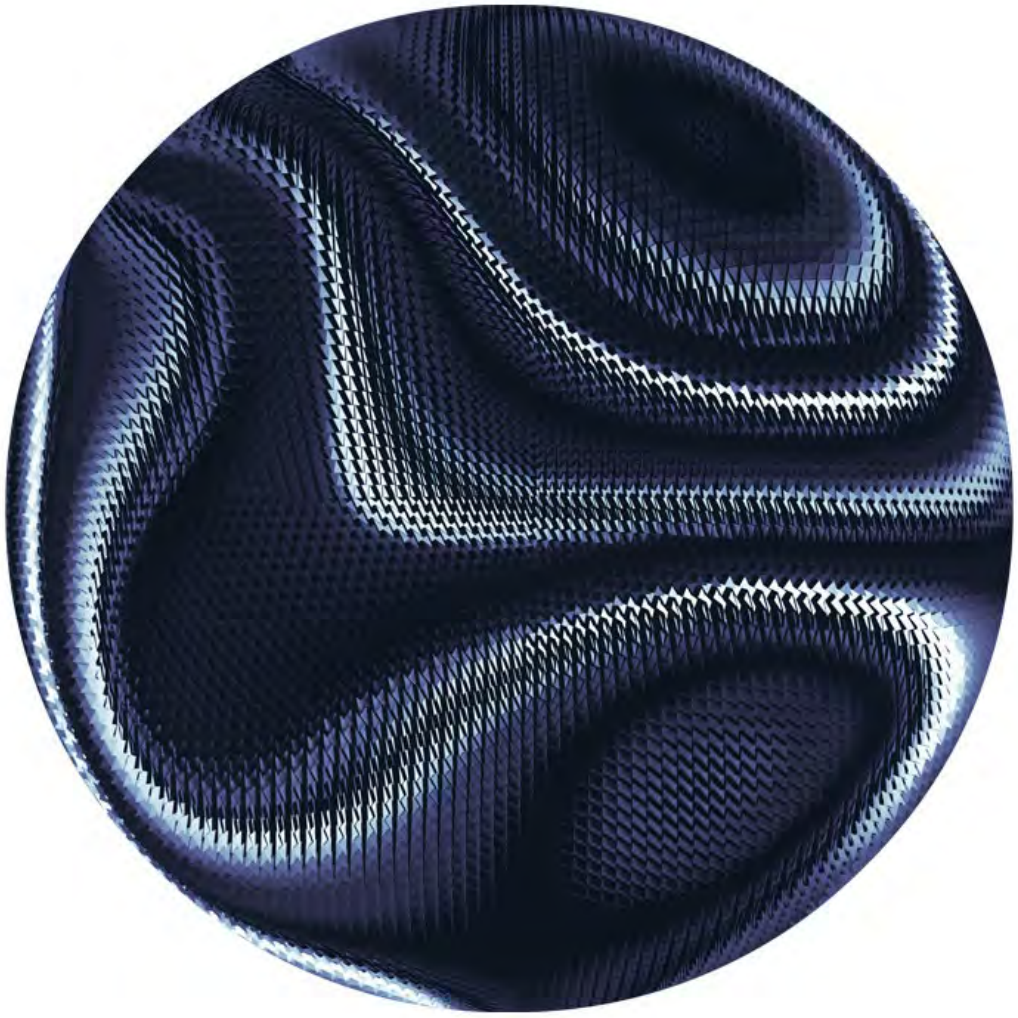

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The COVID-19 recovery will be digital: A plan for the first 90 days

The rapid migration to digital technologies driven by the pandemic will continue into the recovery. Here's how to accelerate your organization's digital capabilities to keep pace.

by Aamer Baig, Bryce Hall, Paul Jenkins, Eric Lamarre, and Brian McCarthy

By now, most C-suite executives have led their companies to digitize at least some part of their business to protect employees and serve customers facing mobility restrictions as a result of the COVID-19 crisis. As one CEO of a large tech company recently stated, "We are witnessing what will surely be remembered as a historic deployment of remote work and digital access to services across every domain."

Indeed, recent data show that we have vaulted five years forward in consumer and business digital adoption in a matter of around eight weeks. Banks have transitioned to remote sales and service teams and launched digital outreach to customers to make flexible payment arrangements for loans and mortgages. Grocery stores have shifted to online ordering and delivery as their primary business. Schools in many locales have pivoted to 100 percent online learning and digital classrooms. Doctors have begun delivering telemedicine, aided by more flexible regulation. Manufacturers are actively developing plans for "lights out" factories and supply chains. The list goes on.

As some regions begin reopening, businesses are considering how to return to some semblance of full speed in an unstable environment in which lockdowns will ease (and potentially be reinstated) in waves. In doing so, they will need to confront three structural changes that are playing out.

First, customer behaviors and preferred interactions have changed significantly, and while they will continue to shift, the uptick in the use of digital services is here to stay, at least to some degree (Exhibit 1). Fully 75 percent of people using digital channels for the first time indicate that they will continue to use them when things return to "normal."[1] Companies will need to ensure that their digital channels are on par with or better than those of their competition to succeed in this new environment. If China offers us any lessons, digital laggards will be substantially disadvantaged during the recovery.

Second, as the economy lurches back, demand recovery will be unpredictable; uneven across geographies, sectors, product categories, and customer segments; and often slow to return to precrisis levels. While a few sectors will face unusually strong demand, leaders in many industries must deal with periods of structural overcapacity. Those companies face the painful need to rightsize the cost base and capital of their operations, supply chains, and organizations overall and to transition their fixed costs to variable costs aggressively wherever possible. Complicating matters for leaders as they grapple with ways to deal with an uneven recovery is that historical data and forecasting models will be of little use to predict where pockets of demand will emerge and where supply will be necessary. New data and completely rebuilt analytical models will be essential to steer operational decisions.

Finally, many organizations have shifted to remote-working models almost overnight. A remote-first setup allows companies to mobilize global expertise instantly, organize a project review with 20—or 200—people immediately, and respond to customer inquiries more rapidly by providing everything from product information to sales and after-sales support digitally. In effect, remote ways of working have, at least in part, driven the faster execution drumbeat that we're all experiencing in our organizations. And this step change in remote adoption is now arguably substantial enough to reconsider current business models.

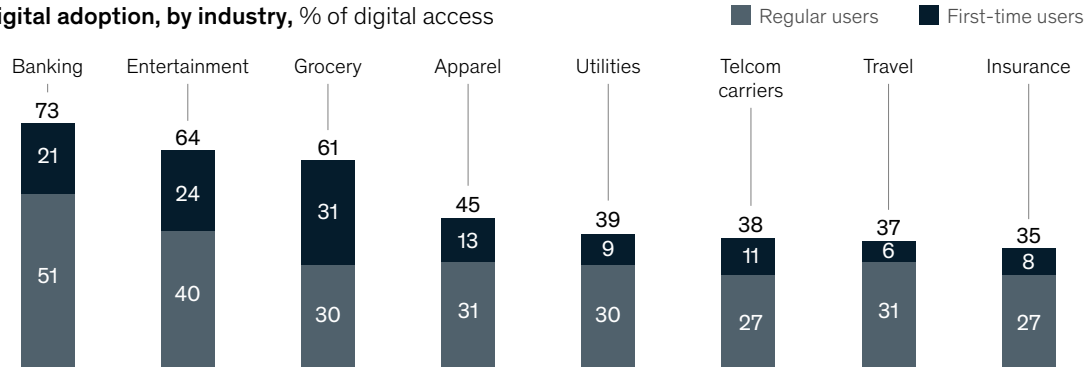
Quickly pivoting the business agenda to address these changes will be critical for a successful recovery. Digital will undoubtably play a center-stage role. We offer suggestions for a 90-day plan to realign the digital agenda and implement the enablers for acceleration during the recovery and beyond.

[1] McKinsey COVID-19 US Digital Sentiment Survey, April 2020.

Exhibit 1

US consumers are accelerating adoption of digital channels, a trend seen across global regions.

Digital adoption, by industry, % of digital access

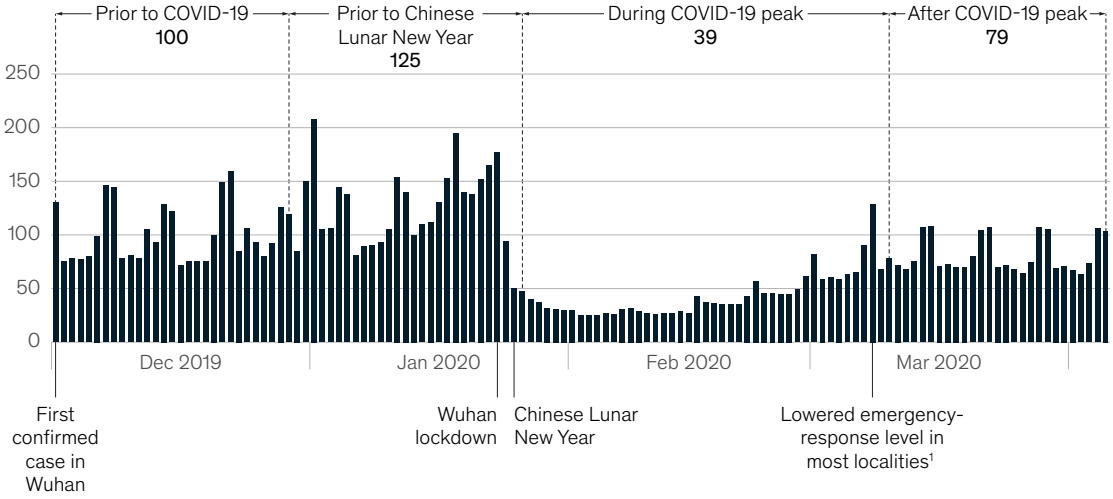


Note: Figures may not sum to listed totals, because of rounding.

Source: McKinsey COVID-19 US Digital Sentiment Survey, Apr 25–28, 2020

Based on data from countries already in the recovery phase, consumption patterns will be uneven and unlikely to return to pre-COVID-19 levels quickly.

Average daily China offline consumption, % (100% = daily average consumption in Dec 2019)

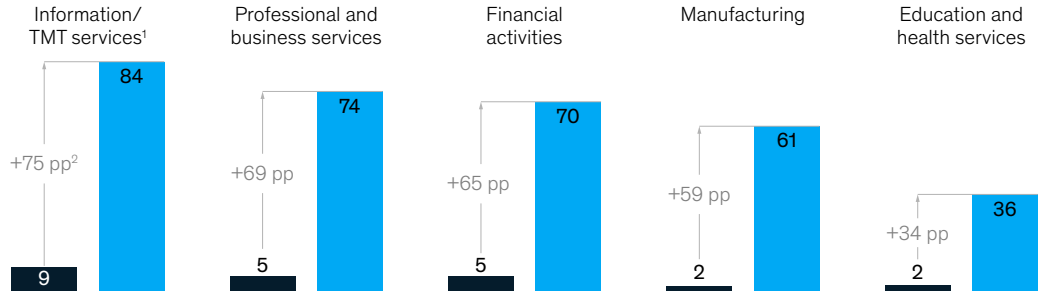


[1] On Mar 8, 2020, 21 Chinese provinces (involving >70% of country's population) announced lowering of epidemic-response level.

Source: MIYA; McKinsey analysis

The levels of remote working have skyrocketed during lockdowns and are likely to remain higher than precrisis levels for some time.

Share of employees working remotely full time, %



[1] TMT = technology, media, and telecom. Pre-COVID-19 figures for remote-work frequency in sector sourced from internal survey (unavailable in American Time Use Survey).
[2] Percentage points.

Source: American Time Use Survey, US Bureau of Labor Statistics, n =134; expert interviews; press search; McKinsey analysis

The digital agenda for recovery

For many companies, customers have already migrated to digital. Employees are already working fully remotely and are agile to some degree. Companies have already launched analytics and artificial-intelligence (AI) initiatives in their operations. IT teams have already delivered at a pace they never have before. But for most companies, the changes to date represent only the first phase of the changes that will be necessary.

We have laid out an agenda that focuses on four efforts: refocusing and accelerating digital investments in response to evolving customer needs, using new data and AI to improve business operations, selectively modernizing technology capabilities to boost development velocity, and increasing organizational agility to deliver more quickly. For each one, we outline a practical 90-day plan to make it happen (Exhibit 2).

Refocus digital efforts toward changing customer expectations

Many companies are accelerating their shifts toward digital-first models—at warp speed. One European variety-store chain, for example, established a fully functioning e-commerce business in just three months. The online business was interconnected across all functions (warehousing, merchandising, marketing, customer support, et cetera) and improved basket size over physical stores by three times as well as delivering nearly 3 percent like-for-like revenue growth in its main market.

But it's not just about digitizing. Companies must also reimagine customer journeys to reduce friction, accelerate the shift to digital channels, and provide for new safety requirements. For example, an automobile manufacturer now handles functions traditionally performed by dealers, such as trade-ins, financing, servicing, and home delivery of cars. Airlines are rapidly reinventing the passenger experience with contactless journeys focused on traveler health and safety to make customers feel comfortable flying again (Exhibit 3).

In the next 90 days. CEOs should ask their business leaders to assess how the needs and behaviors of their most important customers have changed and benchmark their digital channels against those of their competition. This information should form the

Exhibit 2

A plan for the first 90 days has four efforts to launch immediately.

	Refocus digital efforts toward changing customer expectations	Use new data and AI[1] to improve business operations	Selectively modernize technology capabilities	Increase organizational drumbeat
Sprint 1: days 1–29	Align organization to new digital priorities	Assess performance of critical decision-support models	Create rightsizing plan for shifting to variable cost structure and begin assessing cyberrisks	Assess where organizational velocity is needed and where remote-work models could drive productivity
Sprint 2: days 30–59	Bring digital channels to parity or better vs competition	Recalibrate and/or rebuild models	Set up cloud-based data platform and automate software-delivery pipeline	Deploy new models leveraging agile and remote
Sprint 3: days 60–90	Launch new digital offerings or channels	Develop next-generation data sets and models for optimal performance	Begin strengthening technology talent bench	Upskill organization for accelerated digital world

[1] Artificial intelligence.

basis of a renewed digital agenda that should take no longer than 30 days to establish.

Chief digital officers and chief information officers (CIOs) can then quickly stand up (or refocus) agile teams to execute the most urgent priorities. A consumer-electronics company, for example, recently launched an agile war room to improve conversion rates on its website traffic. That type of project can deliver meaningful results in weeks. Changes that require more fundamental work, like setting up a new e-commerce channel, will typically take longer. Continually measuring digital-channel performance during the 90 days will be critical so that companies can quickly adapt as they learn more. Consider setting up a weekly forum for senior business and technology leaders to process the learnings coming in and drive the full agenda at pace and in a coordinated fashion.

Use new data and artificial intelligence to improve business operations

Hundreds of operational decisions get made on daily, weekly, and monthly bases. Take an airline, for example, that must make many decisions: Which routes should we operate? What crew size is optimal for each flight? How many meals should we order? What staffing level is necessary in the contact center?

Modern businesses have several forecasting and planning models to guide such operational decisions. Organizations will need to validate these models. In the same way that many companies had to rebuild risk and financial models that failed during the 2008 financial collapse, models will similarly need to be replaced because of the massive economic and structural shifts caused by the pandemic. For example, models that use time-series, oil-price, or unemployment data will need to be rebuilt entirely. The data must be reevaluated as well.

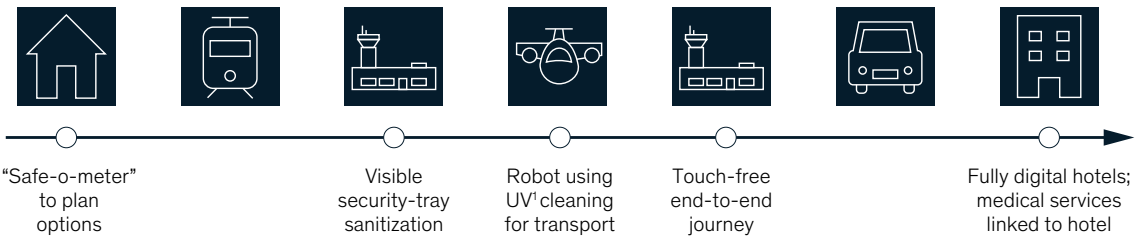
As companies construct these models, analytics teams will likely need to bring together new data sets and use enhanced modeling techniques to forecast demand and manage assets successfully. One automotive-parts supplier, for example, developed a forecasting model that incorporated previously unused third-party data. The model will help the supplier spot potential issues with its own suppliers' ability to deliver needed items, offering a chance to reach out to its suppliers to work out logistics or find another source.

Other business areas can benefit from more sophisticated modeling as well. A leading financial-services provider, for example, stood up an AI-powered solution to generate leads for its

Exhibit 3

The travel industry is mapping out the customer journey to identify points of health risk and design a contactless experience.

Illustrative customer journey with ideas for mitigating risks



[1] Ultraviolet.

sales agents, with models calibrated to handle the current environment.

In the next 90 days. As a first step, the chief analytics officer (or equivalent) should mobilize an effort to inventory core models that support business operations and work with business leaders to prioritize them based on their impact on key operations and their efficacy drift. This assessment is urgent and should be completed as quickly as possible. It will essentially define a program of quick fixes that the data and analytics team can undertake, working hand in hand with business and functional leaders. Once the situation stabilizes, CEOs and business leaders should push their data and analytics teams to develop next-generation models that leverage new data sets and modeling techniques better suited for fast-changing environments. The more advanced companies are already creating synthetic data sets using advanced machine-learning techniques, such as generative adversarial networks (GANs) to train new analytical models when historical data are of little use.

Selectively modernize technology capabilities

Successfully executing the described agenda requires investment capacity and development velocity. CIOs can contribute to both by rightsizing the IT cost structure to new demand levels and reinvesting the freed-up resources into customer-facing digital solutions and critical decision-support systems, first and foremost. Companies can also dedicate some of the savings to modernizing selectively the technology stack and software-development tooling.

Many companies have found they have the potential to free up as much as 45 percent of their IT costs over the course of a year. Our experience suggests that roughly two-thirds of this potential can be achieved through measures such as extending hardware- and software-refresh cycles, rapidly renegotiating vendor contracts, and restricting cloud workloads by turning off noncritical jobs. Additional cuts get deeper into the cost structure and risk hamstringing future growth. The right balance will vary by industry, but under any scenario, rightsizing should expose much needed investment capacity as quickly as possible to fund the 90-day plan.

As CIOs consider upgrading their tech stacks, two features of a modern technology environment are particularly important and can be rapidly implemented: a cloud-based data platform and an automated software-delivery pipeline (commonly called "continuous integration and continuous delivery"). Without these, development velocity stalls and becomes mired in complexity. The good news is that cloud technologies make it possible to deploy these quickly and at relatively low cost.

In the next 90 days. First, develop the plan to rightsize and create a more variable cost structure—the faster the better to free up resources for the digital agenda.

In the second 30-day sprint, choose your cloud partners. While speed is of the essence, CIOs should thoughtfully consider the contractual structures offered by technology providers. Carefully review those that appear too good to pass up to ensure that the providers aren't capturing all the value. And remember to launch appropriate internal efforts to train and prepare teams to operate in the new environment. During this sprint, it's also time to modernize the tech stack selectively—"selectively" being the operative word. Most companies won't have the management bandwidth and resources to take on a full-scale modernization in the next 12 to 18 months. By focusing on setting up or enhancing a cloud-based data platform and equipping agile teams with automated software delivery, CIOs can double, or even triple, development velocity in the short term.

In the final sprint, it's a no-brainer to launch the recruiting of additional digital talent and accelerate digital upskilling of the entire organization. These steps will prepare organizations well for a more substantive modernization of their application landscapes after recovery. Finally, continue to pay attention to cybersecurity. Much of the rapid IT work carried out during the COVID-19 crisis might have created new cyberrisk exposures.

Increase the organizational drumbeat

The current crisis has forced organizations to adapt rapidly to new realities, opening everyone's eyes to new, faster ways of working with customers, suppliers, and colleagues. Many CEOs wonder what it will take to maintain the quickened organizational drumbeat.

Companies that have led the way in adopting flatter, fully agile organizational models have shown substantial improvements in both execution pace and productivity. This has held true during the crisis, as we see a direct correlation between precrisis agile maturity and the time it has taken companies to launch a first crisis-related product or service. While many companies have at least a few agile teams in place, few have successfully scaled to hundreds of teams staffed with many more "doers" than "checkers," which is what's needed to drive the accelerated organizational pace the crisis—and even the next normal—demands.

What can realistically be done in 90 days to increase the organizational drumbeat? Standing up a digital factory is largely the best approach right now because it can be constructed and scaled in three months or less. Many organizations, from banks to mining companies, have accelerated and scaled their digital delivery by establishing these internal factories, with interdisciplinary teams aligned to businesses' digital priorities. One large global bank, for example, built five such factories to support several locations across the Americas.

As previously mentioned, remote working can also help organizations move at a faster clip as companies tap into new labor pools and specialized remote expertise. (And, yes, agile can be executed remotely.) Remote working can also enable new productivity opportunities, especially for companies with large field forces. One leading provider of residential solar services recently documented record sales using a more remote sales model.

In the next 90 days. During the first sprint, identify the business areas where digital-execution velocity is needed and map out plans for digital factories to support them. In parallel, assess where remote work models could unleash productivity benefits. These two lenses should set the table for targeted changes to the operating model. In the second 30-day sprint, design the new models with consideration for staffing level, expertise mix, governance, and operating procedures. Finally, in the third month, implement and operationalize the new designs. We know from experience that three months is sufficient to implement and scale a digital factory. We have also seen banks, pharmaceutical companies, and insurance companies pivot entire field forces to a remote model in a few weeks.

Leaders who want to succeed in the digital-led recovery must quickly reset their digital agendas to meet new customer needs, shore up their decision-support systems, and tune their organizational models and tech stacks to operate at the highest effective speed. In other words, C-level executives must point their digital firepower at the right targets and quickly execute against them. It's essential to set these targets at the outset and regularly measure progress against them. Achieving parity or better across digital channels to win the revenue race, rebuilding the most critical decision-support models, and doubling development velocity are goals that are all within reach. The 90-day plan will help organizations get there.

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After the first wave: How CIOs can weather the coronavirus crisis

Chief information officers must act swiftly to manage IT through the pandemic in a pragmatic way.

by Sven Blumberg, Peter Peters, and Christian Stüer

"The new normal is not clear yet, but we need to start moving toward it."

The implications and repercussions of the COVID-19 crisis are far from certain. But as the quote above suggests, technology leaders are now starting to think about how to get past the first wave of crisis management.

This humanitarian crisis is still unfolding: quarantines, lockdowns, and harrowing images of hospitals straining under the weight of sick patients all underscore the devastating human effects of the pandemic. The economic picture for many countries is dire. As we wrote recently, COVID-19 is a crisis that requires companies to address lives *and* livelihoods. CIOs have a critical role to play because physical distancing and the lockdown of economies require technology not just to maintain business activities but also to lead businesses.

CIOs must still focus on emergency measures and navigating through the chaos of the first wave of this crisis. But the economic implications require CIOs to start thinking ahead as well and to position their organizations and businesses to weather the downturn.

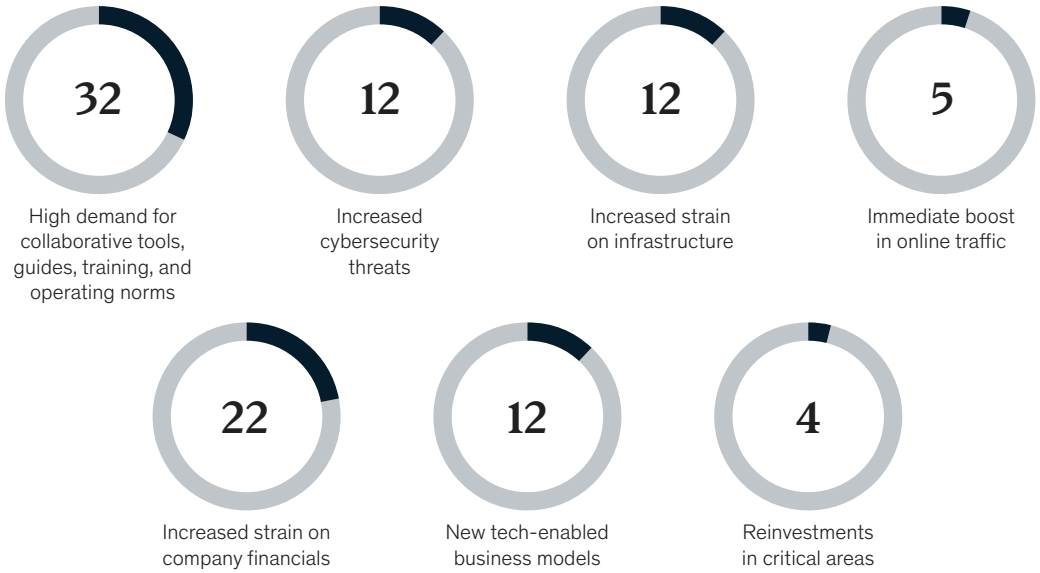
CIOs are already balancing important priorities across horizons. Polls we conducted during two recent webinars with more than 150 IT leaders highlighted their top concerns: putting in place collaboration tools and operating norms for working from home at scale, a near-term priority, and the increased strain on financials, a medium- and longer-term consideration (Exhibit 1).

Given the gloomy economic outlook, CIOs may be tempted to take a radical slash-and-burn approach in an attempt to shore up IT. That would be a mistake. While containing costs must be a crucial element of the second-wave response, CIOs have an opportunity to accelerate programs and push priorities that can help position the business to succeed when the downturn ends. There's no point in winning the battle but losing the war.

Exhibit 1

High demand for collaborative tools and operating norms and increased strain on company financials are the top concerns for chief information officers.

Top technology concerns for organizations,[1] %



[1] Question: Which of these are key concerns for you and your organization? Percentage of 161 participants attending 2 McKinsey webinars.
Source: McKinsey webinar, March 20 and 26, 2020, "The CIO moment: Leadership through the first wave of the coronavirus crisis"

As CIOs begin to shift their focus toward the next wave of the crisis, they should concentrate on three dimensions (Exhibit 2):

— Stabilize emergency measures.

— Scale down in the interim.

— Pivot to new areas of focus.

These moves will require a corresponding reprioritization of the project portfolio.

Stabilize emergency measures

We expect that the emergency measures taken as an immediate response to the COVID-19 lockdown will be sustained as long as the crisis continues. CIOs should prioritize four areas on this front.

Strengthen remote-working capabilities

Companies moved at mind-boggling speed to support remote work. It's now important to revisit those emergency measures to understand what must be updated, changed, or replaced to deal with issues that continue to hurt productivity.

First, organizations must review their ad hoc vendor-selection procedures in light of the alternatives in the market, increase network capacity, implement scalable support processes, and tighten controls that can secure and deploy temporary solutions at scale.

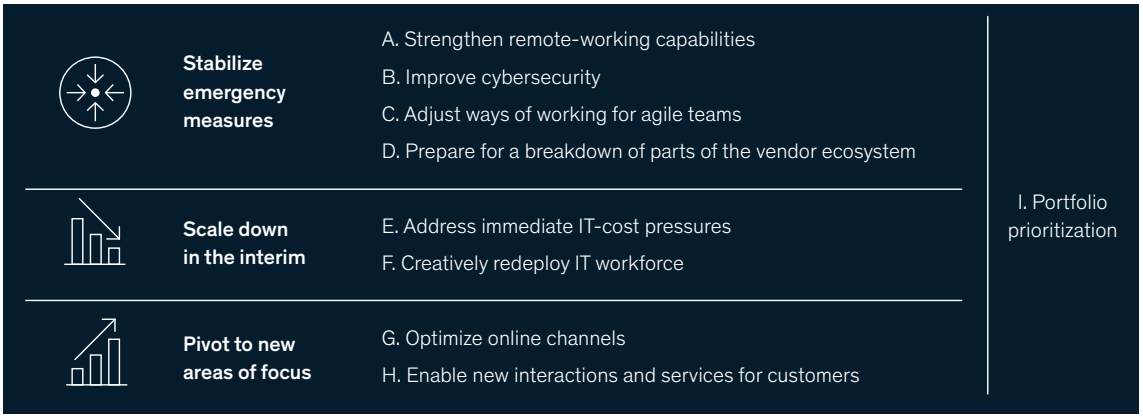
Second, CIOs will need to address the needs of special user groups, such as contact centers, users of critical systems, and employees of finance functions, to ensure that they can continue to operate in an effective way remotely. For contact centers, this may mean changing the routing of calls to a dedicated COVID-19 subteam to adjust for changes in questions from customers. Users of critical systems may need to build up redundancy in their remote-working setups. One energy company can now run an entire trading floor from the homes of employees, though with limited access to information and slower decision support.

Finally, hardware supply-chain interruptions have already proved to be a significant challenge as peaks in short-term demand for devices and IT hardware confront a breakdown of international logistics. It might be an option, if not a necessity,

Exhibit 2

Chief information officers in the next phase will need to take swift actions along three dimensions.

9 actions to weather the crisis



Technology leaders should continue to focus on people-based initiatives that heighten the awareness of risk.

to reprioritize demands by their importance—for example, prioritizing critical "tier 0" users, such as traders in banks or board members; reducing services; determining which of them can be migrated to the cloud; and using alternative purchasing channels and geographies.

Improve cybersecurity

In general, social engineering and insufficient security measures for remote work are the two main cybersecurity risks that organizations face during this time of crisis.

In recent weeks, we have seen an increase in COVID-19–focused social-engineering cyberattacks, which have exploited the current confusion and decreased the effectiveness of the "human firewall" (for instance, the verification of uncertainties with colleagues sitting nearby). CIOs, working with their chief information-security officers, must shore up their cyber protocols to deal with compromised credentials and data, as well as intellectual-property theft, fraud, and other crimes.

To address these problems, technology leaders should continue to focus on people-based initiatives that heighten the awareness of risk. The initiatives may include placing messages on lock screens or pop-up windows and creating secure, dedicated, quick, and effective two-way communication channels to the security team. To support these solutions, organizations need to beef up key processes, such as IT capacity to help employees install and set up security tools, not to mention implementing at scale security technologies such as multifactor authentication-and-control mechanisms that provide remote access to on-premise applications (for instance, teller interfaces).

Adopt new best practices for agile ways of working

Co-location is an important factor for agile ways of working to be productive. Remote work obviously introduces real challenges, such as disrupting a team's continuous alignment, limiting interactions, and complicating agile ceremonies—all of which threaten to drive productivity down. Furthermore, remote environments amplify any previous lack of clarity in roles, responsibilities, and objectives.

Yet there are some companies that have transitioned their digital units almost seamlessly to remote settings, where individual team members feel that they are working more productively than before. One tech company, for example, has fostered an outcome-driven culture that empowers teams to undertake their work outside traditional working hours. In weekly review meetings, they are still held accountable for getting things done.

When we looked more closely at companies that have moved beyond shifting employees to work from home during the first wave of the crisis, we found four differentiating factors: they changed the structure of teams to create smaller agile ones of around five people, strengthened direction setting through leadership, emphasized cultural elements and delegated decisions, with clear accountability, to individual team members, and expanded the use of technology that promotes effective collaboration.

Prepare for a potential breakdown of parts of vendor ecosystems

IT-outsourcing and offshoring vendors, as well as shared-service centers, may well shut down at times.

To address that risk, CIOs are strongly advised to make their vendor dependencies and individual situations transparent—both their location and the fallback options. Mitigation efforts should be prepared not only with existing vendors but also with alternative sources in different regions. A McKinsey survey found that some global capability centers already launching mitigation measures report that "full" (more than 80 percent) production capacity can be maintained for an average of 40 days during the crisis.

Scale down in the interim

Meanwhile, CIOs must address the immediate pressures on IT costs and creatively redeploy the IT workforce.

Address immediate IT cost pressures

With revenues and margins for many businesses plummeting during the crisis, cost pressures on IT will increase. In addition, emergency decisions to manage the initial crisis response might have increased costs—both operational and capital expenditures. Technology and IT departments will be asked to find short-term cost-reduction opportunities to mitigate those effects. CIOs should therefore consider some guiding principles:

— *Be aggressive in IT cost reductions* not only to free up capital but also to invest in capabilities for the "new normal" (more remote work, more online interaction, and more automation). We have found that IT costs can typically be reduced by up to 30 percent quickly.

— *Fully exploit areas of flexibility* to address cost pressures quickly before cutting into capabilities that might affect the future business. In practice, this means deferring nonessential projects and investments that can be reversed, before considering more permanent and potentially damaging changes.

— *Quickly build a task* force to establish the baseline and full potential of cost-reduction measures that then can be deployed in line with the developing business situation. Additionally, define thresholds when cost-reduction measures affect business operations and align on them with stakeholders.

Creatively redeploy the IT workforce

Disruptive changes in customer behavior and emergency responses have dramatically shifted workloads within organizations. Many on-site operations have been drastically reduced and long-term software-transformation efforts paused, but call centers and online channels still must be scaled up rapidly to meet demand. These realities must guide CIOs when they redeploy their people—which includes reevaluating the role of outsourcing partners. Other examples include back-filling for colleagues most affected by the crisis (for instance, those who must take care of small children or affected family members) and filling roles left open by external workers affected by the crisis.

In the past week, we have also seen many highly inspiring examples of companies repurposing their capabilities to help society cope with the crisis. Tech companies have partnered with the World Health Organization, pooling tech talent to work on projects tackling challenges caused by COVID-19. Another recent example: SAP set up a team of 40 developers and created an emergency web application in 24 hours for the German Federal Foreign Office to manage the repatriation of citizens abroad after the legacy system became overloaded.

We believe this kind of thoughtful and creative redeployment helps organizations cope with the crisis, strengthens the sense of contribution and purpose among employees, and keeps them engaged during a period of remote work.

Pivot to new areas of focus

Looking ahead, CIOs must also bolster the online channels of their organizations and support new interactions and services for customers.

Bolster online channels

With people forced to work at home and to minimize visits to brick-and-mortar stores, online sales and service channels are experiencing a massive spike in traffic—in China, we have recently seen increases

of 200 to 300 percent. In the medium term, the traffic baseline for online behavior will probably rise as a result. For now, organizations must act to optimize and bolster their existing online channels to improve customer interactions and solidify retention.

The management of traffic spikes is the most pressing matter for online channels. Mildly invasive short-term measures might include expanding hardware capacity, decreasing or redistributing loads (for instance, by running promotions during off-peak hours), technical optimization (such as horizontally scaling the caching layer), or rerouting of traffic to scalable cloud solutions.

Support new interactions and services for customers

Some companies have responded quickly to the new digital customer behavior by establishing new products, such as mortgage deferrals and crisis-related insurance, or shifting customer interactions to online channels. A government in Western Europe, for example, embarked on an "express digitization" of quarantine-compensation claims to deal with a more than 100-fold increase in volume. Sometimes this effort is about taking loads from call centers, but more often it addresses real new business opportunities. To engage with consumers, for example, retailers in China increasingly gave products at-home themes in WeChat.

Technology departments must anticipate and prepare to offer more of these kinds of digital services, products, and channels. The key to reaching customers will be creating suitable access interfaces between internal IT systems and external social platforms and accelerating the integration of new vendors and distributors.

Portfolio prioritization

Given the enormous pressures CIOs are facing, the entire project portfolio must come under scrutiny to measure the tangible impact it can deliver and how it fits in with the new priorities. One CIO, for example, said that he has already committed himself to continuing only projects that are already nearly complete, reshaping or reducing in scope other projects, and applying a much more rigorous process to the selection and advancement of projects.

We believe that CIOs should apply a crisis checklist to review portfolio projects systematically against key criteria, including these: "Are we still able to deliver, either internally or with potentially affected vendors?" "In what way does the project address new business priorities?" "Does the project assume functioning supply chains?"

With a clear crisis checklist in place, CIOs and their teams can objectively continue, stop, defer, or ramp down projects to maintain focus on what really matters. As the crisis continues to unfold and CIOs develop greater clarity about what the next normal will look like, they will need to adjust their criteria.

CIOs are already under a lot of pressure. After the first shock and successful response, however, CIOs must now handle multiple planning horizons in parallel to manage the current crisis, prepare for the downturn, and ultimately position the business for success when the recovery comes.

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How chief data officers can navigate the COVID-19 response and beyond

Chief data officers play a pivotal role in enabling data-driven decision making that will help their organizations respond to COVID-19 and emerge from the crisis in a position of strength.

This article is written collaboratively by global leaders of McKinsey Technology including ***Kevin Buehler, Holger Harreis, Jorge Machado, Satyajit Parekh, Kayvaun Rowshankish, Asin Tavakoli,*** *and* ***Allen Weinberg****. We integrate deep expertise and thought leadership from the best of McKinsey's experience in this unprecedented COVID-19 crisis to explore how data leaders can act across three horizons to shape the way forward: ensure data teams—and the whole organization—remain operational, lead solutions to crisis-related challenges to come, and adapt to the next normal.*

As the COVID-19 pandemic spreads across the globe, so too does its extraordinary impact on nearly every country, business, and individual. Each day, the world wakes up to rising case counts and reports of unprecedented government efforts to both keep citizens safe and stem economic impacts—efforts that rely on access to trusted, quality data.

Industries at the forefront of the crisis are also relying on data in innumerable ways to inform their response to the crisis. Healthcare providers, for instance, are leveraging data from countries that were affected earlier by COVID-19 to forecast needs for hospital beds, masks, and ventilators. Grocery chains are using sales data to help distributors identify and ship the items most important to their customers. Meanwhile, the sectors we rely on to keep the wheels of the economy moving are using data to inform their operations. Telecom players, for example, are using network traffic data to decide where to upgrade capacity in response to the tremendous demand for bandwidth from an increasingly remote workforce.

Chief data officers (CDOs) in every industry will play a critical role in crisis response and the next normal that follows. In today's high-stakes environment, where misinformation proliferates and organizations must make decisions at a rapid pace, there's arguably never been such an imperative for CDOs to provide organizations with timely and accurate data.

Senior executives will need ready access to both new and newly critical data to make unprecedented decisions in the short term and inform adjustments to their business strategies and operational plans in the medium to long term. Banks, for example, will need to rethink credit models. Manufacturers will need to reconfigure supply chains. CDOs must not only lead the way in sourcing, storing, and serving up the necessary data but also work alongside business and functional heads to identify and drive these new priorities. All the while, they'll tackle other mission-critical responsibilities such as enabling rapid reporting, mitigating new data-related risks, and helping their organizations shift to a predominantly digital operating model.

In this article, we highlight three waves of actions CDOs should consider to help their organizations navigate the crisis and the uncertain landscape that lies ahead:

— ensure data teams—and the whole organization—remain operational

— lead solutions to crisis-triggered challenges to come

— prepare for the next normal (and execute soon)

These insights are based on our discussions with data leaders across industries over the past few weeks and our experience from previous crises, both financial and health related.

Ensure data teams—and the whole organization—remain operational

The priority for CDOs is to take steps to protect employees and help keep the organization up and running, safeguarding data as companies move fast to respond to the crisis.

Enable business continuity. Many institutions have data technology or operations in multiple locations, including offshore, which must remain closed or operate with skeletal capacity. CDOs must continue to provide for the health and safety of their team members and colleagues

first and foremost. As the situation develops and shifts, data leaders should continue to revisit the business-continuity plans for their data operations to ensure that there is adequate support on core data platforms, identifying key personnel and obtaining the required government waivers for maintaining the critical infrastructure.

Set up a dedicated COVID-19 data nerve center. The COVID-19 data nerve-center team should include report owners, data stewards, data engineers, data scientists, and data-visualization specialists. This group should be tightly integrated with the enterprise-wide COVID-19 response team that is likely already in place and drive data efforts that address the broader team's needs as well as those of other leaders, such as rapid development of executive dashboards and daily reports on company performance. In response to these urgent requests, we're seeing companies quickly adopt tools such as robotic process automation to ingest and process data much more rapidly than they could in the past.

Ensure data protection and privacy. Organizations are being forced to operate in ways they have never had to consider, such as having a large portion of their staff working remotely for extended periods of time. As organizations rapidly adapt to these changing needs, they are exposing their data assets to a variety of new attack vectors as well as increasingly aggressive versions of existing foes (bad actors that deploy ransomware, for example, know hospitals do not have time for lengthy negotiations). There are also rising data-security concerns around providing riskier employees with remote access to personally identifiable information (PII), since traditional data controls may not work. CDOs need to work with their information-security peers to update the controls in place, particularly on their key data assets by, for example, limiting the ability to export data. CDOs could also update policies to incorporate the remote-worker role with limited permissions, for example, to take and print screenshots or use external storage devices.

Lead solutions to crisis-triggered challenges to come

Organizations will face a vast number of challenges in the coming months as they adjust to new ways of working and serving customers, and potentially confront additional waves of the virus's spread. CDOs can help in several areas.

Plan for likely stress scenarios. During the 2008 financial crisis, banks struggled to aggregate the data needed to prepare reports for mitigating risk. Since then, many banks have invested in these capabilities—driven in part by the regulatory push of the Basel Committee on Banking Supervision regulation 239 (BCBS 239) principles—an investment that's paying dividends in the face of the COVID-19 crisis. CDOs in other industries should adopt similar practices in an effort that supports their company's plan-ahead team. The effort should begin with identifying the probable stress scenarios—such as another rapid increase in the infection rate, geopolitical events, or bankruptcies—defining the types of reports required to monitor each of them and surfacing the data needed to build them. They will also need to adjust data processes to adapt to the typical challenges observed during times of stress—for example, "shutting off" or at least limiting nonmaterial data streams to reduce the load in an environment where key employees might be absent or redeployed on crisis-related projects.

Proactively tap new data sources. During this time, the CDO should become the go-to person for all data needed across the organization—not just existing sources, but also new and alternative ones, such as video, audio, and geospatial. Some retailers, for example, are using state-level COVID-19 trends to manage inventory, categorizing their merchandise into two buckets: essential or nice to have. To guide their data sourcing, CDOs should proactively engage business leaders now to understand the challenges likely to arise throughout the phases of the crisis and its aftermath so that the data is on hand when it's needed. In addition to helping to identify and provide data, we see CDOs in some industries supporting the execution of analytics use cases such as store-closure prediction, sentiment analysis, or supply simulation. Forward thinkers are proactively setting up data labs to identify indicators of economic recovery from customer, supplier, and vendor signals.

Contribute to data ecosystems for public good. Evaluate opportunities to exchange data (including

that which may not have been deemed useful earlier) with peers at adjacent companies, government agencies, and nongovernmental organizations (NGOs) to help solve societal problems related to the current crisis. An alliance of researchers and technology leaders recently launched the COVID-19 Open Research Dataset (CORD-19) and were supported by the White House in issuing a call to action to develop new text- and data-mining capabilities to help answer questions about the disease. The European Commission is convening a group of leading telecoms in Europe to leverage anonymized cell-tower data to enable cross-country relief efforts for impacted regions. Participating in data ecosystems will not only help citizens but also help organizations develop the ecosystem-building capabilities and partnerships they'll need to compete going forward as industry boundaries continue to blur.

Prepare to reduce cost surgically. Take a "reprioritize and invest" approach to the current portfolio of data initiatives rather than a "slash and hold" approach. Organizations that radically reduced their portfolios during previous crises came out on the other side of them markedly less prepared than those that did not. In the automotive industry, for instance, investing in digital sales channels is critical for success in the long run (and also helps in the nearer term by bypassing complex dealer structures affected by COVID-19). Cost reduction is an important priority, but adapting the business model through data and analytics in the longer term is as well.

Prepare for the next normal (and execute soon)

CDOs should begin planning and executing initiatives that allow their firms to emerge from the crisis with better data capabilities and organizational resiliency.

Leverage momentum to invest in the future. Chances are that CDOs will build out new capabilities or showcase the value of existing ones as they contribute to the crisis response. Some of these could serve as the building blocks for long-deferred initiatives, such as developing a 360-degree view of the customer, adopting consistent tool sets and processes, or modernizing their data architecture and moving to the cloud. They can also serve as a catalyst to recommit to—or perhaps even set bolder—organizational aspirations to become data driven. Businesses are likely getting even more practice using data as they make decisions on the back of crisis-related data. Build on these efforts by setting stretch goals such as having *all* meetings and key decisions backed by data. While implementation of these initiatives will require time, they have the potential to shore up the health of the organization and prepare it for the future.

Review and revamp offerings. The crisis will force CDOs to review their offerings based on new needs arising from the next normal, which is likely to be more digitized than ever before. Risk reports and other business intelligence will likely change along with the data that populate them. Data and models for churn or attrition, workforce management, relationship deepening, digital marketing, and supply-chain and market analytics will all need to be refreshed. This will be an intensive and significant undertaking for the entire organization, requiring visionary and communicative CDO leadership.

Hire and retain top talent. Good data employees can be hard to replace, so finding ways to protect them should be a top priority for the CDO. Additionally, as smaller organizations and start-ups face financial instability through the crisis, top data talent may be looking for work. Make it a priority to hire this talent for the betterment of society, the economy, and your team. Some companies have already taken measures to establish themselves as a "safe-harbor brand" on the talent market and are bringing in top talent who were previously not interested in joining. They are using this momentum to transform their culture and ensure that top-tier talent remains onboard.

Build resiliency for future crises. Invest in additional capabilities that will allow the organization to create more flexibility and timeliness in data aggregation and reporting. One example would be to proactively conduct "drills" to simulate a scenario and produce and discuss ad hoc reports. By strengthening this muscle, we expect that organizations will be much better prepared for any subsequent outbreaks or other crises—which are likely throughout the coming decades.

CDOs should proactively engage business leaders now to understand the challenges likely to arise throughout the phases of the crisis and its aftermath so that the data is on hand when it's needed.

Rethink and digitize physical processes and footprints. Many organizations will need to rapidly reinvent processes that previously required physical documents, to become paperless. Enabling the submission of scanned copies for document verification and supporting contactless servicing capabilities (for example, by creating digital forms to replace physical forms and enabling electronic-signature capture) will likely be key priorities. Organizations finding rapid success in these areas are adapting solutions that are already used by other business units or for other products. Any entirely new processes that are developed will require ample time for testing.

For sectors with a significant physical footprint, such as brick-and-mortar retail, CDOs should lead the way in enabling key decisions—for example, by crossing geospatial data for their stores with data on propagation of the virus to help leaders decide on physical-store closures and where to employ augmented-staffing models.

Reinforce the ethical use of data. As organizations make these new pushes, it will be important for CDOs to drive home the tenets of data governance and ethical data usage to all data citizens across the company. Although crises often require rapid action, the cornerstones of any data initiative should continue to be data risk, privacy rights, and ethics. While the crisis lasts, CDOs might have to employ quick-hit tactics, such as defining and circulating ethical data-usage principles and educating teams new to using data on the fly. Leveraging programs such as data and analytics academies and making significant use of online learning can make this type of important education ongoing and give it greater depth.

This is a difficult time for everyone—corporations, governments, customers, and employees. While CDOs' near-term focus should overwhelmingly be the health and safety of employees and enabling crisis response, as the situation stabilizes, they must step up and make a big contribution to the long-term viability of their organization by empowering it to make effective data-driven decisions.

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How digital is driving industries

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Building an e-commerce business: Lessons on moving fast

With consumers moving online in reaction to coronavirus restrictions, companies will need to learn how to launch new e-commerce businesses quickly.

by Arun Arora, Philip Christiani, Ralf Dreischmeier, Ari Libarikian, and Hayk Yegoryan

While the full implications of COVID-19 are still unknown, it's clear that the impact on retail is already significant. Emerging evidence points to a significant shift, as customers scale back their shopping in stores and instead go online.

In China, online shopping has increased 15 to 20 percentage points,[1] and e-commerce in Italy has increased 81 percent compared with the last week of February.[2] US consumers have largely followed the same pattern. The COVID-19 crisis is first and foremost a human tragedy, requiring companies to take immediate steps to protect their people. Amid this human cost, companies are also starting to come to terms with the impact of the crisis on their businesses. With offline shopping collapsing, companies' strategies will need to focus on fortifying their web presence and, in some cases, building an online business.

We have found that companies can create a working e-commerce site in much less time than they think. In fact, a poor understanding of what's really possible with digital can be one of the most significant hinderances to moving quickly. As we highlight in *Fast Times: How Digital Winners Set Direction, Learn, and Adapt* (Amazon Publishing, February 2020), low aspirations lead to modest, even negligible, outcomes. In our experience, completely new businesses can be launched in fewer than four months. Normally, a company requires at least six to nine months to get a complete solution up and running (and often considerably longer when outsourcing the work to multiple vendors and agencies, with the increased need for coordination slowing down cycle times).

We had the opportunity to watch this thesis play out in the real world recently at one European retail chain that has around 1,000 brick-and-mortar stores across the world. The chain, owned by a private-equity fund, had no e-commerce presence. Although it had previously considered e-commerce, there were serious concerns about whether it could ever work, given the assortment, concept, and even brand constraints. Despite these issues, a variety of pressures, from consumer demand to competitive constraints, forced the company to take action.

Thirteen weeks later, it had a functioning e-commerce business in one of the regions it operated in. Not only that, its launch was successful from the first month, generating almost 3 percent revenue growth within the chosen region, tripling average basket size compared with retail stores, and maintaining a high customer-satisfaction score. When COVID-19 started disrupting daily routines in Europe, the e-commerce revenues jumped up threefold almost overnight.

This article describes the main lessons from that program.

Be pragmatic

Before work started on launching an e-commerce business in our example, the company's leadership gathered to discuss the ambition for the endeavor. One word dominated that discussion: "pragmatic." Rather than attempting to launch a full-blown digital business across all markets at once, the CEO opted to go to market fast with a limited offering and in limited geographies, gain strong traction, and then scale up and out aggressively (see sidebar, "Supporting your remote teams").

Within days, a new team created a comprehensive, week-by-week plan that covered everything from creating customer-testing touchpoints to setting up the warehouse with electricity and equipment to photographing and writing copy for every one of the 800 products to go on offer. All nonrelevant initiatives were postponed in favor of efforts that had direct customer impact. The team closely scrutinized every feature and ruthlessly prioritized intermediate release goals for what mattered most. This biweekly review exercise also made room for fixing problems when things inevitably went wrong.

[1] COVID-19 mobile survey, February 2020; n = 1,249 respondents across 46 Chinese cities.
[2] Expert calls; Chiara Bertoletti, "#Coronavirus Nuovi dati sulle vendite della gdo in store e online," *Gdoweek*, March 6, 2020, gdoweek.it.

Supporting your remote teams

As the COVID-19 pandemic spread, it overtook the effort of a retail chain to refine its new e-commerce site. The team, like workers around the world, had to learn quickly how to collaborate with one another while working remotely. The lessons from that experience and others include the following:

— Invest in adoption and standardization. It's not enough to have the best collaboration tools available. The level of people's familiarity with collaboration tools varies, so spend time up front in training people how to use them well. Also standardize which tools to use. In an effort to move quickly, people may just gravitate to what they know best, resulting in the use of incompatible tools.

— Invest in adequate tools and support—for example, pay for upgraded Wi-Fi and distribute 4G or 5G modems.

— Stay committed to what works. Problem-solve the new issues—foreseen and unforeseen—that arise the way you do any other challenge: uncover the problems and innovate solutions by agile trial and error. Maintain frequent check-ins and track progress.

— Understand that in a time of crisis, team members have personal and family responsibilities that they must also handle. Have the empathy and flexibility to enable that.

This lesson was repeated a second time when management reevaluated scaling plans in light of COVID-19. The team focused instead on further strengthening the core functionality of the e-commerce business and providing an easy, dependable way for a locked-down population to shop for what it needed.

Be clear with responsibilities: Assign ownership, not tasks

A crucial element in enabling speed during our example retail chain's launch of its e-commerce business was clearly designating which teams were responsible for which tasks—and then giving them the space to complete their work. Management created four teams with responsibility for specific work streams and ownership over a certain portion of the customer journey. Management then stepped back, giving teams the responsibility and flexibility to solve every unplanned issue that occurred there and pushed them to be creative with solutions. The four teams and their tasks were as follows:

— *The tech-and-design team* was in charge of defining the microservices architecture, including codesigning the online-store concept with customers and building it iteratively. It also had to develop tech capabilities for connecting the back end of the store with the warehouse-management system, inventory synchronization, and order handling. The team owned the customer journey from the moment the customer arrived to when an order landed on the handheld tablets carried by the pickers in the warehouse. Over time, the tech stack developed to a point at which almost all content-level changes could be done without developer involvement.

— *The operations team* was in charge of setting up the warehouse: establishing packing stations and picking trolleys, setting up the workforce for the warehouse and customer support, liaising with carriers and intermediaries to set up a new relationship, and detailing the procedures for handling all common and edge cases. It owned the part of the journey that started when the warehouse received an order and ended when the customer received their package.

— *The product-assortment team* analyzed the full product assortment available, chose the 800 best SKUs to launch with (based on

Putting in place the right measures and key performance indicators early in the process of creating an e-commerce business is as important as launching quickly.

multiple quantitative and qualitative criteria—for example, "shippability" of items such as ice cream and fragile glassware, sizing to fit existing boxes, and logical fit with other products in the assortment); obtained samples to photograph, measure, and describe; and created creative online-only bundles. It owned the portion of the customer journey covering all of the steps necessary for a customer to find, understand, and choose a product. As such, the team worked closely with the tech-and-design team in the initial phases.

— *The marketing team,* which kicked off nine weeks before the launch, created a detailed marketing launch plan, set up a structured customer-relationship-management system and biweekly campaigns to increase the size of the database by almost threefold prior to launch, worked with an agency to come up with a creative launch campaign, and planned an operation in which all the content and merchandise (such as posters, T-shirts, and bags) would roll out in unison on launch day across offline stores, social media, search advertising, influencers, and various PR channels. This team owned the customer decision journey, from complete lack of awareness to the moment a customer landed on the home page for the first time.

At the end of each day, all the teams came together for an all-hands checkout to update each other about the newest developments. This habit—along with solid agile ceremonies, such as weekly sprint planning, biweekly demonstrations, retrospectives, and use of collaboration tools (Kanban boards and Slack)—was the perfect counterweight to work-stream independence and ensured that everyone was in sync at all times.

Learn and adapt

Putting in place the right measures and key performance indicators early in the process of creating an e-commerce business is as important as launching quickly. It allows companies to track the progress that matters so that they can learn, adapt, and drive continual improvement. It is not enough to measure overall conversion or conversion by channel. Instead, companies need more granular metrics—for example, to identify relevant customer cohorts, measure microconversions per cohort, and then improve for that use case continually. Metrics or key performance indicators that are too high level don't provide a clear-enough story. This concept, in particular, is crucial because launching an e-commerce presence is not a discrete project but much more a program of continual improvement.

In our retailer example, the leadership decided early on that the goal of the e-commerce initiative was to launch quickly a business that could gain traction within a single region and then to use it to learn and improve before going all out globally. The company knew that it needed first to build a muscle to operate and optimize a multinational digital business—and that the best way to do that was by learning through doing.

After a successful launch, for example, the team spent a month analyzing pain points and bottlenecks and then experimenting with new solutions to improving the experience continually. It was able to act quickly because it had established a simple spreadsheet model to track progress. The team checked it daily the first two weeks and weekly thereafter. It then added new metrics as goals changed. For example, when focusing on growing B2B segments, it tracked the number of orders and revenue for B2B customers daily. When focusing on improving operations, it tracked pick-and-pack speed and the percentage of fulfilled orders per day.

The team also developed prototypes for various new features to test with customers and abandoned many pet ideas that simply didn't stick. The team had to go back on one of the online-exclusive ideas—staff curated bundles of products based on common occasions, such as birthdays— that tested very well with customers prelaunch but simply didn't perform in reality.

By keeping a weekly sprint rhythm, it was possible to pivot away from poor ideas and generate new ones constantly until the team found ones that worked. Week by week, the improvements and lessons accumulated, and by month three, the e-commerce business had matured into a state at which a good sales day wasn't a victory but business as usual.

Building an e-commerce business from scratch is no small undertaking. But experience has shown that a dedicated program properly structured can not only pull it off but do it far faster than many might think is possible.

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Preparing for the next normal via digital manufacturing's scaling potential

Achieving digital at scale can give European manufacturing the resilience and flexibility it will need to speed its recovery after the coronavirus crisis—and beyond.

by Enno de Boer, Søren Fritzen, Rehana Khanam, and Frédéric Lefort

The coronavirus pandemic is changing manufacturing operations to a degree never before seen. As organizations and leaders seek to ensure the health and safety of their people, they are also reacting to supply-chain shifts that are impacting sourcing and distribution logistics. Supplier resilience is being brought into sharp focus, and labor shortages are bringing many production lines to a halt.

However, the crisis will eventually resolve, at which point production facilities will need to move quickly to respond to new sources of supply and shifting customer demands. It is these types of pressures that make digital capabilities so critical, providing flexibility and resilience manufacturers need to mobilize and operate in unfamiliar territory.

Yet most companies that have attempted enterprise-wide "digital transformation" have failed to capture the full business opportunities available from new technologies. What lessons can manufacturers learn from the few organizations that have succeeded in moving from successful small pilot projects to scaling digital innovations across their production networks?

Our latest research and experience have allowed us to uncover new insights into the challenges and success factors in implementing digital manufacturing at scale. Moreover, our work has also found that European manufacturing is lagging behind the rest of the world. Only 17 of the 44 members of the Global Lighthouse Network[1] (manufacturers that have been recognized as leading the way in their adoption of digital technologies) are in Europe, and only three of these are using fourth industrial revolution (4IR) tools across their end-to-end value chains.

Some of this seeming hesitation may be because many European manufacturers operate on brownfield sites. The task of enhancing legacy processes, systems, and machinery with 4IR tools can seem more daunting than building a digital production facility from the ground up. However, there is a risk that much of European manufacturing may fall so far behind that they will prove unable to recover the ground lost to more technologically-advanced manufacturers elsewhere.

The time for organizations to act and to implement digital is now. Our research has revealed five fundamental principles that translate into tangible actions for scaling and sustaining digital technologies, regardless of a manufacturer's starting point.

Industry 4.0 can unlock significant value

A select group of industry-leading manufacturers are using digital transformation to develop new or enhanced ways of operating their businesses, using a variety of Industry 4.0 capabilities:

— Data, computational power, and connectivity, such as sensors, the Internet of Things, cloud technology, and blockchain

— Analytics and intelligence, ranging from big data and advanced analytics to artificial intelligence and knowledge-work automation

— Human-machine interaction, including virtual and augmented reality, robotics and automation, robotic process automation (RPA), and chatbots

— Advanced production methods such as additive manufacturing and use of renewable energy

The benefits these companies have recorded include 30 to 50 percent reductions of machine downtime, 15 to 30 percent improvements in labor productivity, 10 to 30 percent increases in throughput, and 10 to 20 percent decreases in the cost of quality. These breakthroughs create impact across the value chain that may be even more important, if harder to measure: increased flexibility to meet customer demand, faster speed to market, and better integration within the supply chain.

[1] The Global Lighthouse Network is an ongoing research project of the World Economic Forum, in collaboration with McKinsey.

Although all of the manufacturers we assessed are transitioning to digital manufacturing, they are not deploying these technologies at the same rate. In fact, most organizations find themselves stuck in "pilot purgatory," with no clear approach for quickly scaling up innovations across the manufacturing network. Our latest research confirms that at least 70% of manufacturers are languishing in pilot purgatory, according to the findings from the Global Lighthouse Network.

Culture is generally considered to be among the most significant challenges to scaling. Additionally, companies' path to success at scale is often hindered by the absence of several fundamentals, including:

— *Strategic direction* regarding where and how digital manufacturing will bring real business value, as well as the incentives for people to make it happen

— The *required capabilities*—technical, managerial, and transformational—to truly understand and execute the changes

— *Robust data and IT infrastructure*, which instead are often patchy and become a bottleneck for scaling successful pilots

A scaling approach based on five principles

How can a manufacturer successfully scale digital manufacturing across a global network and capture its full potential? Our latest research and experience show that a transformational approach should be based on five fundamental principles (Exhibit 1).

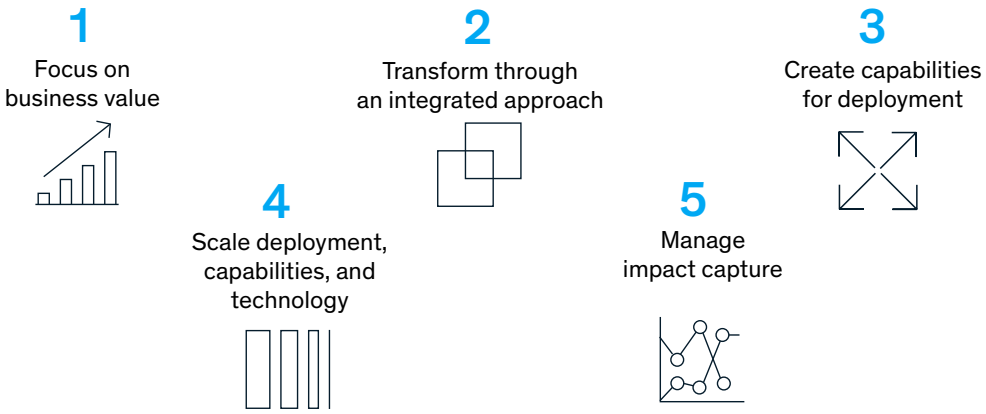
Focus on business value

To succeed, the scaling of digital manufacturing must originate from the company's digital strategy, with clear financial and operational-performance aspirations. These aspirations must in turn become formal targets linked to real business needs and cascaded throughout the organization.

For example, at a global pharmaceutical company, various business units had been experimenting with digital innovations in their operations for some time—but few ideas achieved much impact beyond the individual unit. Company leaders recognized that they needed to clarify on a network-wide basis which digital solutions could contribute to the entire enterprise's business needs and priorities—and, accordingly, where to focus the transformation efforts and how to implement at scale.

Exhibit 1

For digital transformation to achieve scale and capture their full potential, organizations should follow five principles.



A three-month digital scan combined qualitative interviews with a quantitative assessment of prioritized sites. The effort helped the company achieve four critical objectives:

— Confirm where and how the value at stake in digital manufacturing can support real business needs

— Define a prioritized portfolio of digital solutions to scale

— Understand the level of readiness of its data and technology infrastructure across the network

— Understand the investment required in technical, managerial, and transformational capabilities

The company applied the insights from the scan to create an aligned, and value-oriented road map for rolling out the digital transformation across the network. The plan integrated both digital and traditional improvements, accounted for resources and technology requirements, and reflected a clear strategy for building capabilities at scale.

Transform through an integrated approach

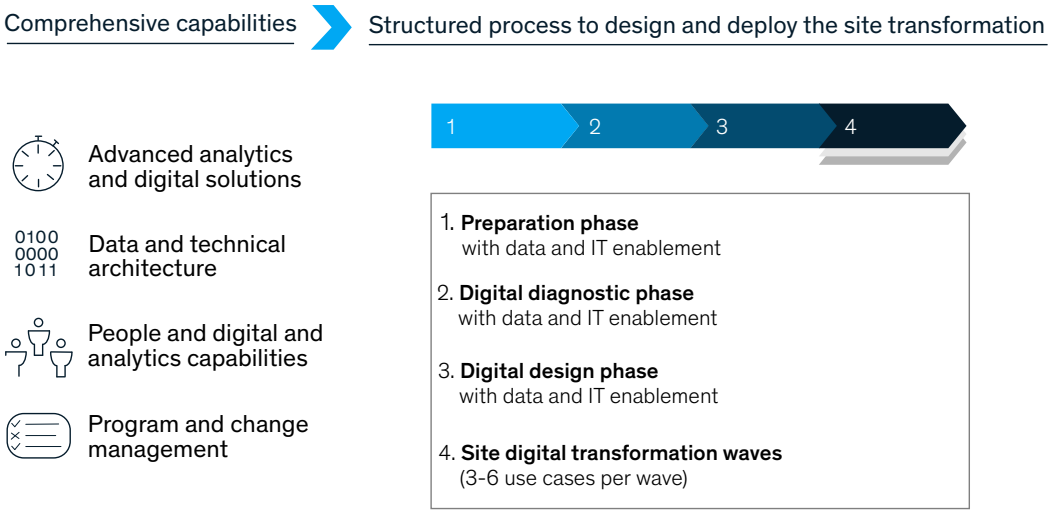
To drive transformational change, a company must follow an integrated approach at each of its sites. The approach should address a comprehensive set of capabilities and follow a structured process (Exhibit 2):

— Design digital solutions built upon a repository of value-driven use cases. Deploy the use cases as "integrated bundles" to maximize return on investment (ROI), and center them around user journeys to enhance sustainability.

— Establish the data and technical architecture, in close collaboration with the IT function, to ensure scalable solutions for future roll-out. For example, horizontal scalability enables

Exhibit 2

Digital transformation at a site should address a comprehensive set of capabilities and follow a structured process.



integration of more use cases into the architecture, while vertical scalability facilitates connecting more data, users, and sites.

— Invest and develop new roles and capabilities, and engage the existing line organization in a thorough reskilling and upskilling program.

— Establish a cross-functional set-up and follow an agile way of working. For example, build "minimum viable products" rapidly and iteratively while keeping things simple and learning along the way to make adjustments as needed.

Create capabilities for deployment

A well-thought-through operating model provides the basis for establishing the cross-functional setups and new capabilities that ensure effective deployment. To support both leadership and the front line through implementation, the company should build communities of practitioners including digital change agents, data scientists, data engineers, and IT architects. The company also needs "translators" to facilitate interactions between technical experts and businesspeople.

To maximize value from the transformation, the company should combine new and existing capabilities (Exhibit 3). For example, a global medtech company is using the new digital capabilities to enhance its existing lean-management and operational-excellence capabilities, rather than replace them.

This combination's power becomes clear in the application of advanced analytics to improve manufacturing-line performance. The technology cannot deploy itself: An experienced process engineer is needed, first to install sensors and then to use them in improving the process. It's the engineer who develops a root-cause hypothesis for subpar performance and identifies possible countermeasures, working with a data scientist who uses advanced analytics and modeling to prepare, process, analyze, and interpret the data that the sensors produce. In addition, a domain expert with prior lean-management experience must serve as a translator who facilitates the interface between the line teams and the analytics and data experts. The translator glues together the new and existing capabilities, so that the team can interpret the results and make changes on the shop floor.

Most members of the team leading the transformation should be 100 percent dedicated to the effort over a fixed time period, applying a capability-building strategy that uses on- and off-the-job training with rigorous talent development. Organizations that have already codified their best capability practices into an existing manufacturing and supply chain academy can provide training for the new roles and skillsets that culminates in accreditation.

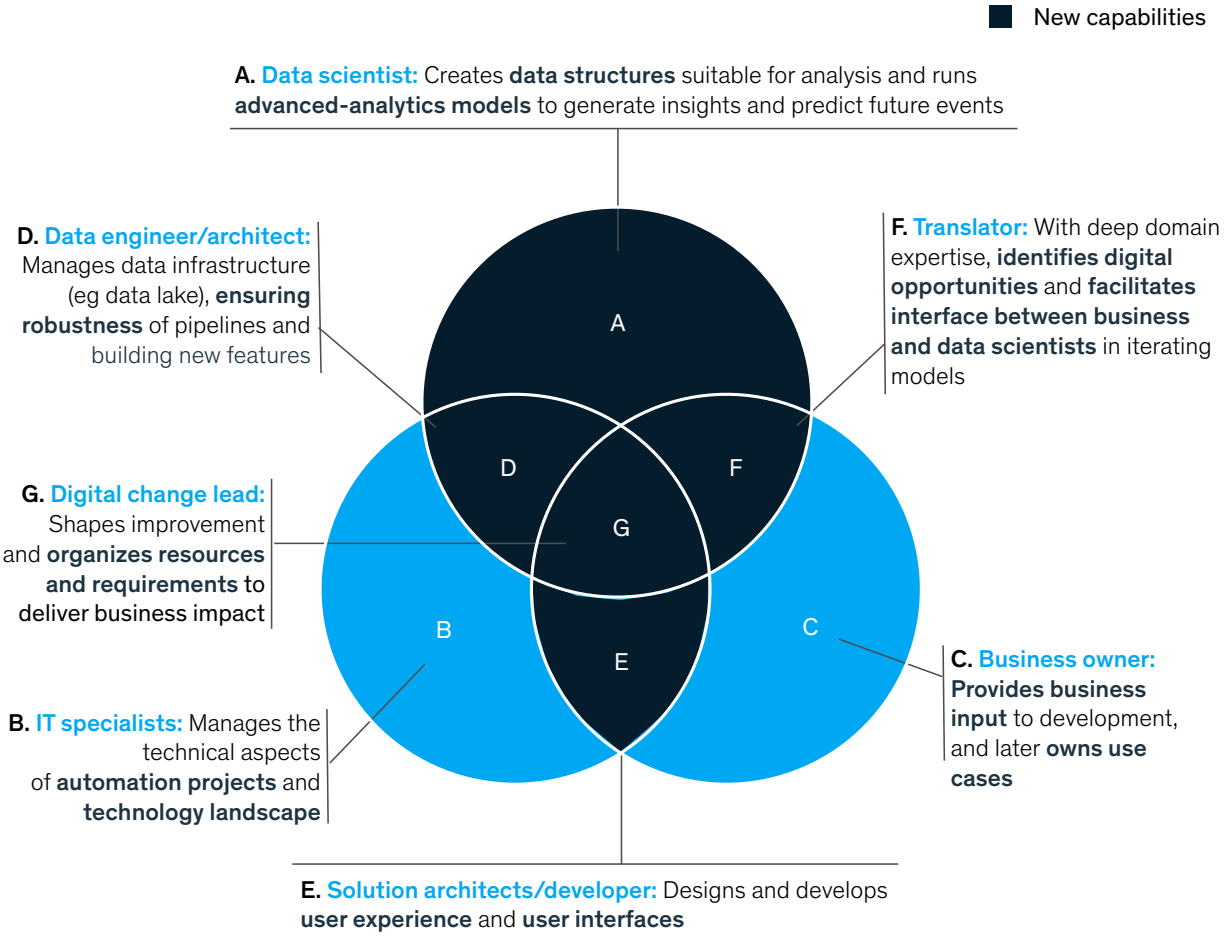
Scale deployment, capabilities, and technology

A company needs robust governance of innovation to develop value-driven use cases across its network on a continuous—preferably, industrialized—basis. The successful structures typically depend on some degree of centralization: an internal "lighthouse" site that has successfully implemented multiple 4IR technologies, for example, or an "agile studio" environment for experiencing agile working practices, or an "innovation hub" for ideation of new ideas. The insights these structures develop can then be replicated quickly across the business.

The structures also impose order, such as by categorizing use cases on the basis of maturity: in development, ready for industrialization, or scalable. It is important to have clear objectives and a set of rules on how to drive the development and scaling of the use cases, as well as promote positive collaboration across the network. Some sites will lead development, while others will industrialize use cases to be deployed at scale in the remaining sites.

Exhibit 3

To deploy the changes successfully, make structural investments into new capabilities.



In the future, these roles will represent ~1.5–2.5% of the operations organization, or 150–250 FTEs in 10,000-FTE operations organization

The effort to deploy and scale the use cases should leverage the company's shared library of approved applications and utilize formalized playbooks. For example, a global company identified priority use cases and was preparing to roll out digital manufacturing across its network. It invested in a joint effort by practitioners at selected sites and its global center of excellence (CoE) to capture and codify a use-case repository that included detailed how-to guides and tactical training material. The contents of the repository were made available for redeployment throughout the network.

The scale-up across the network should be formalized in a road map with adapted deployment models that best fit the organization's context and needs, scaling mechanisms, and a resourcing strategy. The sequence and timeline of scaling should reflect the company's priorities with regard to which use cases to implement,

where to implement them, and when to initiate implementation and scale up. The prioritization should take into consideration business needs, value at stake, potential ROI, and site readiness.

An organization can combine various roll-out options and tailor them based on its situation and maturity. These options include:

— A site-by-site rollout, with a dedicated team supporting each site's transformation and capability building

— Using an "academy" to transform multiple sites in parallel through structured on-the-ground capability building, with fieldwork to accomplish concrete changes between the training sessions

— A use-case propagation approach, in which specific, well-scoped initiatives are developed and rolled out across multiple sites, potentially in an accelerated fashion as no-regrets moves

— A hybrid model in which certain use cases have an accelerated roll out, while others are deployed more gradually in the context of a comprehensive site transformation

A digital CoE provides the required backbone for the digital transformation at scale and for supporting the sites. Early on, the company should clarify the CoE's overarching role at each stage of executing the road map. For example, to define the best value proposition for its CoE, a global company specified the following roles and responsibilities:

— Developing and codifying digital solutions, as well as new ways of operating in conjunction with the sites

— Providing and building digital capabilities at the site level and developing digital communities—for example, leveraging a "see, do, teach" approach that includes capability accreditation

— Delivering on-the-ground support and coaching for digital deployment to sites' leaders, change teams, and front lines to help them reach their targets; this includes, for example, using common playbooks to support change management, capability building, and sustainability

Finally, another major enabler of deployment at scale is ensuring the accessibility and scalability of data within a flexible technology architecture. Most companies will need to develop and transition to a future-state data and technology architecture—including data capture, extraction, consolidation, systems, tools, and site hardware. To develop this architecture, a company needs an integrated view of the potential use cases and the required data and technology. It must also take a longer-term perspective to sustain this new architecture by anticipating potential future technology development and disruptions. All of these elements should be linked to a syndicated future-state data and technology architecture design.

Establishing an architecture to meet future needs

To implement its use-case road map, a global company designed a data and technology architecture using a minimum viable architecture (MVA) approach—including the required technologies and tool stack down to site level. The architecture anticipates the critical features required to support the use-case road map, making it easily extendable over time. It also systematically standardizes practices for extracting data from legacy systems, with the potential to automate data-quality validations and highlight gaps between the actual and required data quality early on. Additionally, the architecture enables future scaling by re-using data engineering and analytics components through a repository of codes, data pipelines, and apps.

In many situations, external vendors will play a prominent role in deploying technology at scale.

A company must take a thorough approach to engaging with vendors, including during the selection, assessment, and feasibility studies, as well as the day-to-day development and collaboration phases. To maintain transparency and proper governance for important decisions and interactions, a company needs to deploy a streamlined and consolidated approach to vendor management.

Manage for impact

Starting from day one, a company must ensure that it captures the operational and financial benefits to enable a self-funding digital transformation at scale. To manage for impact, a company needs strong governance of performance and health. This includes assigning clear ownership, responsibility, and accountability within the business units and among the P&L owners—not within the CoE.

By rigorously managing the delivery of impact, a company can reach the hard-to-achieve targets. Sustaining the impact requires managing the health of the transformation with respect to the various requirements we have discussed—such as scoping, resources and capabilities, change story and communication, leadership commitment, and transitioning to the future-state data and technology architecture.

To work in an agile and iterative way, teams must adhere to strict governance. This includes starting sprints with the top deliverables identified, and having daily check-ins to align on priorities and actions for the day. At the end of a sprint, teams should review progress and address roadblocks, as well as consider how well the team collaborated and the opportunities for improvement. Strong governance also includes regular steering committee meetings to review achievements and critical risks.

Among the best practices we have observed is using a playbook to codify the approach to scaling and sustaining the transformation. The playbook could include a how-to guide structured in phases and specifying activities and deliverables, as well as use-case guides for each digital solution, detailed with all supporting elements.

Finally, as with any at-scale transformation, it is crucial to remember that change management is an integral part of the effort. Implementing technology solutions alone will not elevate performance!

Summing up: Best practices derived from our research and experience

Exhibit 4 summarizes the key elements of the scaling approach and highlights best practices relating to each.

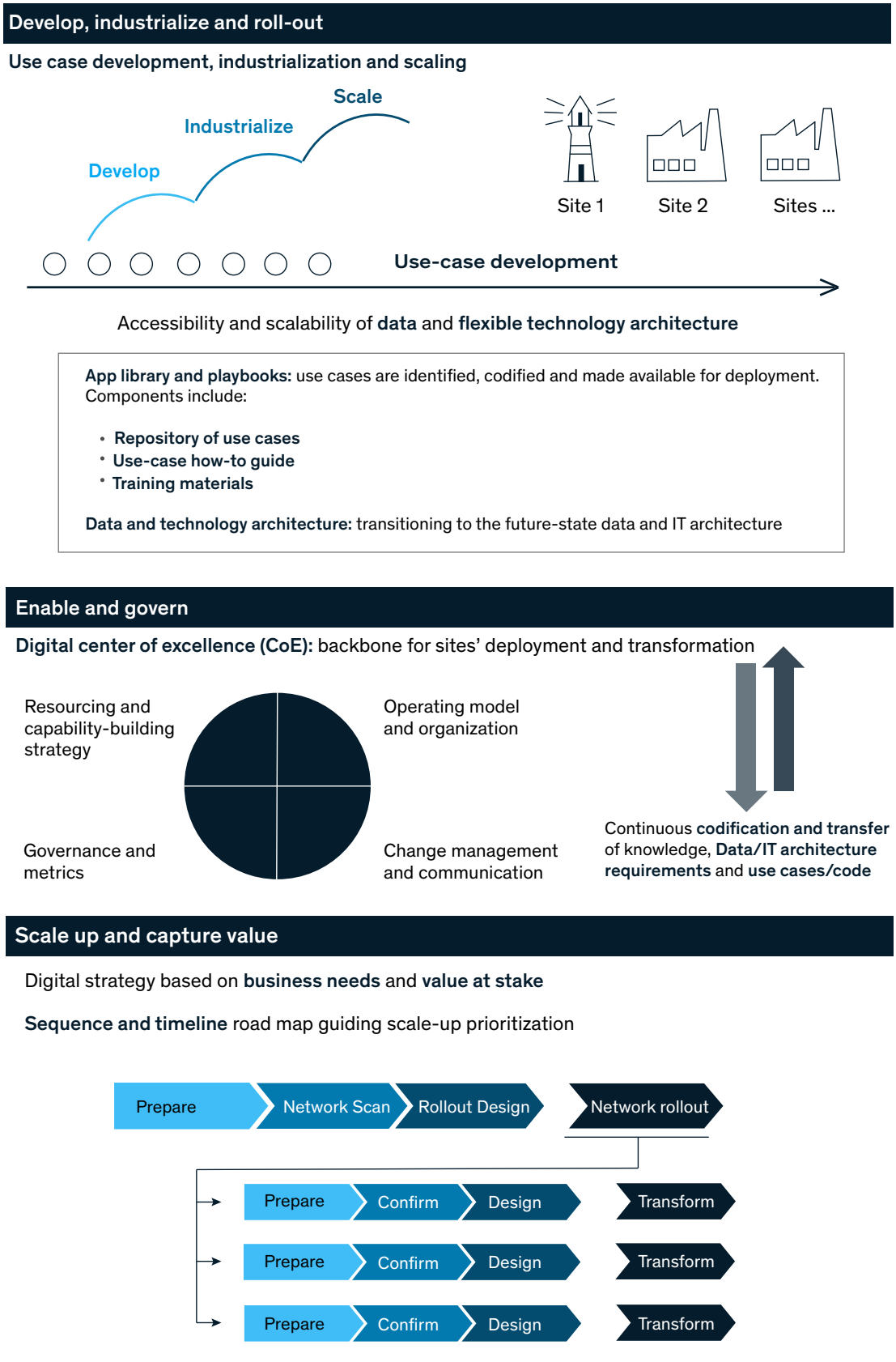
— *Development, industrialization, and rollout* usually start with a lighthouse (or set of lighthouses) to enable the development and industrialization of use cases. This also allows the organization to crack data-access challenges and begin to shape the technology architecture. The learnings are captured in a library of approved apps and playbooks that support the transformation, as well as in building the blueprint for the data and technology architecture needed in scale up.

— *Enablement and governance* are supported by a digital CoE that covers elements needed for sustainability, capability building and resourcing, and change management. The CoE is typically also a supporting mechanism for continuous codification and transfer of knowledge, data and IT-architecture requirements, use cases, and code when the transformation is eventually scaled up across a network.

— *Scale-up* is based on business needs and the value at stake, with prioritization made transparent on a well-defined road map. In scaling up, the company selects the most appropriate deployment models, whether site by site or use case (or a combination). It supports the efforts with playbooks and a "see, do, teach" approach to build capabilities and skills. As scale-up progresses, the learnings are continually codified back into the app library and playbooks and inform data and technology architecture needs.

Exhibit 4

The scaling approach covers rollout, governance, and value capture.



How should European manufacturing leaders prepare to transform at scale?

To assess a company's readiness to orchestrate a digital manufacturing transformation that integrates the five fundamental principles, leaders of manufacturing organizations should consider the following questions:

- Where would digital, robotics, and advanced analytics create the most value in your manufacturing network?
- What is your current ambition level for a digital transformation? What impact do you aspire to in the short term and medium term, respectively?
- How have you connected your digital strategy to your existing operations strategy?
- How advanced is your organization in its journey from digital development and piloting to at-scale deployment?
- Have you already established a lighthouse, agile studio, or innovation hub within your organization to support robust governance?
- What successes have you achieved? Which factors have been critical to success?
- What main challenges are you facing? What mitigation actions are you working on?
- How are you balancing the need for tangible change with the imperative for a quick return on investment?
- To what extent are you combining transformations of your business, technology, and organizational capabilities?

For many manufacturers, the answers to these questions will point to the need for a thorough reconsideration of their approach to digital transformation. Those that act quickly to orchestrate and sustain a digital transformation will be better placed to respond to the long-lasting changes in the operating environment resulting from the coronavirus pandemic. Moreover, the flexibility and resilience that digital will add to operations as manufacturing ramps up again once the current crisis is over, will allow those organizations that transform successfully to gain a significant advantage over slower-moving competitors. Now is the time to get started.

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Fashion's digital transformation: Now or never

Some apparel, fashion, and luxury companies won't survive the current crisis; others will emerge better positioned for the future. Much will depend on their digital and analytics capabilities.

by Antonio Gonzalo, Holger Harreis, Carlos Sanchez Altable, and Cyrielle Villepelet

The COVID-19 pandemic is simultaneously an unprecedented health crisis and a global economic shock. Amid the pandemic, the apparel, fashion, and luxury (AF&L) industry has moved quickly to address urgent public-health needs—closing stores, manufacturing much-needed items such as face masks and hand sanitizer, and making donations to healthcare and community organizations. At the same time, AF&L companies are grappling with COVID-19's business ramifications, including widespread job losses in an industry that provides livelihoods for millions of people worldwide.

Although no one in the industry foresaw the intensity of this crisis, some fashion companies are finding that they are better equipped than others—largely because of their digital know-how. In this article, we touch on COVID-19's impact on the AF&L industry to date. We then propose a set of actions that AF&L companies can take to build their digital and analytics capabilities—not just to ensure business continuity and minimize the downside of COVID-19, but also to emerge from the crisis in a position of strength.

A deepening digital divide

Our consumer-sentiment surveys, conducted in April, show declines in purchase intent of 70 to 80 percent in offline and 30 to 40 percent in online in Europe and North America, even in countries that haven't been under full lockdown.[1] E-commerce is clearly not offsetting the sales declines in stores. Nevertheless, it has been a lifeline for fashion brands as stores have been shuttered—and it will continue to be critical during and after the recovery period. In China, the return of offline traffic has been gradual, with 74 percent of Chinese consumers saying they avoided shopping malls in the two weeks after stores reopened.[2] This suggests that some percentage of offline sales could permanently migrate to e-commerce.

Digital is not only an increasingly important sales channel; it can also help companies adapt cost structures and make each step of the value chain better, faster, and cheaper. For example, digitization can enable new logistics and sales-fulfillment options (such as click-and-collect and drive-through), fuel innovative ways of customer acquisition, and help predict and manage inventory to create a more resilient supply chain. The fundamental enabler to all this will be data—the transparency, governance, and accuracy of which have never been more important.

This all portends a deepening digital divide. Even before the crisis, companies that were digitally and analytically mature outperformed competitors that hadn't built robust digital and analytics capabilities (Exhibit 1). The COVID-19 crisis has only widened the gap between industry leaders and laggards. For leaders with the ability and willingness to invest, the pandemic has clearly been an accelerator. As a top executive of a leading apparel player recently declared, "We've accomplished two years of digital transformation in two months."

Thus, for executives in the AF&L sector and all related subsectors (such as beauty products and sporting goods), the imperative is clear: make digital and analytics a core element of your company's strategy.

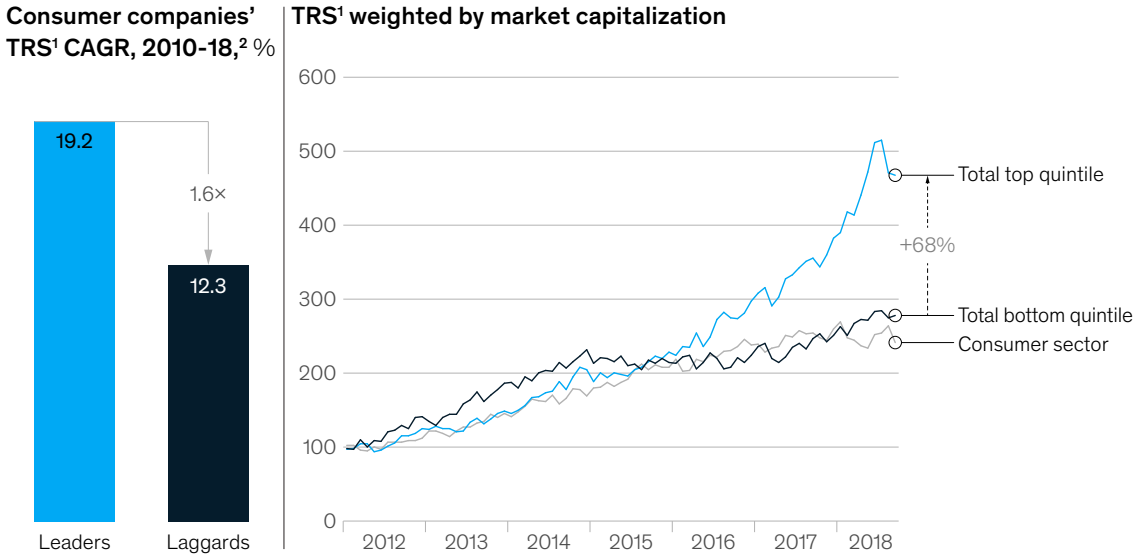
A number of trends in the post-COVID-19 world—the "next normal"—could make digital and analytics play an even more important role.[3] Physical distancing could continue, making consumers less likely to visit brick-and-mortar stores, and a contact-free economy could emerge—raising e-commerce and automation to a new level.

The implications of these trends will differ for each company, depending on its digital starting point and strategic orientation. Digital and analytics leaders (companies in which online sales account for 30 to 40 percent of total sales, parts of the value chain are significantly digitized, and online and offline channels are integrated to some degree) have an advantage today but could quickly lose it if other players accelerate their transformation.

[1] For survey findings by country, see "Global surveys of consumer sentiment during the coronavirus crisis," April 2020, McKinsey.com.
[2] McKinsey Chinese COVID-19 consumer-sentiment survey with field work March 21–23, 2020.
[3] Shubham Singhal and Kevin Sneader, "The future is not what it used to be: Thoughts on the shape of the next normal," April 2020, McKinsey.com.

Exhibit 1

Digital and analytics leaders outperform their competitors in total returns to shareholders.



[1] Total returns to shareholders.
[2] S&P 500 index, consumer sector.

Source: Capital IQ, McKinsey analysis

On the other hand, laggards (companies with less than 20 percent of total sales coming from the online channel, low digitization levels across the value chain, and siloed online and offline operating models) have an opportunity to make an "all in" bet on digital and analytics—and perhaps gain market share with smaller capital-expenditure investments, which used to be a limiting factor for many brands.

That said, digitization won't be a panacea. Companies should direct investments to areas in which the highest business value lies—which might not be in sales but rather elsewhere in the value chain. Equally important, companies should avoid "gold plating," aiming instead for the fastest minimum viable digital solution that will achieve the business goal. Finally, the sequencing of initiatives will play a big role in making a company's digital transformation as self-funding as possible.

Navigate the now: Immediate priorities

The health and safety of employees and customers, of course, has been—and remains—the absolute priority. By now, AF&L companies have closed stores, introduced new hygiene and safety processes in warehouses and distribution centers, and set up digital tools for remote working and collaboration.

Although the situation remains uncertain and is evolving daily, there is a clear set of actions involving digital and analytics that AF&L players should implement now to keep the business going, stem sales losses, and plan the comeback.

Engage with customers in an authentic way

Email, social media, and other digital channels have seen significant spikes in usage during the crisis (Exhibit 2). AF&L brands must therefore continue to communicate frequently with consumers, even

if most consumers aren't currently spending. Use digital channels to launch genuine, purpose-driven communications regarding health, safety, business continuity, and community building. If you decide to send consumers relevant content, be sure to do so in an appropriate and empathetic tone (for example, a global sports-apparel player now offers yoga lessons on Instagram).

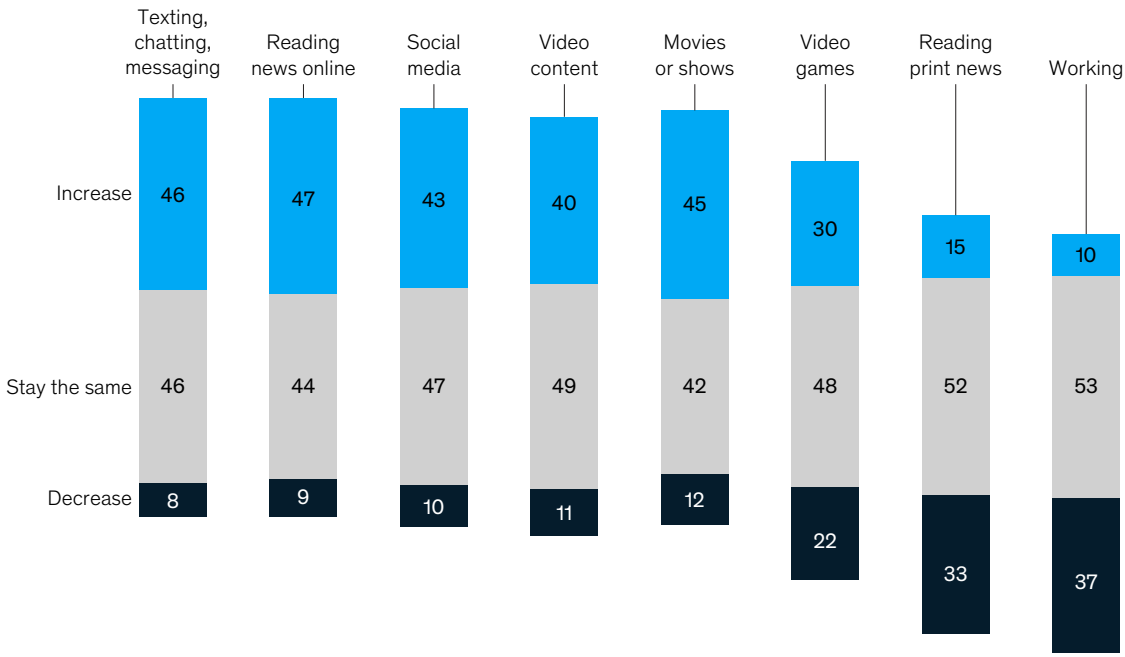
Whether it's a personalized offer or outreach from a personal stylist, the best brands are maintaining customer relationships even while stores are closed. Staying in touch with your most loyal customers doesn't just keep your brand on top of mind but also helps to boost sales. On a leading Chinese e-commerce platform, transaction volume for fashion-brand miniprograms (brand-powered apps embedded within the platform's interface) more than doubled between January 2020 and February 2020, during the peak of China's outbreak.

[4] Similarweb, April 19, 2020, similarweb.com.

Exhibit 2

Consumers are spending more time online during the crisis.

Change in time spent on select activities,[1] % of respondents



35%
of consumers browse for fashion inspiration in online shops at least once per week

22%
of consumers state they will browse for inspiration online more often in the next 4 weeks

10%
of consumers think brands should not promote their own interests at this time of crisis

[1] Question: Over the next 2 weeks, how much time do you expect to spend on these activities compared to how much time you normally spend on them?

Source: McKinsey COVID-19 Consumer Pulse Survey, Apr 1–Apr 6, 2020, n = 5,000+; McKinsey COVID-19 Apparel & Fashion Survey, Mar 27–Mar 29, 2020, n = >6,000

Refine and scale up your online operation

We expect the online share of fashion and apparel in Europe and North America to increase by 20 to 40 percent during the next 6 to 12 months. In April, traffic to the top 100 fashion brands' owned websites rose by 45 percent in Europe.[4] Some of the larger players have even reduced their promotion intensity to be able to handle the volume of orders.

Delivering an excellent customer experience online is crucial, so reallocate your resources and shift management attention from offline to online. Also, scale up capabilities in both demand generation and fulfillment (Exhibit 3). Seek to eliminate points of friction in every part of the online customer journey—for example, by improving your website's search function and expanding your online assortment. Some retailers have redeployed store personnel from closed stores to support online fulfillment or to assist consumers via digital call centers.

While most AF&L players already have an e-commerce presence, some still don't. Companies without one can launch a basic online platform in 10 to 15 weeks. A private-equity-backed retailer did it in 13 weeks (Exhibit 4).

Prioritize digital-marketing levers as demand rebounds

In anticipation of a shift toward online sales, allocate more of your marketing budget to digital channels. Establish or improve your digital-marketing "war

Exhibit 3

Companies must accelerate their online capabilities in both demand generation and operations management.

Example levers

Accelerate demand

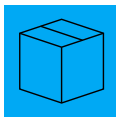
Relevance, awareness, and traffic

- Simplify range, prioritize essentials to meet immediate demands of new customer traffic
- Launch contextual and personalized campaigns across marketing channels
- Allocate budget to highest-impact targeted paid channels (eg, Facebook, Instagram, search-engine advertising)
- Adjust search-engine optimization and other nonpaid channels to situation (eg, refine keywords)
- Shift focus from brand building to performance marketing (including budget reallocation)

On-site and conversion

- Tailor on-site messaging to address current situation (eg, contextual landing page with special content for COVID-19 situation)
- Launch and optimize targeted markdowns and promotions to wind down forecasted stock excess
- Optimize on-site product assortment and display (eg, focus on top SKUs)
- Introduce bundles (eg, family boxes), special offers (eg, free shipping, 3-for-2), and innovative discounts

Manage operations



Stock and fulfillment

- Strengthen supplier relationships, especially for priority SKUs (eg, CEO meeting)
- Prioritize SKUs and ensure sufficient stock allocation (eg, longer inventory days for high-demand SKUs)
- Ensure omnichannel management of stock, fulfilling online orders from best online or offline location to optimize overall stock positioning
- Prepare fulfillment and customer-support capacity for increased demand
- Staff temporary resources as needed
- Identify scenarios and plan for worst case; work with government authorities to understand guidelines

Loyalty

- Focus on user interface and user experience (more important than ever as customers are more willing to switch brands at this time)
- Leverage customer relationship marketing and maximize frequency of email and app push campaigns
- Investigate opportunity to create special offers for loyal customers
- Focus on contactless delivery (delivery staff training, communication) to match customer expectations
- Communicate proactively with customers (eg, email from CEO to address situation)

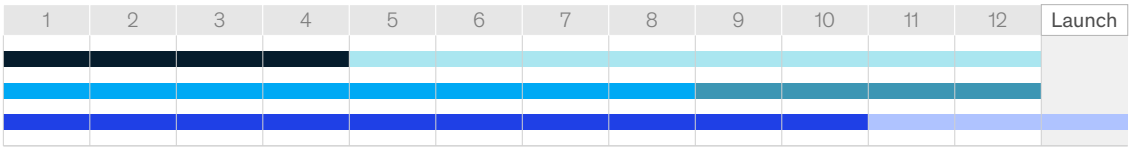
Exhibit 4

A retailer built and launched an e-commerce platform in 13 weeks.

Launch timeline, weeks

Company Private-equity-owned retailer with 1,000 physical stores but no online presence

Impact More than 400% week-on-week growth rates in online sales within the first month



Assortment/ merchandising
Decide on online assortment and prepare product pages (eg, photos, details, measurements)

Design
Design online store, prepare minimum viable product, integrate digital marketing tools, test prototypes, and make new design iterations

Technology Development
Build tech foundation; integrate online store with warehouse-management system

Operations
Set up warehouse processes to handle online orders; onboard new warehousing staff and set up customer-service team

Marketing
Develop and execute marketing plan, including search-engine optimization, in-store advertising, and launch strategy

Getting ready for launch
Track objectives, key results, and key performance indicators; maintain budgeting; set up tracking tools

room" and increase its visibility in the organization—for instance, by establishing a C-level digital-performance dashboard that provides a cross-channel view of e-commerce, customer relationship management, and social media, thus enabling rapid identification of opportunities for efficiency optimization or growth.

Retrain your look-alike models to capture value from the new consumer segments and behaviors that have emerged during the crisis. Upgrade your digital-marketing activity to be best-in-class—for example, by adding sophisticated imagery to your social-media posts and conducting "social listening" to inform the development of new services and offers.

Use granular data and advanced analytical tools to manage stock

The value of excess inventory from spring/summer 2020 collections is estimated at €140 billion to €160 billion worldwide (between €45 billion and €60 billion in Europe alone)—more than double the normal levels for the sector. Clearing this excess stock, both to ensure liquidity and to make room for new collections, will become a top priority.

At the best-performing companies, an "inventory war room" uses big data and advanced analytics to first simulate dynamic demand scenarios specific to locations (channel, country, store) and SKUs, then to synthesize the resulting inventory risk—thus enhancing decision making. The war room decides, for example, whether to redistribute SKUs, transfer inventory to future seasons, or accelerate markdowns (Exhibit 5). A company's investments in developing advanced analytical tools to steer markdowns during the crisis will pay off almost immediately.

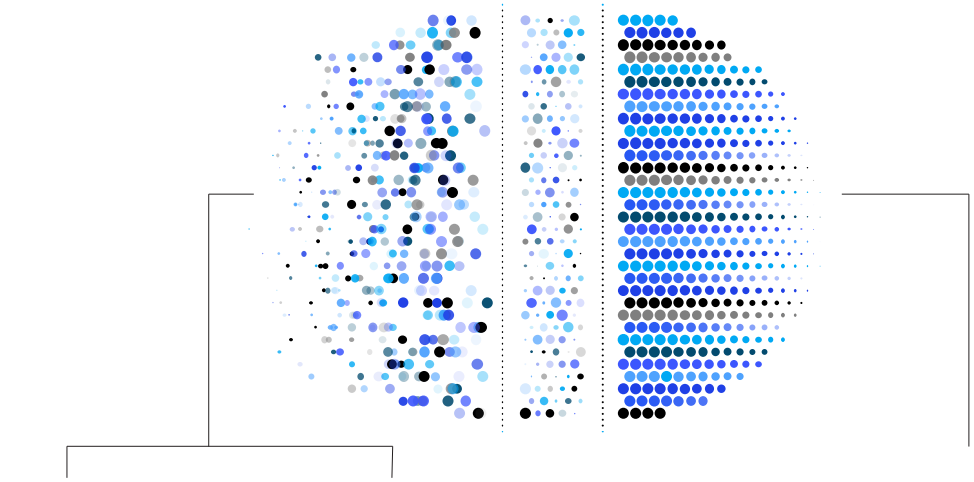
Optimize costs using a zero-based approach

In light of crisis-related sales decreases, cutting costs is an obvious imperative for most companies. However, reducing all budget lines across the board is risky. We recommend a zero-based budgeting approach instead.

Identify two categories of projects: critical projects linked to core digital and analytics priorities that must proceed as planned or at a slightly lower speed (for example, building a new data lake to enable personalized marketing) and core projects that can be delayed (such as those that don't enable

Exhibit 5

Using analytics, a company can quickly build sell-through scenarios and synthesize resulting inventory risk.



Required data

- Sales, units, cost, and price by item, by store, and by week
- Inventory at a granular level by item by week
- Possibility of selling in-store inventory online
- Existing product hierarchy
- Existing store master file
- Season-indicator data

Optional data

- Sell-through plans at best available level of detail
- Product-attribute data (standard or custom)
- Product-level e-commerce data (eg, clicks per day)
- Category-level sales breakdown

Analytics

- Ingest, blend, and interpret up to 20 terabytes of data, then combine data with projections from leading global health organizations, business decisions (such as when to open doors by state), and economic-recovery scenarios

Output

- Granular understanding of the "baseline" scenario across styles, channels, and locations
- Forecast networkwide performance during the crisis, variations across the footprint
- More granular understanding of cash required by scenario

emergency response). Continue only the projects that fall into those two categories; stop all others. A range of savings levers—such as vendor renegotiations and tactical moves to the cloud—can help dramatically reduce your operating costs. Reset your digital and analytics priorities and budget and adapt them to a post-coronavirus world.

Shape the next normal: Longer-term strategic actions

Although time frames remain uncertain for now, AF&L players should start planning how they'll compete in—and perhaps even influence—the industry's next normal. Consumer habits, companies' interactions with consumers, and the number and types of touchpoints will all change. The requirements for supply-chain speed and flexibility will continue to increase. Digital and analytics will play a critical role in helping companies emerge stronger from the crisis.

Set an ambitious aspiration and define a clear road map

A digital and analytics transformation is typically an 18- to 24-month journey, requiring an ambitious aspiration, a clear plan, and concrete milestones. In our experience, successful digital and analytics transformations have the following elements in common:

— Strong support (or even direct sponsorship) from the CEO during the entire journey.

— A pragmatic approach that starts with an understanding of the consumer and the drivers

of value creation; digital for digital's sake will not deliver results.

— A clear road map and prioritization of initiatives, combining actions that help set up the enablers for the organization with the implementation of use cases that generate quick wins.

— A focus on getting to a minimum viable product (MVP) within two to three months—a rapid timeline that allows the company to iterate while generating value, avoiding large up-front investments.

— A central team to monitor value capture. This team also helps build the road map by scanning opportunities, allocating budgets, and coordinating implementation, ensuring that all efforts are focused on delivering tangible impact rather than gold plating.

— Well-defined key performance indicators (KPIs) to measure success.

The first step in the transformation program should be the definition of digital priorities, which will differ based on each company's business model and digital starting point. Digitization is much more than just selling online; a quick diagnostic may be required to select and align on key value areas.

Typically, digital and analytics priorities can be categorized according to their place in the value chain: customer experience (front), distribution and supply chain (middle), and product development and support functions (back). Exhibit 6 shows high-impact use cases in each of these three areas.

Provide an excellent omnichannel experience

The pandemic has elevated digital channels as a must-have for AF&L players. Therefore, take this opportunity to leapfrog into the digital arena by making it the center of your operating model: move your traffic- and engagement-generation engine to digital, and leverage digital channels to drive store traffic and vice versa.

Besides scaling up digital sales efforts, reconfigure your store footprint accordingly—for example, by reducing presence in "B" areas (markets with lower population density and lower profitability per square meter), devoting less store

Exhibit 6

Digital and analytics can transform domains in every part of the apparel value chain.

Customer experience (front)

- Seamless omnichannel experience
- Personalized customer journeys, activations, and promotions to maximize customer value
- Prescriptive merchandising optimization
- Online artificial-intelligence-powered sales associates
- Markdown optimization powered by advanced analytics (AA)
- Shelf, format, and macro space optimization
- Store of the future

Supply chain and distribution (middle)

- Allocation of new collection merchandise (no sales historical record)
- AA-powered granular demand forecasting and replenishment
- IoT-enabled warehouse optimization and automation
- Optimal warehouse picking and slotting
- End-to-end digitized supply-chain planning
- AA-powered network, transport, and route optimization
- Platform for last-mile delivery

Product development and support functions (back)

- Digital collection development and management
- End-to-end digitized product management (including design, virtual sampling, production visibility)
- Digitized and robotized finance and back-office processes
- Talent and HR analytics

Digital and analytics can not only drive top-line growth but also significantly improve speed, cost, flexibility, and sustainability across the supply chain.

space to product categories with high online penetration, experimenting with innovative formats (such as drive-through windows or pop-up stores), and making it easy for customers to perform any omnichannel operation, including complex ones (such as buying online from a store if the product isn't in stock there, and then picking it up from another physical store in the next 12 hours). Use data and analytics to tailor the assortment in each store and to streamline and optimize assortments overall.

In our experience, fully integrated management of stock in stores and warehouses is core to any omnichannel operation. Making all stock (even stock shortly arriving to warehouses) visible to customers in any channel has proved to boost sales.

Bet on personalization

Personalization has helped several industry players achieve 20 to 30 percent increases in customer lifetime value across high-priority customer segments. It has proved even more valuable in subsectors with more stable and predictable purchasing patterns, such as beauty products.

Use cases for personalization have mostly centered on personalized offers, personalized promotions and benefits (such as access to new products), and reductions in generic traffic-generation costs. To go further, add personalization capabilities to your digital war room—for example, by collecting and analyzing all the available data to generate detailed insights about your customers. Build actionable microclusters based on customer behavior. For instance, entice the highest spenders with special incentives (such as triple loyalty points for purchases of at least $1,000), target customers who tend to buy in the categories where you have the largest inventory buildup, and give online customers coupons to redeem in-store once physical stores reopen.

Prioritize use cases based on your business context, advanced-analytics capabilities, and customer segments. Create a prioritized use-case road map and a technology-investment plan. Integrate personalization into all delivery channels to ensure consistency in your customer communications.

Leverage big data and analytics to manage the supply chain

Digital and analytics can not only drive top-line growth but also significantly improve speed, cost, flexibility, and sustainability across the supply chain. For instance, some leading companies are using radio-frequency identification (RFID) to track products more precisely and reduce in-store merchandising manipulation. Companies' RFID investments typically yield operations simplifications and service-level improvements.

In addition, automating logistics through digital warehouse design and predictive exception management can significantly increase efficiency. The benefits will flow to consumers as well—in the form of better product availability and faster, cheaper, and more accurate deliveries. Leading online players, for example, are using models

powered by artificial intelligence (AI) to predict sales of specific products in certain neighborhoods and cities, then stocking the predicted amount of inventory in nearby warehouses.

Digitize product development and support functions

During the COVID-19 crisis, the digitization of product development has proved to be a competitive advantage. Companies that were already using cutting-edge tools such as 3-D product design, virtual sampling, digital material libraries, and AI-supported planning have fared better than their peers during the crisis. Their designers and merchandisers can react faster to market trends, significantly reduce both sample costs and time-to-market, and collaborate remotely across teams. The past several weeks have shown that it's possible to do much more on this front than some in the industry initially thought. Indeed, the pandemic may have shattered historical preconceptions and biases against digitization in core product-development processes.

Digitization of support functions is another key lever for improving efficiency. By automating repetitive tasks in back-office functions such as indirect purchasing, finance, legal, and HR, you can simultaneously reduce costs and free up time and resources to reinvest in more valuable activities. Companies that have automated their finance processes—such as claims collection and financial reconciliation—have found that they've also increased the agility and accuracy of these processes while capturing significant synergies. Speed up the digitization of all support functions through robotic process automation and other leading-edge technologies.

Build data and tech enablers to support your transformation

Technical enablers play a key role in powering digital and analytics growth. In our experience, three core principles are the most relevant:

— Use cloud infrastructures to sustain scaling and to access best-in-class services, particularly for use cases that best benefit from the cloud's features (for instance, data consumption across the globe, very high storage and processing needs).

— Think data from the start. Build solid data foundations as part of every digital and analytics initiative in a way that allows rapid scaling and forward compatibility. Design and build out pragmatic data governance focused on enabling business value by helping to ensure data breadth, depth, and quality. Establish a strong data culture and ethics.

— Design your technology stack for faster integration and development, with applications broken down into microservices and isolated through the use of application programming interfaces; use unified DevOps toolchains to enable automation and reduce time-to-market to a matter of hours instead of weeks.

These enablers shouldn't become causes for delay. Rather, they should follow the same agile timelines and sprints as the core initiatives. Implementation should be pragmatic and clearly linked to value generation.

Attract and retain top digital talent

After the crisis, financially stable companies may be able to attract top-notch digital talent, including in-demand profiles such as digital-marketing specialists, data scientists, data engineers, user-experience and user-interface designers, and software and data architects. Retaining these kinds of employees will require AF&L companies to develop new talent processes—with tailored initiatives in recruiting, career growth, learning and development, and performance management—specifically for engineering and digital talent, similar to what many fashion players already do for designers and creative directors.

In addition, AF&L players should adopt agile ways of working to speed up development of digital and analytics products and projects. Agile techniques enable companies to release MVPs into the marketplace quickly and refine them iteratively based on consumer feedback.

There's no denying that the COVID-19 pandemic will make for a difficult 2020. For some AF&L companies, even survival may be a struggle. However, if they lead with empathy and undertake bold actions in digital and analytics—particularly around e-commerce, data-driven stock management, and digitization of key functions—we believe they can not only endure the crisis but also build competitive advantage and strengthen their business for an omnichannel, digital-centered next normal.

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Restore and reimagine: Digital and analytics imperatives for insurers

As the world recovers from the COVID-19 crisis, insurers should invest in digital and analytics capabilities that will make them more customer-centric, simple, tech driven—and competitive.

by Ramnath Balasubramanian, Krish Krishnakanthan, Johannes-Tobias Lorenz, Sandra Sancier-Sultan, and Upasana Unni

When the world paused (and reorganized) its usual activities to contain the spread of COVID-19, many insurers demonstrated great resolve. As operations stabilize—even as the macroeconomic environment does not—the next phase must be focused on embedding resilience and flexibility in organizations and reimagining insurance for the next normal.

The COVID-19 crisis will cause structural shifts that will have significant implications for the insurance industry. An extended period of volatility, uncertainty, and depressed economic activity will accelerate ongoing changes in consumer behavior, needs, and expectations. Some of these shifts will be irreversible.

Demand for digital interactions will spike and stay elevated. In such an environment, digitally enabled intermediaries and digital-only sales models are proving to be effective and may be accelerating the winner-take-all trend.

Customers will also be more acutely aware of their personal and health risks and will demand solutions to help them better manage these risks. These shifts, combined with ongoing economic pressures, will require insurers to develop radically simple solutions, highly efficient operating models, and consistently innovative business models.

Accelerating investments in digital and analytics initiatives that have long been under consideration is a crucial strategic choice. Such investments can be the difference between slowly declining and flourishing. Indeed, our research shows that across sectors, revenue growth (as measured by the five-year compound annual growth rate) for digital leaders is on average four times that of companies that only dabble in disjointed digital initiatives.[1] For many insurers, capturing the business value of digital and analytics capabilities will require rapid upgrades to technology platforms. Insurers have no time to lose.

Restore and reimagine

Strategic investment in comprehensive digital and analytics capabilities will help insurers develop a more detailed understanding of their clients and determine the best ways to serve them. The work is not only about technology; it will also require significant investments in reskilling (and upskilling) employees and reimagining the way they work.

Insurers should prioritize seven crucial digital and analytics imperatives.

1. Digital upgrades for all channels

Human interaction will remain pivotal in the future, but stakeholders will expect all interactions to have digital support. For instance, field agents will adapt to remote selling with prioritized leads for the "next-best conversation."[2] Insurers will also use analytics-derived segmentation to ensure retention, which is especially important during the pandemic, and to support cross-selling to microsegments. By going digital, intake functions will support rapid information gathering and become consistent for all customers and intermediaries. This consistency will be empathetic and low-stress for customers. Finally, insurers will use digital and analytics capabilities to shape remote recruiting for intermediaries and service staff.

Such digital and data-driven interactions are already in use. One North American financial-services company uses proactive prospecting, which predicts which prospects will have the highest value, to increase their top advisers' volume of new business by 10 to 15 percent.

2. Customer lifetime value for better retention and continuous engagement

Retaining and growing revenue from an existing customer is usually a better bet than acquiring new clients. During the pandemic-fueled crisis, insurers should therefore find ways to be relevant

[1] For more on becoming a leading digital company, see Tanguy Catlin, Jay Scanlan, and Paul Willmott, "Raising your Digital Quotient," June 2015, McKinsey.com.

[2] The "next-best conversation" applies analytics to an organization's existing data and knowledge about its customers to suggest ways to engage them.

During the pandemic-fueled crisis, insurers should find ways to be relevant to their customers and engage them.

to their customers and engage them. Customer engagement in this context requires an insurer to understand the customer's lifetime value through the lenses of acquisition costs, insurance risks, cost to service, cross-sell potential, and retention. While some insurers are already promoting retention with auto-premium refunds and up-front commission payouts to brokers, maintaining a clear view of economic viability and customer value will be key to long-term recovery. Following the crisis, insurers can further prioritize and improve customer engagement by continuously fine-tuning their understanding of customer value.

3. Friction-free underwriting and granular pricing
Digital quoting and purchasing are becoming must-haves for all types of insurers. In life insurance, AI engines can enable fluid-free underwriting informed by public and private data—accessed with customers' consent. In property and casualty, auto insurers have launched mobile apps that allow customers to get an instant quote by submitting a photo of their driver's license.

Despite the importance of digital solutions, many insurers struggle to fully digitize onboarding across business lines. These incomplete digital onboarding experiences often lack core functionality in areas such as document verification, payments, and digital signatures. With no in-person option to accomplish these tasks, insurers should prioritize comprehensive digital onboarding now. More-granular pricing (based on better data capture) is a key way to finance these investments. For example, a European insurer improved the combined ratio of its small- to medium-enterprise business by more than five percentage points over three years with enhanced loss-prediction modeling and automated underwriting decisions.

4. AI-driven capabilities for more empathetic service
Insurance clients tend to look for clear answers during times of uncertainty. Digital capabilities for the service organization, particularly the call center, will be critical to offering empathetic service. Some insurers use AI to transfer information between channels and create a seamless omnichannel experience, letting chatbots and virtual agents provide quick service and transferring customers to traditional agents as needed. Insurers with a good understanding of why customers are calling can optimize calls and route them to the most appropriate service professionals.

5. Next-generation claims model from intake to payout
Companies with the capabilities to tap their troves of claims data can create predictive models that significantly improve claims outcomes. They can conduct more effective return-to-work monitoring, for example, and create better guidelines for workers' compensation and disability. Others will improve severity prediction and early intervention, including identification of claims likely to jump in severity, such as short-term disability claims that become long-term disability claims, auto bodily injury claims, and worker's compensation claims. A North American auto insurer produced a 3 to 5 percent improvement in payout accuracy

for auto bodily injury claims and a 5 to 8 percent improvement in settlement time by using a predictive severity model to identify which claims should be sent to specialized claims handlers.

Claims are a promising area for mining additional value. Insurers should invest in digital capabilities for straight-through and low-touch claims processing—starting with digital-first notice of loss.

6. Workforce reskilling and new ways of working

To remain at the forefront of the industry, insurers will need to have numerous employees with the right technical skills and the commitment to continuously upgrade these skills. Hiring the digital talent needed to drive the necessary digital and analytics transformation can be expensive and time consuming. In response, leading insurers are investing in long-term reskilling and upskilling to harness the capabilities of their existing workforce through personalized digital learning.

In parallel, insurers are accelerating the adoption of agile practices. Several insurers across North America, Europe, and Asia have started to reorganize into agile tribes and squads that cut across business, IT, and other support functions. Switching to agile ways of working helped these insurers bring their products to market two to four times more quickly, improved customer satisfaction scores by 10 to 25 percent, and raised productivity by 10 to 30 percent.[3]

Finally, leading insurers use talent-to-value diagnostics to ensure that they match the right talent to high-value processes, all while building the most important capabilities when reskilling the workforce.[4]

7. New products and ecosystems

Insurers should aspire to become more relevant to their customers—to position themselves not just as claims payers but as partners that help prevent losses and support customers through challenges. Now could be a good time to innovate and scale up work on new products and ecosystems that reflect new customer needs—for instance, in health and prevention.

Ecosystems can also enable new growth,[5] help attract and retain customers, and make products more viable. Some innovative insurers are partnering with external players to offer customers a full suite of services through external application programming interfaces (APIs) and warm handoffs between companies. Insurers should identify partnership opportunities that align with their business strategies and focus on a few partnerships that can deliver value at scale. This approach helps maintain focus and maximize payoff when working with partners and within ecosystems.

Insurers should not postpone their digital and analytics agendas. They can approach the current moment as a chance to reimagine and rapidly prioritize upgrades in their technology platforms. The time to act—and to tap into the resulting business value—is now.

[3] For more on agile organizations, see Wouter Aghina, Karin Ahlback, Aaron De Smet, Gerald Lackey, Michael Lurie, Monica Murarka, and Christopher Handscomb, *The five trademarks of agile organizations*, January 2018, McKinsey.com.

[4] For more on linking talent to value, see Mike Barriere, Miriam Owens, and Sarah Pobereskin, "Linking talent to value," *McKinsey Quarterly*, April 2018, McKinsey.com.

[5] For more on deriving value from ecosystems, see Tanguy Catlin, Ulrike Deetjen, Johannes-Tobias Lorenz, Jahnavi Nandan, and Shirish Sharma, "Ecosystems and platforms: How insurers can turn vision into reality," March 12, 2020, McKinsey.com.

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Inside a mining company's AI transformation

How copper-mining giant Freeport-McMoRan unlocked next-level performance with help from McKinsey data scientists and agile coaches.

by Red Conger, Harry Robinson, Richard Sellschop

The mood was apprehensive as data scientists, metallurgists, and engineers from Freeport-McMoRan filed into the control room of a copper-ore concentrating mill in Bagdad, Arizona, on the morning of October 19, 2018. They had come to learn what would happen when they cranked the big mill up to a work rate that had never been tried.

The possibility of causing problems at the mill weighed on everyone's mind. The team members had initially resisted the idea of running the mill faster. They wanted to keep the stockpile of ore that feeds the mill from dropping below the minimum size they had long maintained. Their concern was that a too-small stockpile would hamper the mill's performance.

Whether the minimum stockpile size actually helped the mill run better was another matter. No one really knew for sure. Nor could the mill's managers and staff say what would happen if the stockpile shrank to less than the traditional minimum.

As the weeks went by, the copper-ore concentrating mill sustained a faster pace with no loss of efficiency. The data model had been right: the mill could handle more ore than its operators thought.

What they did know is that a custom-built artificial-intelligence (AI) model, loaded with three years' worth of operating data from the mill and programmed to look for operational tweaks that would boost output, kept saying copper production would rise if the mill were fed with more ore per minute.

To the mill operators, that notion sounded logical enough—except that it didn't account for the minimum stockpile size they had in mind. But the model didn't know, or care, about minimum stockpile size or any of the mill operators' other ideas about how the mill ought to be run.

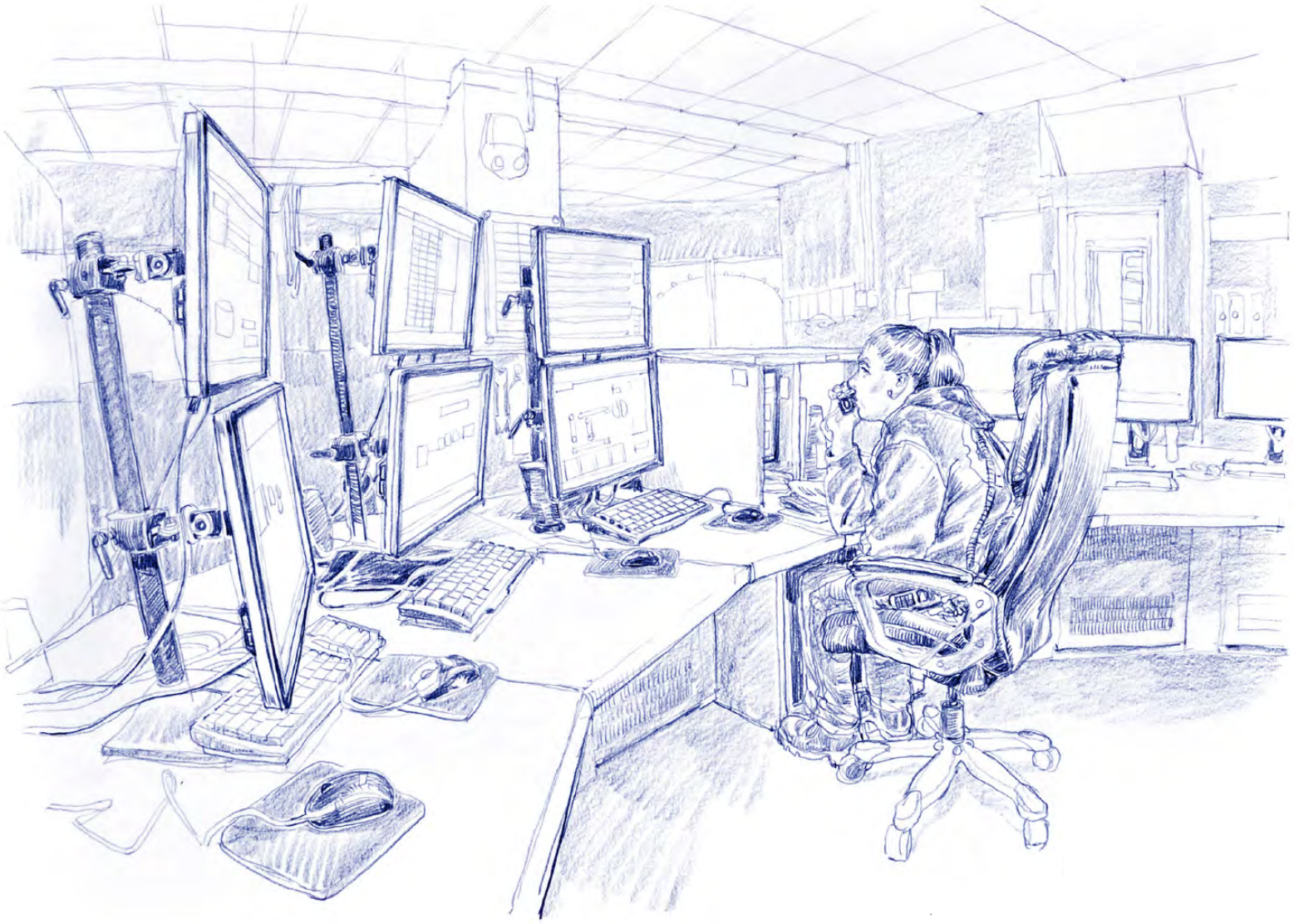
With permission from company executives, the crew members at the Bagdad site decided to turn up the pace of the mill as the model had suggested. They also prepared to ramp up mining and crushing activities so the stockpile of ore wouldn't run out.

At ten o'clock in the morning, a technician clicked a control on his computer screen to speed up the system of conveyor belts carrying chunks of ore from the crusher to the stockpile and from the stockpile to the mill.

Everyone in the room kept watch on the 13 oversize monitors in the control room, which were lit up with readings from hundreds of performance sensors placed around the mill. The quantity of ore grinding through the mill rose. No warnings went up.

Twelve hours passed. The mill held steady. Even when its stockpile of ore dipped below the usual minimum, the accelerated delivery of ore from the crusher and the mine allowed the mill to keep going. As the weeks went by, the mill sustained the faster pace with no loss of efficiency. The data model had been right: the mill could handle more ore than its operators thought.

"That was the breakthrough we'd been looking for," Justin Cross, the Bagdad site's general manager, told us. "Once we started to run the mill at full speed, we knew we could get results from more of the recommendations that the model was making."



Grinding-mill operator Megan Alford monitors the bank of screens displaying details of the copper ore churning in the main mill just beyond the glass.

The ‘age of the operator’

The story of how Freeport-McMoRan learned to rely on an AI model as much as the intuition of veteran mining engineers and metallurgists might not raise eyebrows outside the tech industry.

For mining companies, though, it illustrates a quiet but profound shift into an era we think of as the “age of the operator,” when the best-run businesses wring profits out of low-grade ore that miners would have waved off as waste just ten years ago.

One mine where Freeport-McMoRan had been processing declining ore grades is Bagdad, a sprawling Arizona complex where prospectors staked their first claims in 1882. Bagdad’s reserves of higher-grade ore have been depleted for some time, but Freeport-McMoRan has sustained the mine’s production of copper by making various process improvements.

By the end of 2017, executives believed that Bagdad had gotten as efficient as it could get with its existing equipment, so they reasoned that adding capacity would be the surest way to get even more copper out of the site. Early in 2018, they started planning a $200 million capital expansion of Bagdad’s ore-concentrating mill that would lift production by 20 percent.

Copper prices were high at the time. The investment looked certain to pay off.

Then copper prices dropped from a five-year peak of around $3.30 per pound in early June to $2.75 or so a month later. All of a sudden, investing $200 million to expand Bagdad no longer seemed practical.

Instead, Freeport-McMoRan’s leaders resolved to find new process changes that would increase Bagdad’s copper output without a massive injection of capital.

Discovering improvements at an efficient mine wouldn’t be easy. But Freeport-McMoRan had plenty of high-quality information to study. Around ten years before, Bert Odinet, Freeport-McMoRan’s chief information officer, coordinated an effort to standardize the way that each site measures and reports its performance and to build a central data warehouse for storing those measurements.

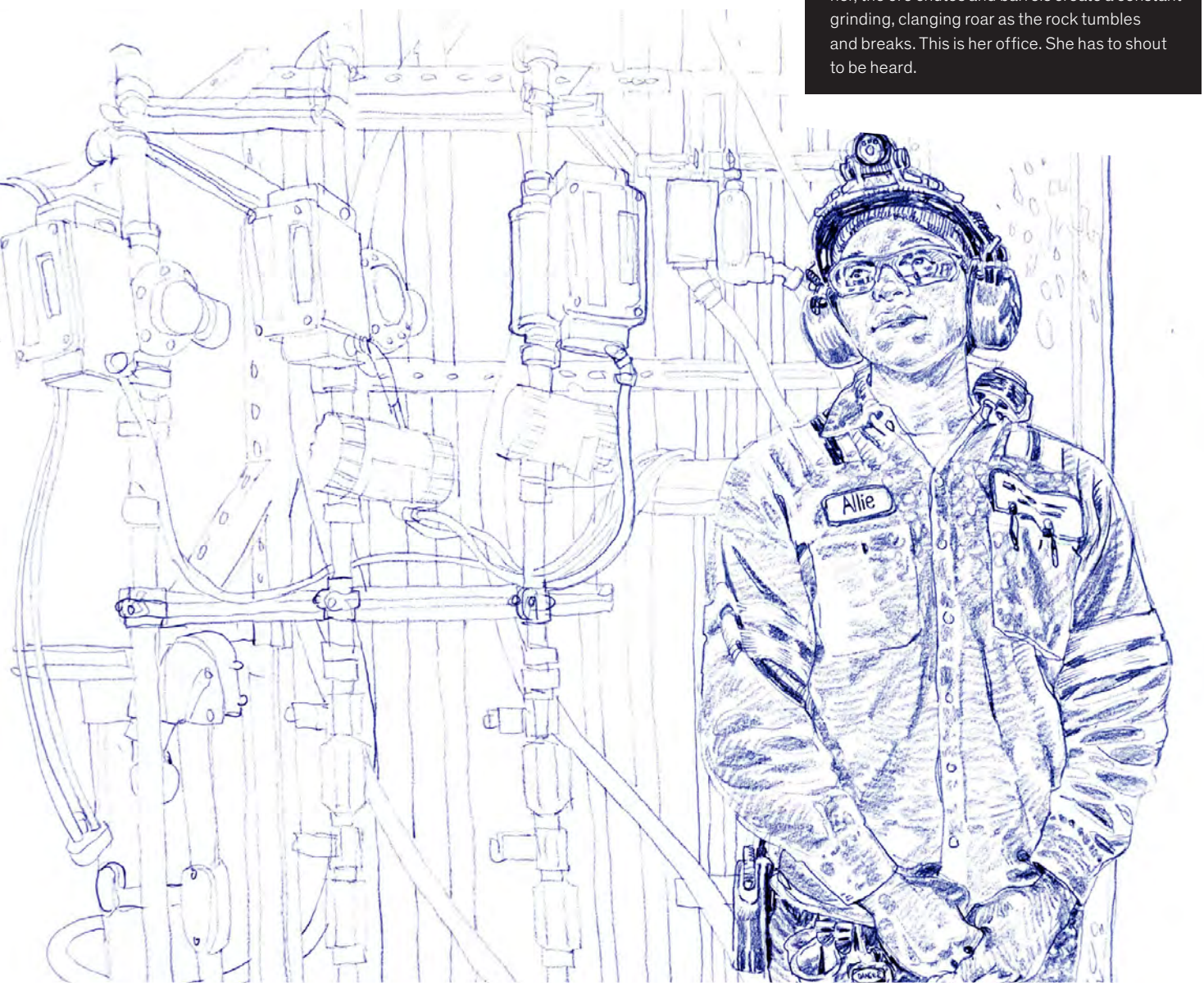
Several years later, maintenance teams lobbied for the installation of additional network equipment and performance sensors on the company’s trucks, power shovels, and stationary machines. The teams would manually download data from those sensors to the data warehouse so they could further sharpen their maintenance practices and improve the functioning of equipment.

Freeport-McMoRan’s leaders resolved to find new process changes that would increase the site’s copper output without a massive injection of capital.

When wireless mesh networks became cost effective and reliable, Freeport-McMoRan installed them at all its sites. Now the company could capture and correlate second-by-second performance readings in the data warehouse, all in real time.

"We learned things we'd have never predicted," Odinet said. "That project taught us to be more receptive to what the data was telling us. And it gave us the confidence to try more complicated analyses."

With advanced analytics and AI techniques, Freeport-McMoRan could scan the vast quantity of data it collected, identify even more operational changes that might raise performance, and put them to the test in the field.



Allison (Allie) Naltazan is in training to become a mill operator on the ore-grinding line. Around her, the ore chutes and barrels create a constant grinding, clanging roar as the rock tumbles and breaks. This is her office. She has to shout to be heard.

Bagdad looked like a good proving ground for this method. The site is staffed with creative, open-minded engineers, metallurgists, and equipment operators who stood out at Freeport-McMoRan for their willingness to try new things. Their earlier efforts to enhance Bagdad's metallurgical processes, for example, had resulted in higher copper recovery.

And Cross, Bagdad's general manager, was a natural tinkerer who liked to spend his free time outfitting his pickup truck for off-road use and milling mesquite logs into lumber for a house he planned to build himself. Since joining Freeport-McMoRan in 2006, Cross had led a series of projects to streamline operations at the company's mines.

It also helped that Bagdad's operations were stable. With few equipment problems or process hiccups to straighten out, workers would have time to help increase copper production.

Executives felt that promising opportunities to boost Bagdad's production could be found in one part of the operation: the ore-concentrating mill, a noisy facility where huge milling machines and flotation cells bubbling with chemical solutions turn grapefruit-size rocks containing around 0.4 percent copper into a fine-ground mix of 25 percent copper and 75 percent rock.

The mill's technicians ran the facility strictly by the book, a set of operating instructions that Freeport-McMoRan engineers in Phoenix had developed. There had to be ways of building on those instructions that would better the mill's performance.

After talking things over with engineers and operations specialists from Bagdad and from headquarters, Freeport-McMoRan CEO Richard Adkerson and CFO Kathleen Quirk decided to let the crew at Bagdad work with McKinsey on a new kind of mining project: data mining in an agile way.

Learning agile

The project called for more than sophisticated data science. It also called for a new approach to solving tricky operational problems.

"Usually when we run operational projects, we overengineer them. We test every conceivable scenario, build in safeguards, and do everything we can to ensure that a process change will result in an improvement before we make it," Cross observed. "It's a dependable way to get good results. But it takes a huge amount of time, effort, and capital investment."

McKinsey's consultants reckoned that the crew at Bagdad might get better results, more quickly, by carrying out the analytics project differently. They introduced the idea of working under agile principles, which emphasize quick development of functional solutions that teams then improve, little by little, according to feedback from users.

The general manager assembled a team of people representing every division of the mill, along with other parts of the organization they would need to work with, such as the mine and Freeport-McMoRan's central data-science group.

Another essential feature of agile methods is face-to-face collaboration within well-rounded teams. Cross assembled a team of people representing every division of the mill, along with other parts of the organization they would need to work with, such as the mine and Freeport-McMoRan's central data-science group.

The composition of the team allowed it to tap the expertise and account for the interests of each division of Bagdad that its work might affect. It also enabled the team to contend better with challenges that involved different divisions and couldn't be solved by one division alone.

The team's agile approach was to work in "sprints"—two-week bouts of activity in which the team conceived a data-modeling function or operational change, tested it, and learned what would make it better.

As improvements came to light, the team would add them to a backlog. Then it would plow through the items on the backlog in subsequent sprints, starting with the easiest, most beneficial tasks.

For Bagdad's crew members, this agile style of working wasn't just different from business as usual. It represented a radical departure from the way they'd been doing things.

"It took us a while to get comfortable with agile," Cross said. "We had to let go of a lot of old habits."

McKinsey brought in agile coaches to help. The coaches explained the rudiments of agile—building a backlog, deciding what to accomplish in each sprint, holding morning meetings to agree on the work the crew would perform each day and to note any difficulties that might slow it down—but were mainly there to join the team's activities and teach its members to work together in agile ways.

Shannon Lijek, a McKinsey partner who specializes in helping organizations apply agile methods, was one of the coaches who came to help the Bagdad team get the hang of agile.

“We’ve found that the best way to learn agile is to jump right in,” said McKinsey partner Shannon Lijek.

“Agile can be tricky to adopt at first because it isn’t a process you can memorize. It’s a set of principles for minimizing wasted effort and getting more work done. And we’ve found that the best way to learn agile is to jump right in,” Lijek said.

One way that Bagdad’s agile team cut out needless effort was by introducing solutions as soon as it had built “minimum viable products,” or MVPs, that were good enough to use, rather than laboring to perfect those products first.

“If we’d built the model ourselves, we’d have tried to get it 100 percent right before doing anything with it,” Cross told us.

“Shannon and the McKinsey coaches encouraged us to work with solutions that weren’t finished. They’d say, ‘You can get 60 percent of the improvement with an MVP, and that’s a lot. So just start using it. Then you can worry about making it better.’”

From predicting to optimizing

Once the team Cross formed came together, it began investigating the possibility of improving the mill’s performance. The idea was to spend a month examining data from the mill for patterns that revealed potential improvements. If those improvements looked promising enough, the team would pursue them.

Beginning in late June, the Bagdad team and data scientists from McKinsey built a machine-learning model to check whether the mill truly ran as efficiently as people believed. The model, a type of extreme gradient-boosting model, consisted of an ensemble of thousands of decision trees that had been engineered to include a great deal of metallurgical knowledge.

The staff at Bagdad and Freeport-McMoRan’s central operations group believed all the ore entering the mill was of the same type. Consequently, they had defined a single “recipe” of lower and upper parameters for the mill’s 42 control settings: the mix of differently sized ore chunks being fed into the mill, the pH level in the flotation cells, and so on.

But when the agile team at Bagdad ran the data from the mill’s performance sensors through its model, the members of the team learned something new. From the mill’s perspective, the mine was actually producing seven distinct types of ore.

What’s more, the mill’s standard recipe for control settings didn’t match the properties of all those ore types. Ore containing more iron pyrite, for example, would yield more copper if the pH level in the flotation cells were set higher than the recipe prescribed.

"Thinking about ore clusters in terms of data from the mill's instruments, rather than classifications from traditional geology, was a major mindset shift—and it opened up many new possibilities for improving performance," said Sean Buckley, a McKinsey partner who led the analytics work.

All told, the team's analysis suggested that adjusting the mill's controls to suit each of the seven ore types could increase copper production by 10 percent or more.

That prospect convinced Freeport-McMoRan's leaders to let the agile team at Bagdad build an AI model that would look at the ore coming into the mill and suggest control settings to heighten production of copper from that ore.

To determine just how much copper Bagdad could yield, staff decided to establish a new mandate—maximizing copper production at a reasonable cost, with little new capital investment.

Mill operator II Floyd (George) Mocaby and senior metallurgist Rahul Singh review the alarms on the gantry system.

Team members wrote algorithms to discern the connections among the ore type, the operational readings from the plant's sensors, the amount of ore running through the mill, and the amount of copper recovered. Next, they developed more algorithms to predict the plant's performance based on measurements from the sensors.

After several weeks of development sprints, the team had raised the accuracy of the model's performance predictions to 96 percent—high enough to know that the model was properly interpreting the data streaming in from the mill's sensors and relating it to the mill's control settings.

The team then turned its attention from predicting performance to improving it. Staff began by asking a simple question that no one had asked in some time: What measure of performance do we want to optimize?

For years, the team at Bagdad had oriented its decisions and activities toward particular targets for copper production and operating cost. That approach made a certain kind of sense. It meant that Bagdad consistently generated profits.

Now, to determine just how much copper Bagdad could yield, the team decided to establish a new mandate—maximizing copper production at a reasonable cost, with little new capital investment.

Introducing AI and agile to mining operations: Lessons from Bagdad

by Red Conger

Freeport-McMoRan's effort to increase copper production at Bagdad taught us a good deal about how to use agile methods and AI tools at our sites, where it can be difficult to alter accepted routines. Here are a few things we're keeping in mind as we expand the use of agile and AI to more of Freeport-McMoRan's operations:

- Don't wait for the "perfect" product or solution to begin using it. Once it's working well enough, implement it right away. Immediate action brings immediate results.
- Be willing to reconsider and discard long-standing assumptions and processes if you find better ways to do things. That means validating your new ideas through data analysis and fieldwork.
- Empower frontline teams to take risks. That's how testing and learning happens. Set clear boundaries on what teams can try. Make it clear they won't be blamed if their experiments come up short or incur extra costs.
- Use data science to catalyze decision making. Human judgment and intuition are hard to replace, but people can make better decisions when they're informed by analytical findings.
- Once you create value with agile and AI, spread the word about what you did and how you did it. Showcasing success will attract interest in these capabilities and motivate colleagues to adopt them.

Red Conger is president and COO, Americas, of Freeport-McMoRan.

Maximizing production could lessen performance in other areas. Nonetheless, executives agreed that if Bagdad could increase production as the model predicted, the short-term cost would be worth it.

Cross and Cory Stevens, Freeport-McMoRan's vice president of operational improvement, knew that maximizing production could lessen Bagdad's performance in other areas. The mill's recovery rate—the percentage of copper extracted from the ore—might drop. Or the whole operation could come to a halt for hours.

Stevens went to other executives to explain that Bagdad's experiment could be costly. The performance numbers they'd see for the next few months might be dismal, he warned.

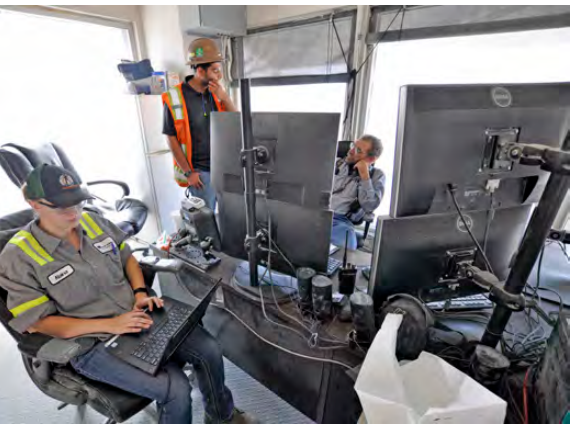
Nonetheless, the executives agreed with Stevens that if Bagdad could achieve the 10 percent increase in production that the model predicted, the short-term cost would be worth it. They gave him the go-ahead to try maximizing production.

With that approval, Cross granted Bagdad's staff the latitude to make operational changes that deviated from standard procedures and could cause the mill to miss its performance targets. Worker safety and equipment integrity were the only areas where no compromises or experiments would be allowed. Any other changes were fair game.

A big breakthrough

Over a series of iterations during the next month or so, the team conceived, tested, and refined algorithms that would look at sensor-generated data and recommend control settings to maximize copper output. The new algorithms, known as genetic algorithms, used the principles of natural selection to "evolve" settings that would produce the most copper, given a particular type of ore.

Most challenging were the model's recommendations to depart from the operational recipe that the staff at Bagdad had been following for years. The agile team spent a lot of time debating what to do with those.

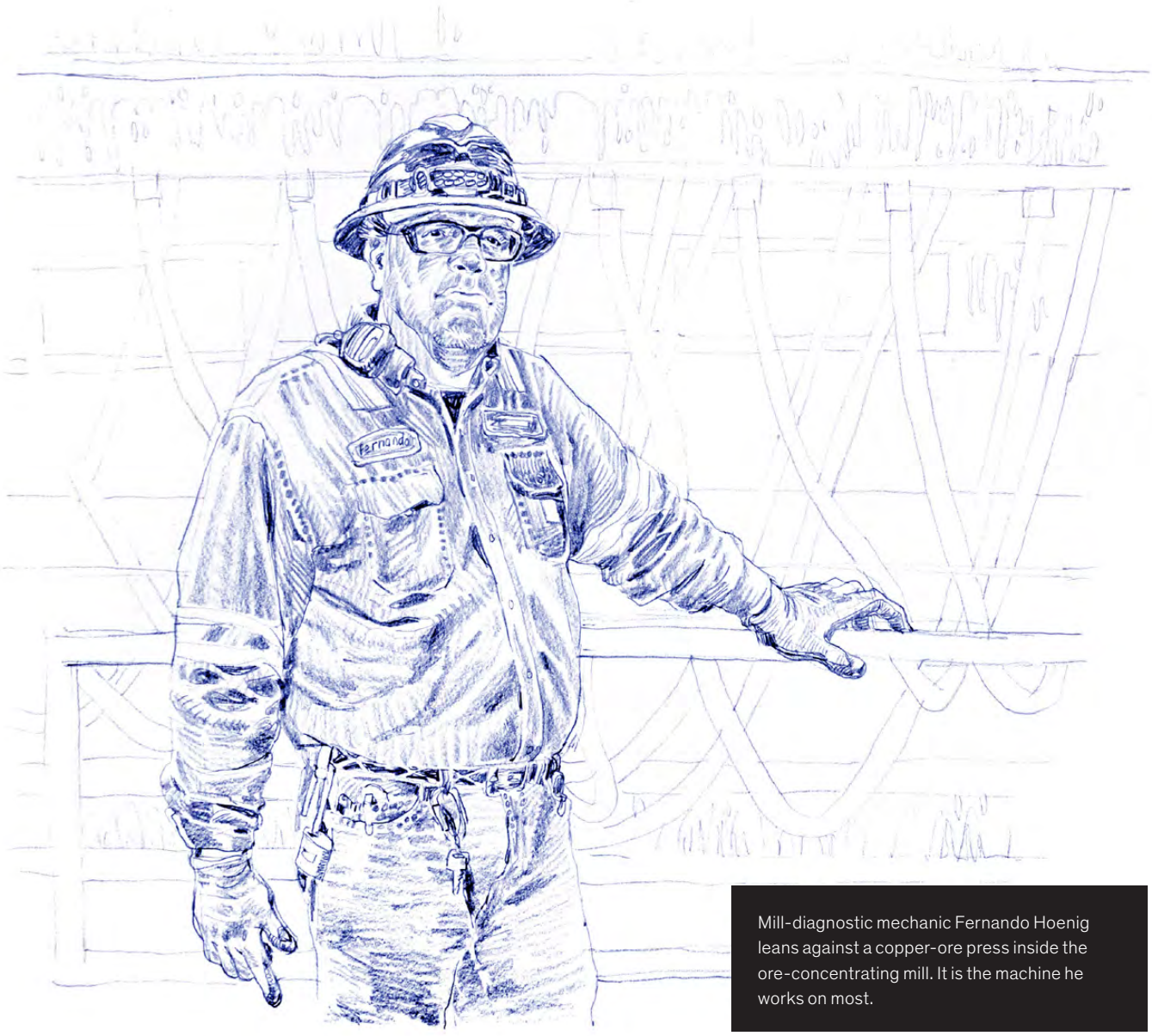


Metallurgist I Alaina Mallard, senior metallurgist Rahul Singh, and mill operator II Floyd (George) Mocaby discuss the expert system inside the ore crusher's control room.

By early September, the team had expanded the prediction model into an MVP of an optimization model, dubbed TROI, that was capable of issuing recommendations every 12 hours, once for each of the mill's two daily shifts.

When each new set of recommendations came out, the engineers, equipment operators, and metallurgists on the team would huddle and decide what do to with them.

TROI was a work in progress, so its earliest recommendations weren't entirely reliable. At every shift, metallurgists from Freeport-McMoRan and from McKinsey would study the model's recommendations and question whether they were credible. Then the metallurgists would take note of the problem recommendations so the agile team could look into them.



Mill-diagnostic mechanic Fernando Hoenig leans against a copper-ore press inside the ore-concentrating mill. It is the machine he works on most.

Some recommendations led the team members to discover flaws in TROI's logic, which they added to their backlog and corrected in subsequent development sprints. Others indicated that the underlying performance data were faulty and prompted the team to look for fixes.

"TROI helps us to improve the quality of our instrumentation and highlights sensors that need attention," said Frank Ochoa, one of Bagdad's process-control and instrumentation engineers.

Most challenging were the recommendations to depart from the operational recipe the staff had been following for years. The agile team spent a lot of time debating what to do with those.

Gradually, as the team fine-tuned TROI, its recommendations became more plausible, and the staff at Bagdad began following them. Yet many of those recommendations resulted in slim performance gains, if any.

Mid-October arrived. The team was nowhere close to the 10 percent production boost it thought possible.

Cross and Stevens decided it was time to act on a weighty recommendation that no one was especially eager to try: speeding the flow of ore from the mine and the crusher to the mill. Cross asked the mine operators to redline their activities—and reassured them that they wouldn't be blamed for spending more money or triggering operational breakdowns.

The mine operators ramped up blasting, even though they had to use more explosives. They queued up trucks to carry rocks to the crushing plant, in violation of a long-standing directive to keep trucks from standing idle. They choke-fed the giant crusher with run-of-mine, or unprocessed, ore to find out how much it could handle.

Finally, on October 19, the team pushed up the mill's processing rate. Right away, copper production jumped 5 percent. TROI had helped the team unlock a record level of performance.

Small gains add up

Having achieved a major performance gain, Bagdad's agile team turned to enhancing the model's ability to recommend mill-control settings that would increase copper production.

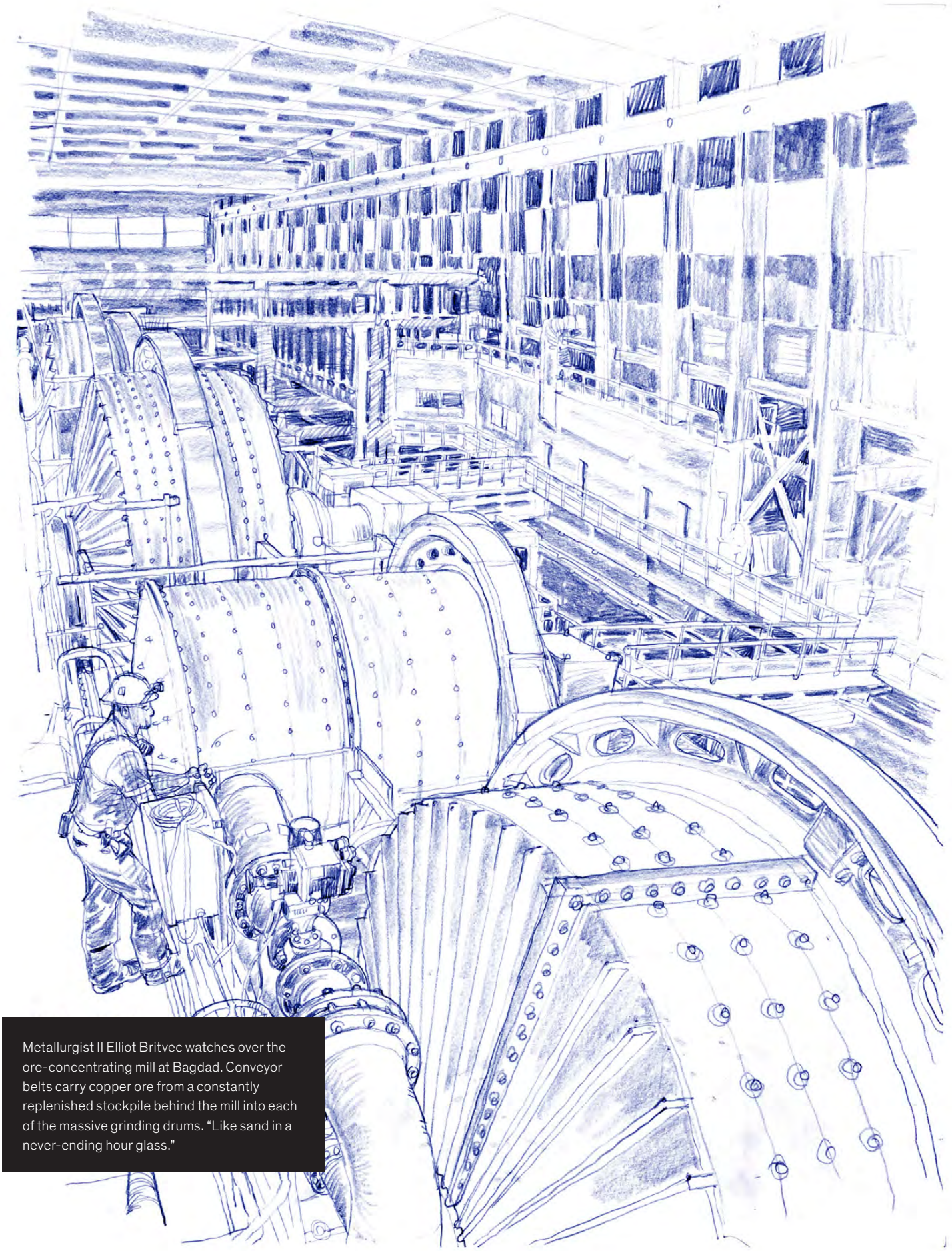
TROI could already identify which type of ore was running through the mill at any moment. In the next round of sprints, the team added functions to account for other incoming operational data.

Each time TROI recommended a set of control settings, the metallurgists at the plant would consider the recommendations, choose which ones to accept, and pass them to shift supervisors and operators, who would adjust the mill's controls accordingly.

Letting the metallurgists decide which recommendations to follow helped the agile team learn more quickly. Occasionally, the metallurgists applied settings that looked questionable just to find out whether they would work. And when the metallurgists rejected the recommended settings, they typed notes into the model to explain their decisions.

"TROI doesn't always give fully accurate recommendations, but it provides a new perspective on how to manage the plant and challenges our assumptions," said Lulu Raymond, a senior metallurgist at Bagdad.

As soon as the team pushed up the mill's processing rate, copper production jumped 5 percent. The model had helped the team unlock a record level of performance.



Metallurgist II Elliot Britvec watches over the ore-concentrating mill at Bagdad. Conveyor belts carry copper ore from a constantly replenished stockpile behind the mill into each of the massive grinding drums. “Like sand in a never-ending hour glass.”

The agile team reviewed the data model's recordings and the metallurgists' notes every day and kept working through a backlog of upgrades. Within several weeks, the team had refined the model to the point that metallurgists were accepting more than 80 percent of its recommendations.

All the while, sensors gauged the mill's performance. The model's machine-learning algorithms recorded which settings improved performance and which ones didn't, and whether the recommendations were helping.

The agile team reviewed the model's recordings and the metallurgists' notes every day, added items to the backlog of upgrades it planned to make, and kept working on those upgrades. By early December, the team had refined TROI to the point that metallurgists were accepting more than 80 percent of its recommendations.

It wasn't long before the metallurgists and mill operators began trying to outsmart TROI. They would monitor the type of ore passing into the mill, anticipate the control settings that the model might suggest, and apply those settings before the model made its twice-daily recommendations (later increased to every three hours). This became a kind of competition: Who can run the mill better than TROI would?

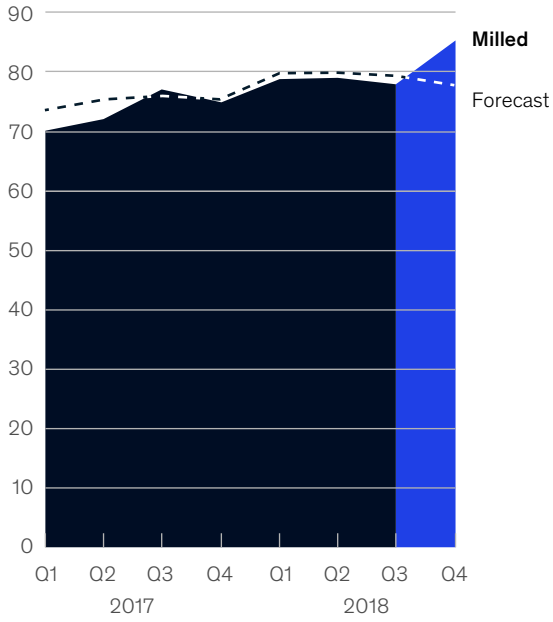
Most important, the mill's production increased substantially. In the fourth quarter of 2018, Bagdad's throughput exceeded 85,000 tons of ore per day—10 percent more than the previous quarter—while its copper-recovery rate rose by one percentage point and its operations became more stable (exhibit). The following quarter, copper production at Bagdad went up yet again.

Those gains should lift Bagdad's copper production by 20 million pounds per year, an increase that has allowed Freeport-McMoRan to avoid most of the $200 million capital expansion of the Bagdad concentrator complex.

Exhibit

By following recommendations from the artificial-intelligence model, a copper mill's operators increased throughput by 10 percent.

Average Bagdad mine dry ore milled daily, thousand tons



Source: Freeport-McMoRan

We think this is just the beginning for Freeport-McMoRan.

Having learned to maintain TROI during the project, the company's metallurgists and data scientists now run the model themselves, without ongoing support from McKinsey. They study daily and weekly reports that compare the mill's performance with TROI's predictions, and they continue enhancing the model's ability to make recommendations.

Freeport-McMoRan executives have also sponsored the creation of a second agile team at Bagdad to test and make process improvements at the mine. This team, too, is working without help from McKinsey, using the agile methods that it learned on the mill project.

At another one of Freeport-McMoRan's Arizona copper mines, Morenci, managers have kicked off an agile and analytics effort like Bagdad's. And the company will soon launch its most ambitious program of this kind at Cerro Verde, a copper mine in Peru with five times the capacity of Bagdad.

The age of the operator is here, and Freeport-McMoRan is adapting to it with agile methods and AI tools.

Red Conger is president and COO, Americas, of Freeport-McMoRan. **Harry Robinson** is a senior partner in McKinsey's Southern California office, and **Richard Sellschop** is a partner in the Stamford office.

Illustrations and photography by Richard Johnson.
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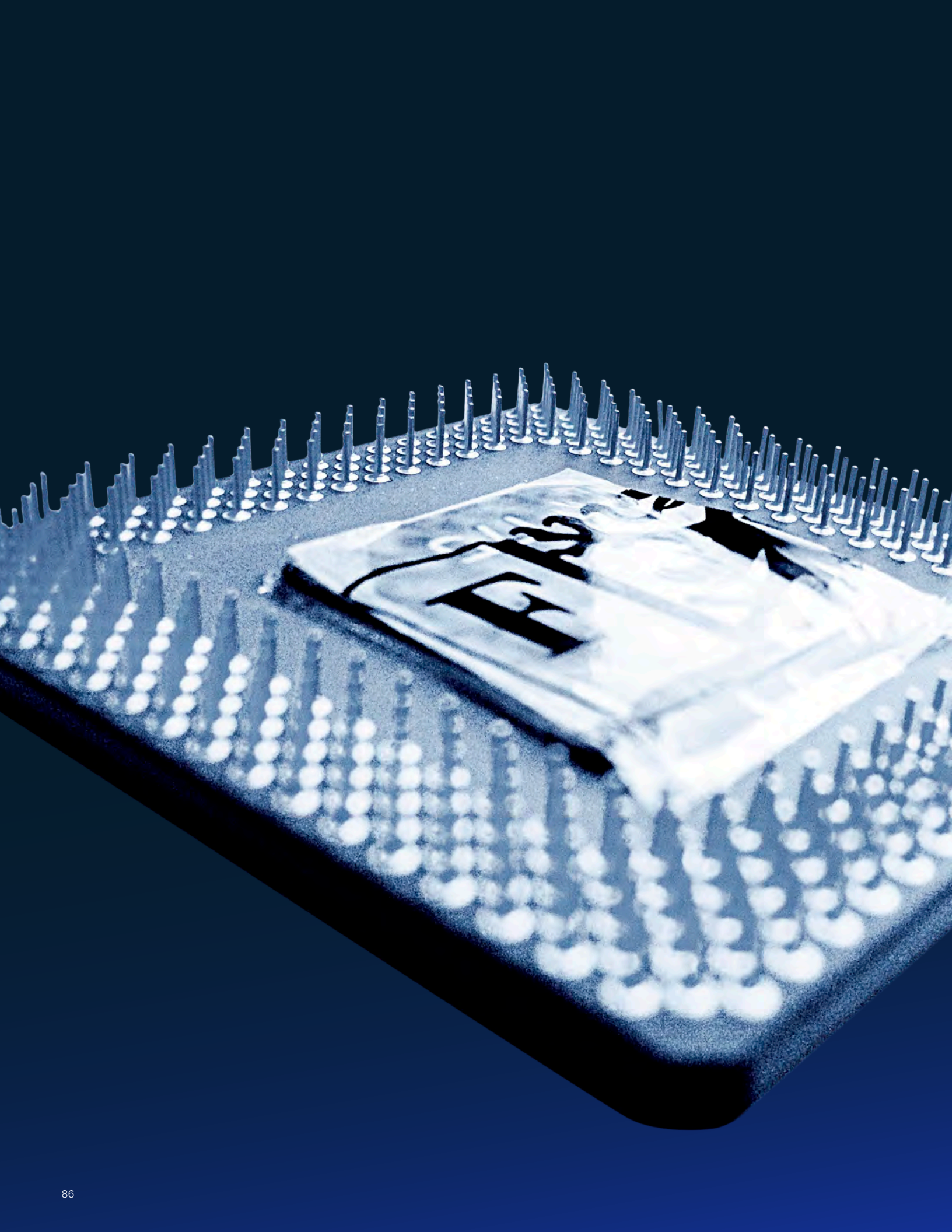
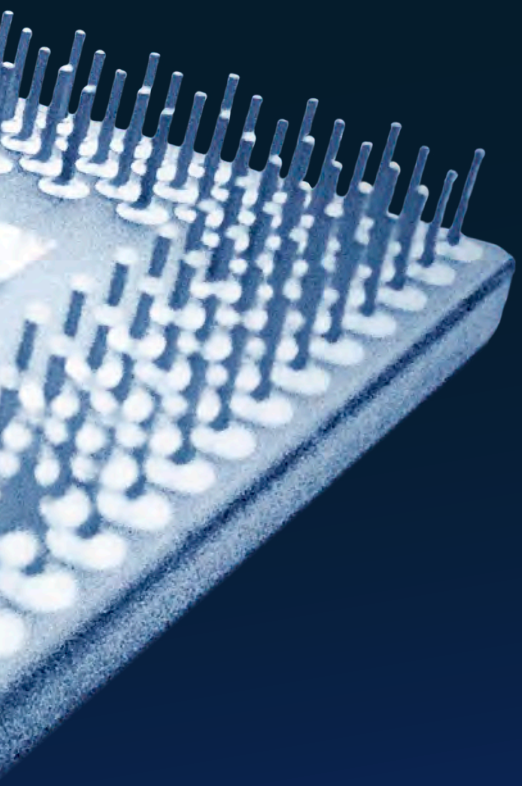


The special challenge of cybersecurity



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COVID-19 crisis shifts cybersecurity priorities and budgets

Cybersecurity technology and service providers are shifting priorities to support current needs: business continuity, remote work, and planning for transition to the next normal.

by Venky Anant, Jeffrey Caso, and Andreas Schwarz

Few corporate functions shifted priorities so much and so quickly when the COVID-19 crisis struck as corporate cybersecurity operations and the technology providers that support them did. As legions of employees suddenly found themselves in a work-from-home model, chief information-security officers (CISOs) adjusted, pivoting from working on routine tasks and toward long-term goals to establishing secure connections for newly minted remote workforces. CISOs also took steps to prevent new network threats that target remote workers and to bolster business-facing operations and e-commerce after a surge in online shopping during pandemic lockdowns.

The response to the crisis continues to press department budgets and limit resources for other, less essential functions—a situation that we believe will direct spending in fiscal year 2021, which many departments are beginning to plan for. According to new McKinsey research, overall spending should taper off from the sector's recent rapid growth in industries that were hit hard by the COVID-19 crisis while holding steady in industries that have not been as affected.

The challenges that cybersecurity organizations face have spilled over to technology providers. Those companies have done their own pivots to keep up with customers' shifting needs and to institute new ways of doing business. To succeed in the post-COVID-19 era, technology providers must rethink their strategies and offerings to accommodate a new security landscape. And they must continue to monitor customers' needs and adjust sales, service, and training accordingly.

COVID-19 crisis's impact on cybersecurity spending

CISOs responded to the pandemic by quickly instituting measures to maintain business continuity and protect against new cyberthreats. To manage continuity, they have been patching remote systems over virtual private networks (VPNs) that have strained under increased loads. They have been monitoring spiking threat levels, including a near-sevenfold increase in spear-phishing attacks, since the pandemic began. Remote workers are also being bombarded with attacks based on COVID-19-crisis themes that are taking advantage of delayed updates to email and web filters, and using social engineering to prey on workforce concerns.

Many CISOs' fiscal 2020 budgets had already been allocated before the pandemic, so to cover the cost of addressing the crisis, they had to put other projects on hold. According to our research, which covers more than 250 global CISOs and security professionals, the crisis-inspired security measures will remain top budget priorities in the third and fourth quarters of 2020.

More than 70 percent of security executives also believe that their budgets for fiscal year 2021 will shrink, according to the survey. As a result, supporting new tactics to safeguard organizations is expected to limit outlays for such things as compliance, governance, and risk tools. For corporate security-operations centers, the cost of securing the fundamentals could reduce budgets for more advanced threat-intelligence upgrades, behavioral analytics, and other tooling.

In our client work, we have seen those priorities play out in many ways, including the following:

— A software company rerouted resources that had been designated for a security-automation project to cover gaps in multifactor authentication (MFA).

— A consumer-packaged-goods company postponed holding cybersecurity "war games" and diverted the resources to accelerate the rollout of a VPN.

— A financial-services company postponed "red team" exercises to close vulnerabilities in remote-work applications.

>70%

of CISOs and security buyers believe budgets will shrink by the end of 2020 but plan to ask for significant increases in 2021.

— In the next 12 months, spending will vary by industry (exhibit). For financial-services and insurance industries, for example, we expect to see budget increases for specific segments, such as security controls for the cloud-based business functions that more of those companies are adopting.

Our research suggests that other industries will not fare as well. Spending for healthcare payers should track with precrisis allocations but could taper off in the last half of the fiscal year because of budget constraints. Healthcare providers that have been on the front line of the crisis have had to adjust operations to interact with patients digitally and virtually, including through telemedicine. Implementing those new technologies have dug into operations budgets, and such companies could cut back on cybersecurity spending as a result. We also expect retail companies' cybersecurity budgets to contract in line with lost revenues. However, an increase in online shopping means that some retailers are prioritizing investments in security for digital-payment platforms to support the evolving needs of their customers.

In most cases, we expect cybersecurity spending at large enterprises to bounce back faster than that at small and medium-size enterprises (SMEs).

Spending hot spots

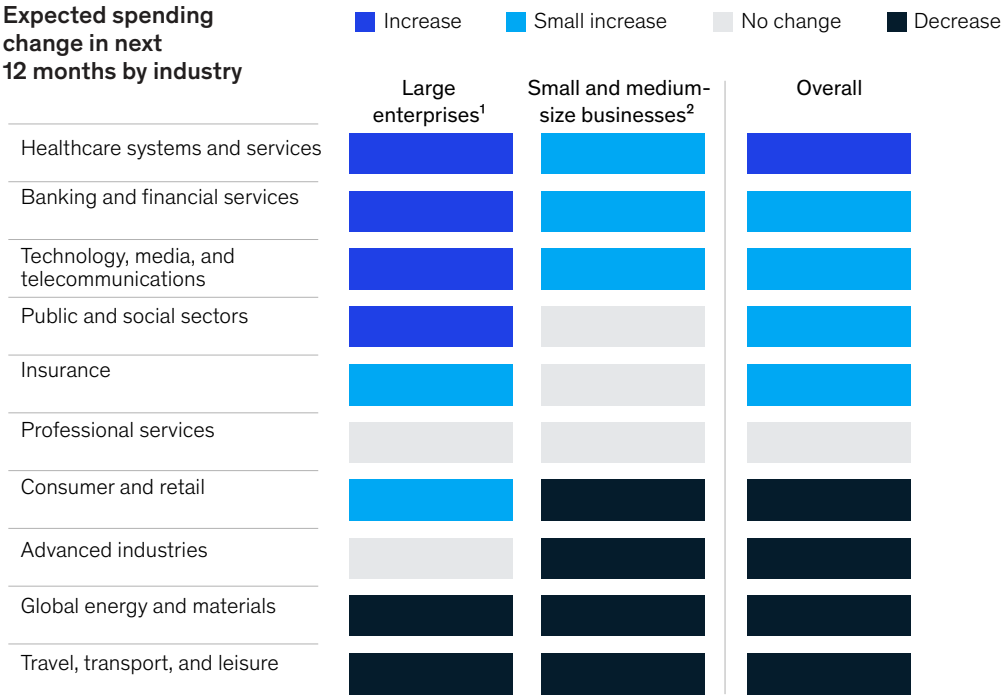
Many companies are giving some or all employees the option of working remotely on a long-term or permanent basis. We expect other companies to reopen their physical offices in waves, welcoming back essential workers first, then other employees, and finally contractors, vendors, and other third parties. For industries that must maintain a sterile environment, such as healthcare, the process of returning nonessential people to the office could stretch even longer.

Based on those trends, other recent activity, and insights gleaned from our research, we believe CISOs and cybersecurity-operations teams will continue to make the following security niches high priorities for spending:

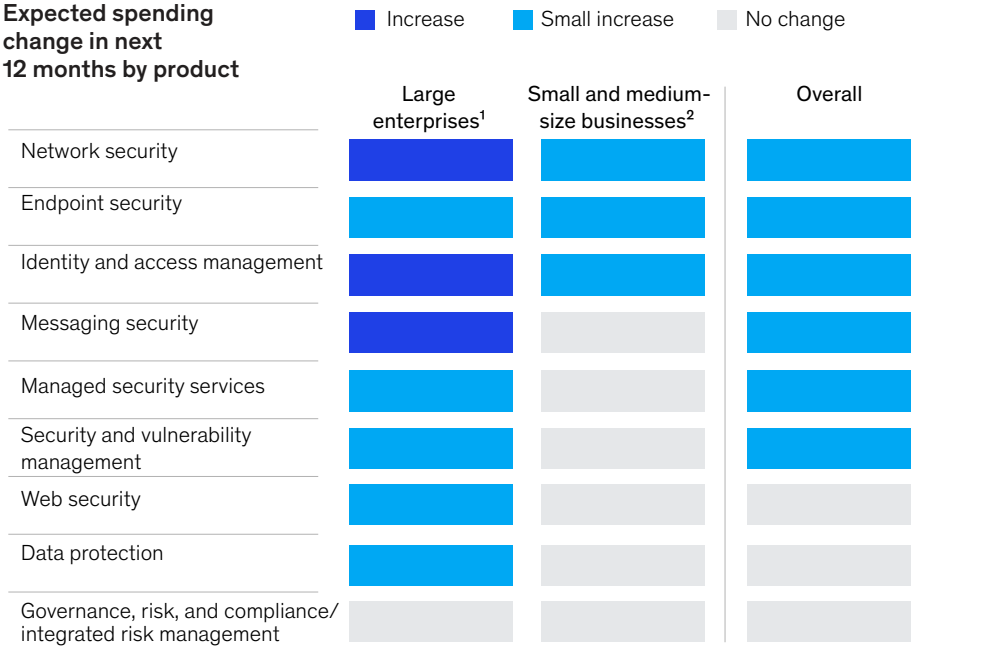
— *Perimeter security.* Companies will continue to prioritize short-term spending on security for remote workers. We also expect them to spend on e-commerce security that can be scaled to cover increased activity (including the SMEs that use third parties to provide such services). That could result in higher spending on pay-per-seat and pay-per-megabyte licenses and ultimately cause companies to shift additional funds from in-house systems to outsourced services.

Exhibit

The COVID-19 crisis is expected to shift cybersecurity spending by industry and product category.



- Industries hardest hit by pandemic (eg, retail, energy) expect budgets to drop; small businesses will be more affected than large ones will
- Vendors could use customers' need for new services to recommend shifting cybersecurity tech stack to cloud rather than patching new features onto legacy systems



- >70% of CISOs[3] and security buyers believe budgets will shrink by end of 2020 but plan to ask for significant increases in 2021
- Product spending reflects CISOs' need to address pandemic-era business conditions, including safeguarding remote workers from heightened attacks

[1]>5,000 employees.
[2]<5,000 employees.
[3]Chief information-security officers.

— *Next-generation identity and access controls.* Companies that had deferred adding MFA to legacy systems are accelerating its adoption or are moving to cloud platforms. With more employees working remotely, teams managing business-critical systems are revisiting who qualifies for privileged access. CISOs at medium-size companies are likely to prioritize managing privileged-access and identity-governance solutions that integrate with security-information and event-management tools and with advanced security analytics to save time and money.

— *Remote access.* CISOs will continue to support virtual work-arounds for help-desk staff who would work in the office under normal circumstances. A virtual security help desk assists remote workers with access issues that also support productivity, such as email security tokens and remote desktop access. At SMEs in particular, we expect to see higher than average spending on MFA services that integrate with collaboration tools and system-as-a-service solutions, including file sharing, virtual-desktop infrastructure, and communication platforms.

— *Automation.* Companies that can automate routine tasks can free up time for other work that adds more value. At organizations that use outsourced services, we expect CISOs to ask managed-service providers to make up for increased workloads by adding such automated services as security orchestration automation and response tooling rather than by increasing staff or budgets.

— *Security training.* The crisis has provided companies with an opportunity to drive home cybersecurity's importance to the workforce, especially frontline employees. We expect that the cyberawareness training—that developed in- house and that delivered by an outside provider—that CISOs offer will be adapted both to cover remote-work situations and bring-your-own-device policies and to be delivered virtually.

— *Security for trusted third parties.* Companies that provide network access to contractors or other trusted partners need to protect those parties from outside attacks, since such threats could affect their own security. We expect to see companies increase monitoring for potential threats, which could increase budgets for click-of-a-button security-ratings tools, security-risk assessments, and security-reporting instruments—however, these expenses will not likely be prioritized until after any technical security gaps made more relevant by COVID-19 (for example, remote access security, multifactor authentication) have been closed.

Next normal for cybersecurity providers

Companies' actions to maintain business continuity and protect remote workers will likely have ramifications for cybersecurity providers over the 12 to 18 months (the time that CISOs estimate it will take for security organizations to reach the next normal). Plans for permanent remote work, phased reopening, and limited interaction with nonessential visitors will boost interest in some cybersecurity products and services but curb it for others. That will change how providers need to interact with customers and prospects:

— *Product refreshes could decrease.* To address budget constraints, CISOs are considering extending how long they use security applications before upgrading, especially for hardware-based services (such as firewalls). They also will prioritize paying for new features or patches for only the most critical applications. That could make organizations more vulnerable to attacks on their technology stacks, creating a business opportunity for providers to offer additional or new technologies or services.

— *Go-to-market touchpoints will shift.* Until regions reopen completely, providers' sales and marketing representatives can't meet face to face with security-team personnel. The nimblest will find other ways to keep in touch and provide extra value, such as by switching to video calls and using a customer-engagement application to record touchpoints.

— *Delivering services will be more challenging.* Providers won't be able to send technicians or other staff to a customer's facility to install or run an outsourced service, respond to a crisis, or help with a transformation project. In that absence, we forecast that demand for remote services and permissions under restricted access will increase.

— *The market for security and training will grow.* With cyberthreats to remote workers increasing, companies are motivated to boost training to improve awareness and educate them about cyber hygiene. Providers that can offer such services should be prepared to deliver them virtually, including for real-time interventions.

— *Customers may be open to replatforming.* CISOs that need to bring services in line with current needs may be more inclined to move those applications to new platforms, including the cloud. It may be easier to add MFA and single-sign-on features on modern cloud platforms than to bolt those features onto an older platform. If that's the case, rip-and-replace scenarios could present providers with an opportunity to negotiate new deals, especially if they can reduce cyberfriction and disruptions.

— *Short-term pricing strategies could open doors.* CISOs faced with budget pressures may need to revisit cybersecurity-services contracts to maximize value and cut costs. If providers are able, they could use the opportunity to extend licenses for a period of time without negative financial consequences to customers. That could solidify relationships while setting the stage for future contract extensions or renegotiations.

What cybersecurity providers can do

In the short term, we expect CISOs to continue to prioritize situations related to remote work and business continuity. But eventually, we expect the emergence of a phase of hybrid activity—one in which CISOs both take care of their immediate needs and begin to resume limited support for longer-term or strategic cybersecurity imperatives.

Providers can use this period of time to solidify existing relationships and build new ones as trusted partners and influencers. To get there, we recommend providers focus on the following key areas:

— *Anticipate customers' needs.* Understand the issues that security teams face to determine which products and services could best meet their needs. Security teams will be focused on supporting technology and security features—capabilities and services that are critical to their organizations' operations. Those needs will vary by team. An end-point-security team, for example, might focus on bring-your-own-device issues, and a network-security team may need to deal with VPN load to support a workforce split between working from the office and working from home. Similarly, needs may vary by company. A large insurance company might need to prioritize General Data Protection Regulation compliance as it accelerates the move of its business systems to the cloud, and a midsize utility might need to focus on network segmentation.

— *Adjust approaches and technologies to address urgent problems.* Develop a pitch that links an organization's mission statement to the issues that its customers are currently facing. If the business case is right, look at opportunities

to expand beyond the company's traditional wheelhouse through acquisition or in-house development of new capabilities. Opportunities to expand should sync with the areas in which CISOs are accelerating their own road maps, particularly maintaining security operations, mitigating the risk of remote access to sensitive data and software-development environments, and implementing MFA to enable employees to continue working remotely.

— *Assess the portfolio.* Times have changed. The solutions that a customer needs today may be different from when a provider first developed its portfolio, and it may need to shift its offerings as a result. After evaluating which products or services are likely to be more attractive in the recovery and next normal, providers can reorient engineering, sales, and marketing resources to support them. Play up the most compelling aspects of an integrated offering. If it is unclear that proprietary technology will continue to dominate a specific niche, it could be an opportunity to help customers optimize cybersecurity expenditures by suggesting open-source frameworks and solutions.

— *Invest in relationships.* When customers look back on this era, they will remember the partners that stuck with them. When providers can't build revenue, they can build relationships. Companies will continue to adjust security models to the requirements of different markets and regulators, and providers can help them by offering guidance and best practices.

CISOs that acted quickly to reorient security to cover remote workers and business continuity during the COVID-19 crisis must now prepare for the future. Such preparation includes determining how to allocate limited cybersecurity budgets to support additional modifications. Cybersecurity providers must shift their approaches, becoming trusted partners and influencers to help customers maximize their spending while preparing for the next normal.

Venky Anant is a partner in McKinsey's Silicon Valley office; **Jeffrey Caso** is an expert in the Washington, DC, office; and **Andreas Schwarz** is an expert in the New York office.

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Cybersecurity tactics for the coronavirus pandemic

The pandemic has made it harder for companies to maintain security and business continuity. But new tactics can help cybersecurity leaders to safeguard their organizations.

by Jim Boehm, James Kaplan, Marc Sorel, Nathan Sportsman, and Trevor Steen

The COVID-19 pandemic has presented chief information security officers (CISOs) and their teams with two immediate priorities. One is securing work-from-home arrangements on an unprecedented scale now that organizations have told employees to stop traveling and gathering, and government officials in many places have advised or ordered their people to stay home as much as possible. The other is maintaining the confidentiality, integrity, and availability of consumer-facing network traffic as volumes spike—partly as a result of the additional time people are spending at home.

Recent discussions with cybersecurity leaders suggest that certain actions are especially helpful to fulfill these two priorities. In this article, we set out the technology modifications, employee-engagement approaches, and process changes that cybersecurity leaders have found effective.

Securing work-from-home arrangements at scale

The rapid, widespread adoption of work-from-home tools has put considerable strain on security teams, which must safeguard these tools without making it hard or impossible for employees to work. Conversations with CISOs in Asia, Europe, and North America about how they are securing these new work-at-home arrangements highlight the changes these executives are making in three areas: technology, people, and processes.

Technology: Make sure required controls are in place

As companies roll out the technologies that enable employees to work from home and maintain business continuity, cybersecurity teams can take these actions to mitigate cybersecurity risks:

— *Accelerate patching for critical systems.* Shortening patch cycles for systems, such as virtual private networks (VPNs), end-point protection, and cloud interfaces, that are essential for remote working will help companies eliminate vulnerabilities soon after their discovery. Patches that protect remote infrastructure deserve particular attention.

— *Scale up multifactor authentication.* Employees working remotely should be required to use multifactor authentication (MFA) to access networks and critical applications. Scaling up MFA can be challenging: the protection it will add calls for a surge in short-term capacity. Several practices make the rollout of MFA more manageable. One is to prioritize users who have elevated privileges (such as domain and sys admins, and application developers) and work with critical systems (for instance, money transfers). Targeting those users in pilot rollouts of modest scale will allow cybersecurity teams to learn from the experience and use that knowledge to shape more extensive implementation plans. Cybersecurity teams can also benefit from using MFA technologies, such as the application gateways offered by several cloud providers, that are already integrated with existing processes.

— *Install compensating controls for facility-based applications migrated to remote access.* Some applications, such as bank-teller interfaces and cell-center wikis, are available only to users working onsite at their organizations' facilities. To make such facility-based applications available to remote workers, companies must protect those apps with special controls. For example, companies might require employees to activate VPNs and use MFA to reach what would otherwise be facility-based assets while permitting them to use MFA alone when accessing other parts of the corporate environment.

— *Account for shadow IT.* At many companies, employees use so-called shadow IT systems, which they set up and administer without formal approval or support from the IT department. Extended work-from-home operations will expose such systems because business

processes that depend on shadow IT in the office will break down once employees find themselves unable to access those resources. IT and security teams should be prepared to transition, support, and protect business-critical shadow assets. They should also keep an eye out for new shadow-IT systems that employees use or create to ease working from home, to compensate for in-office capabilities they can't access, or to get around obstacles.

— *Quicken device virtualization.* Cloud-based virtualized desktop solutions can make it easier for staff to work from home because many of them can be implemented more quickly than on-premises solutions. Bear in mind that the new solutions will need strong authentication protocols—for example, a complex password, combined with a second authentication factor.

People: Help employees understand the risks

Even with stronger technology controls, employees working from home must still exercise good judgment to maintain information security. The added stress many people feel can make them more prone to social-engineering attacks. Some employees may notice that their behavior isn't monitored as it is in the office and therefore choose to engage in practices that open them to other threats, such as visiting malicious websites that office networks block. Building a "human firewall" will help ensure that employees who work from home do their part to keep the enterprise secure.

— *Communicate creatively.* A high volume of crisis-related communications can easily drown out warnings of cybersecurity risks. Security teams will need to use a mix of approaches to get their messages across. These might include setting up two-way communication channels that let users post and review questions, report incidents in real time, and share best practices; posting announcements to pop-up or universal-lock screens; and encouraging the innovative use of existing communication tools that compensate for the loss of informal interactions in hallways, break rooms, and other office settings.

— *Focus on what to do rather than what not to do.* Telling employees not to use tools (such as consumer web services) they believe they need to do their jobs is counterproductive. Instead, security teams must explain the benefits, such as security and productivity, of using approved messaging, file-transfer, and document-management tools to do their jobs. To further encourage safe behavior, security teams can promote the use of approved devices—for example, by providing stipends to purchase approved hardware and software.

— *Increase awareness of social engineering.* COVID-19–themed phishing, vishing (voice phishing), and smishing (text phishing) campaigns have surged. Security teams must prepare employees to avoid being tricked. These teams should not only notify users that attackers will exploit their fear, stress, and uncertainty but also consider shifting to crisis-specific testing themes for phishing, vishing, and smishing campaigns.

— *Identify and monitor high-risk user groups.* Some users, such as those working with personally identifiable information or other confidential data, pose more risk than others. High-risk users should be identified and monitored for behavior (such as unusual bandwidth patterns or bulk downloads of enterprise data) that can indicate security breaches.

Processes: Promote resilience

Few business processes are designed to support extensive work from home, so most lack the right embedded controls. For example, an employee who has never done high-risk remote work and hasn't set up a VPN might find it impossible to do so because of the in-person VPN-initiation requirements. In such cases, complementary security-control

Even with stronger technology controls, employees working from home must still exercise good judgment to maintain information security.

processes can mitigate risks. Such security processes include these:

— *Supporting secure remote-working tools.* Security and IT help desks should add capacity while exceptionally large numbers of employees are installing and setting up basic security tools, such as VPNs and MFA. It might be practical to deploy security-team members temporarily at call centers to provide added frontline support.

— *Testing and adjusting IR and BC/DR capabilities.* Even with increased traffic, validating remote communications and collaboration tools allows companies to support incident-response (IR) and business-continuity (BC)/disaster-recovery (DR) plans. But companies might have to adjust their plans to cover scenarios relevant to the current crisis. To find weak points in your plans, conduct a short IR or BC/DR tabletop exercise with no one in the office.

— *Securing physical documents.* In the office, employees often have ready access to digital document-sharing mechanisms, as well as shredders and secure disposal bins for printed materials. At home, where employees might lack the same resources, sensitive information can end up in the trash. Set norms for the retention and destruction of physical copies, even if that means waiting until the organization resumes business as usual.

— *Expand monitoring.* Widening the scope of organization-wide monitoring activities, particularly for data and end points, is important for two reasons. First, cyberattacks have proliferated. Second, basic boundary-protection mechanisms, such as proxies, web gateways, or network intrusion-detection systems (IDS) or intrusion-prevention systems (IPS), won't secure users working from home, off the enterprise network, and not connected to a VPN. Depending on the security stack, organizations that do not require the use of a VPN or require it only to access a limited set of resources may go largely unprotected. To expand monitoring, security teams should update security-information-and-event-management (SIEM) systems with new rule sets and discovered hashes for novel malware. They should also increase staffing in the security operations center (SOC) to help compensate for the loss of network-based security capabilities, such as end-point protections of noncompany assets. If network-based security capabilities are found to be degraded, teams should expand their IR and BC/DR plans accordingly.

— *Clarify incident-response protocols.* When cybersecurity incidents take place, SOC teams

must know how to report them. Cybersecurity leaders should build redundancy options into response protocols so that responses don't stall if decision makers can't be reached or normal escalation pathways are interrupted because people are working from home.

— *Confirm the security of third parties.* Nearly every organization uses contractors and off-site vendors, and most integrate IT systems and share data with both contract and noncontract third parties, such as tax or law-enforcement authorities. When organizations assess which controls must be extended to employees to secure new work-from-home protocols, they should do the same for third-party users and connections, who are likely to be managing similar shifts in their operations and security protocols. For example, ask providers whether they have conducted any remote IR or BC/DR tabletop drills and, if they have, ask them to share the results. Should any third parties fail to demonstrate adequate security controls and procedures, consider limiting or even suspending their connectivity until they remediate their weaknesses.

— *Sustain good procurement practices.* Fast-track procurement intended to close key security gaps related to work-from-home arrangements should follow standard due-diligence processes. The need for certain security and IT tools may seem urgent, but poor vendor selection or hasty deployment could do more harm than good.

Supporting high levels of consumer-facing network traffic

Levels of online activity that challenge the confidentiality, integrity, and availability (CIA) of network traffic are accelerating. Whether your organization provides connectivity, serves consumers, or supports transactions, securing the CIA of network activity should be a top priority for any executive team that wants to protect consumers from cyberbreaches during this period of heightened vulnerability. Much as organizations are stepping up internal protections for enterprise networks, security teams in organizations that manage consumer-facing networks and the associated technologies will need to scale up their technological capabilities and amend processes quickly.

Technology: Ensure sufficient capacity

Companies that make it possible for employees to work from home must enable higher online network-traffic and transaction volumes by putting in place technical building blocks such as a web-application firewall, secure-sockets-layer (SSL) certification, network monitoring, antidistributed denial of service, and fraud analytics. As web-facing traffic grows, organizations should take additional actions to minimize cyberrisks:

— *Enhance web-facing threat-intelligence monitoring.* To anticipate threats and take preventive measures, security teams must understand how heightened consumer traffic changes the threat environment for web-facing enterprise activities. For example, to find out if attackers are becoming more interested in an organization's web-facing technologies, organizations can conduct increased passive domain-name scans to test for new malicious signatures tailored to the enterprise domain or for the number of adversarial scans targeting the enterprise network, among other threats.

— *Improve capacity management.* Overextended web-facing technologies are harder to monitor and more susceptible to attacks. Security teams can monitor the performance of applications to identify suspected malware or low-value security agents or even recommend the removal of features (such as noncritical functions or graphics on customer portals) that hog network capacity.

Processes: Integrate and standardize security activities

Customers, employees, and vendors all play some part in maintaining the confidentiality, integrity, and availability of web-facing networks. Several steps can help organizations to ensure that the activities of these stakeholders are consistent and well integrated:

— *Integrate fraud-prevention capabilities with the SOC.* Organizations that support the execution of financial transactions should consider integrating their existing fraud analytics with SOC workflows to accelerate the inspection and remediation of fraudulent transactions.

— *Account for increased costs.* Many SOC tools and managed-security-service providers base charges for monitoring on usage—for example, the volume of log records analyzed. As usage increases with expanded network traffic, organizations with usage-based fee arrangements will need to account for any corresponding increase in costs.

— *Help consumers solve CIA problems themselves.* For media providers, enabling customers to access content without interruption is essential, but increased usage levels can jeopardize availability. Companies may wish to offer guides to show users how to mitigate access problems, particularly during periods of peak use.

Securing remote-working arrangements and sustaining the CIA of customer-facing networks are essential to ensure the continuity of operations during this disruptive time. The actions we describe in this article, while not comprehensive, have helped many organizations to overcome the security difficulties they face and maintain their standing with customers and other stakeholders.

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McKinsey and Praetorian have entered into a strategic alliance to help clients solve complex cybersecurity challenges and secure innovation. As a part of this alliance, McKinsey is a minority investor in Praetorian.

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Cybersecurity's dual mission during the coronavirus crisis

Chief information-security officers must balance two priorities to respond to the pandemic: protecting against new cyberthreats and maintaining business continuity. Four strategic principles can help.

by Jim Boehm, James Kaplan, and Nathan Sportsman

The extraordinary efforts of many organizations to protect workers and serve customers during the COVID-19 pandemic have also increased their exposure to cyberthreats. Large-scale adoption of work-from-home technologies, heightened activity on customer-facing networks, and greater use of online services all present fresh openings, which cyberattackers have been quick to exploit.

The overarching challenge for chief information-security officers (CISOs) and cybersecurity teams will be protecting their institutions while enabling operations to go on without interruption. For example, cybersecurity teams at companies that provide web-based services to consumers must adjust their security programs to match scaled-up operations while securing a massive shift to work-from-home tools. At the same time, CISOs must make it possible for security-team members to look after themselves and their families during a health crisis.

Addressing these diverse and sometimes competing needs at once won't be easy. But recent conversations with cybersecurity leaders suggest that some governing principles are helping them meet the challenge. This article recommends four such principles: focusing on critical operating needs, testing plans for managing security and technology risks, monitoring for new cyberthreats, and balancing protection with business continuity.

How the response to COVID-19 has increased cyberrisk

As organizations and people have curtailed travel and in-person gatherings, they have shifted a great deal of activity into the digital realm. Workers and students are staying home, using videoconferencing services, collaboration platforms, and other digital tools to do business and schoolwork. In their free time, they are going online to shop, read, chat, play, and stream. All these behaviors put immense stress on cybersecurity controls and operations. Several major vulnerabilities stand out:

— *Working from home has opened multiple vectors for cyberattacks.* A broad shift toward work-from-home arrangements has amplified long-standing cybersecurity challenges: unsecured data transmissions by people who aren't using VPN software, weak enforcement of risk-mitigating behaviors (the "human firewall"), and physical and psychological stressors that compel employees to bypass controls for the sake of getting things done. The more that homebound employees struggle to access data and systems, the more they will attempt to use risky work-arounds (exhibit). Cybersecurity teams will need to secure work-from-home systems and test and scale VPNs and incident-response tools. In addition, they may wish to revisit access-management policies so that employees can connect to critical infrastructure via personal devices or open, internet-facing channels.

— *Social-engineering ploys are on the rise.* In social-engineering gambits, attackers attempt to gain information, money, or access to protected systems by tricking legitimate users. Companies have seen more malware-laced email-phishing campaigns that borrow the identities of health, aid, and other benevolent organizations. Scammers posing as corporate help-desk teams ask workers for their security credentials using text phishing ("smishing") and voice phishing ("vishing"). Email fraudsters have tried to get executives to move money to fund vendors, operations, and virus-related-response activities.

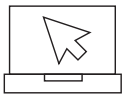
— *Cyberattackers are using websites with weak security to deliver malware.* With the creation of new domains and websites to spread information and resources to combat the coronavirus, attackers are exploiting the weak security controls on many of these sites to spread malware via drive-by downloads. A common approach hides readily available malware (such as AZORult) inside coronavirus heat maps or early-warning applications. In one instance, a threat actor targeted a public-sector entity by embedding malware in a pandemic-related document and disguising it as an official communiqué from another part of the government. Once installed, such a malicious application steals a user's confidential data (for example, personal information, credit-card information, and bitcoin-wallet keys). Some malware applications launch ransomware

Exhibit

Shifting to work-from-home arrangements can open multiple vectors for cyberattacks.

Changes in app-access rights

- Under existing policies, access to apps differs based on criticality and cyberrisk appetite (eg, data infiltration, data-protection loss), from less critical apps accessible from almost anywhere (eg, public network) to apps accessible through extranet, apps accessible only through VPN, and, ultimately, critical apps accessible only on site (eg, trading, treasury)
- Remote working can require organizations to widen access rights by enabling off-site access to some of the most critical apps, which can increase cyberrisk
- Some users might not have strong multifactor authentication, because their access rights are usually limited; change in access rights, combined with weak authentication, constitutes a further threat



Use of personal devices and tools

- Some employees may have been enabled to work from their own personal devices, but because these devices are not centrally controlled (for patching, network-access control, and endpoint data-protection systems), they can introduce cybersecurity vulnerabilities
- To get work done, many employees use consumer-grade tools, accounts, and devices and share data over nonsecure and noncontrolled channels

Lack of social control

- Click-through rates for phishing emails and success rates of fake call-center agents can increase if employees no longer maintain a "human protection shield" by asking coworkers about suspicious emails or calls

attacks, which lock a user's system until they pay a certain amount of money to the attacker.

— *Public-sector organizations are experiencing acute pressure.* A large government entity in North America suffered from a distributed denial-of-service attack aimed at disrupting services and issuing misinformation to the public. A major hospital in Europe was hit with a cyberattack that forced it to suspend scheduled operations, shut down its IT network, and move acute-care patients to another facility. And a department of a local government had its website encrypted by ransomware, preventing officials from posting information for the public and keeping employees from accessing certain files.

As the COVID-19 outbreak progresses and alters the functioning of our socioeconomic systems, cyberattackers will continue their efforts to exploit our fears and our digital vulnerabilities. To remain vigilant and effective, CISOs will need new approaches.

How to address the challenge: Strategic practices for chief information-security officers

While many CISOs and other executives have drawn on their experiences with past crises to respond to the early stages of the COVID-19 outbreak, the pandemic's vast scale and unpredictable duration are highly unusual. There is no playbook that CISOs can open for guidance. Nevertheless, the CISOs and senior cybersecurity managers we have spoken to have found it especially helpful to follow four practices:

— *Focus.* Security- and technology-risk teams should focus on supporting only those technology and security features, capabilities, and service rollouts that are critical to operations. Examples of focus areas that may justify a surge in capacity over the coming weeks include maintaining security operations, mitigating risks of remote access to sensitive data and software-development environments, and implementing multifactor authentication to enable employees to work from home.

Employees on the front line will play an especially important role in keeping the organization safe as normal on-premise security measures become less relevant.

Organizations should also reiterate to employees their safe remote-working protocols and their procedures for threat identification and escalation. Employees on the front line will play an especially important role in keeping the organization safe as normal on-premise security measures become less relevant.

— *Test.* If your organization has security- or technology-risk plans of any kind—such as plans for incident response, business continuity, disaster recovery, talent succession, and vendor succession—then test them right away. If your organization doesn't have adequate plans in place, create them and then test them. You must determine whether your organization's risk-response approach is effective and efficient. Eliminating risk events is impossible, but you can reduce the exacerbated risk associated with a poor response.

— *Monitor.* Consider mustering all available resources to help with monitoring, which enables risk response and recovery to begin. Areas for stepped-up monitoring can include remote monitoring of collaboration tools, monitoring networks for new and novel strains of malware, and monitoring employees and endpoints to catch data-related incidents before they result in operational risk.

— *Balance.* Cybersecurity teams are likely to receive a flood of urgent requests for cybersecurity-policy exceptions that will allow teams elsewhere in the organization to get work done (for example, to approve the installation of new apps and allow the use of USB drives). While CISOs might be inclined to deny such requests for the sake of preventing undue risk, they must also bear in mind the importance of maintaining business continuity during a fluid and challenging time for their colleagues. To support continued operations, CISOs may need to tolerate slightly higher risk in the short term by granting waivers or temporarily relaxing some controls. An accommodating approach will encourage colleagues to make intelligent risk trade-offs. That said, CISOs shouldn't allow these exceptions to weaken an organization's risk posture permanently. If CISOs grant waivers or relax controls, they should establish formal evaluation and review processes and implement time limits to force periodic reevaluation or limit the exceptions to particular user groups.

The COVID-19 crisis is a human challenge above all else. Everyone is juggling professional responsibilities with important personal ones. The coming weeks and months are likely to bring more uncertainty. By adhering to the practices we described—focus, test, monitor, and balance—CISOs can fulfill their responsibilities to uphold their institutions' security and maintain business continuity while also meeting their obligations to their teams.

Jim Boehm is a partner in McKinsey's Washington, DC, office; **James Kaplan** is a partner in the New York office; and **Nathan Sportsman** is the founder and CEO of Praetorian.

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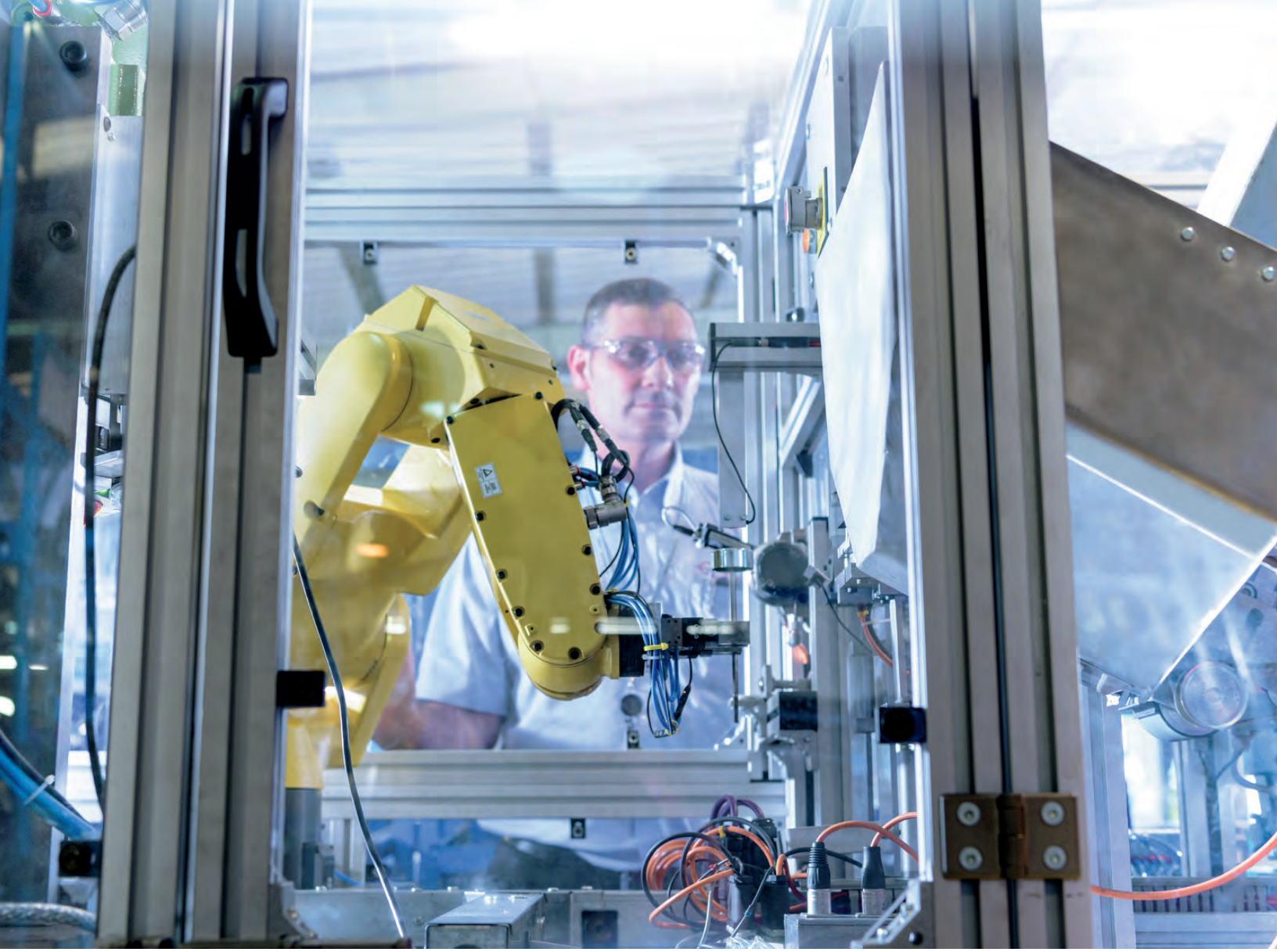

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Where machines can replace humans—and where they can't (yet)

The technical potential for automation differs dramatically across sectors and activities.

by Michael Chui, James Manyika, and Mehdi Miremadi

As automation technologies such as machine learning and robotics play an increasingly great role in everyday life, their potential effect on the workplace has, unsurprisingly, become a major focus of research and public concern. The discussion tends toward a Manichean guessing game: which jobs will or won't be replaced by machines?

In fact, as our research has begun to show, the story is more nuanced. While automation will eliminate very few occupations entirely in the next decade, it will affect portions of almost all jobs to a greater or lesser degree, depending on the type of work they entail. Automation, now going beyond routine manufacturing activities, has the potential, at least with regard to its technical feasibility, to transform sectors such as healthcare and finance, which involve a substantial share of knowledge work.

These conclusions rest on our detailed analysis of 2,000-plus work activities for more than 800 occupations. Using data from the US Bureau of Labor Statistics and O*Net, we've quantified both the amount of time spent on these activities across the economy of the United States and the technical feasibility of automating each of them. The full results, forthcoming in early 2017, will include several other countries,[1] but we released some initial findings late last year and are following up now with additional interim results.

Last year, we showed that currently demonstrated technologies could automate 45 percent of the activities people are paid to perform and that about 60 percent of all occupations could see 30 percent or more of their constituent activities automated, again with technologies available today. In this article, we examine the technical feasibility, using currently demonstrated technologies, of automating three groups of occupational activities: those that are highly susceptible, less susceptible, and least susceptible to automation. Within each category, we discuss the sectors and occupations where robots and other machines are most—and least—likely to serve as substitutes in activities humans currently perform. Toward the end of this article, we discuss how evolving technologies, such as natural-language generation, could change the outlook, as well as some implications for senior executives who lead increasingly automated enterprises.

Understanding automation potential

In discussing automation, we refer to the potential that a given activity could be automated by adopting currently demonstrated technologies, that is to say, whether or not the automation of that activity is *technically feasible*.[2] Each whole occupation is made up of multiple types of activities, each with varying degrees of technical feasibility. Exhibit 1 lists seven top-level groupings of activities we have identified. Occupations in retailing, for example, involve activities such as collecting or processing data, interacting with customers, and setting up merchandise displays (which we classify as physical movement in a predictable environment). Since all of these constituent activities have a different automation potential, we arrive at an overall estimate for the sector by examining the time workers spend on each of them during the workweek.

Technical feasibility is a necessary precondition for automation, but not a complete predictor that an activity will be automated. A second factor to consider is the cost of developing and deploying both the hardware and the software for automation. The cost of labor and related supply-and-demand dynamics represent a third factor: if workers are in abundant supply and significantly less expensive than automation, this could be a decisive argument against it. A fourth factor to consider is the benefits beyond labor substitution, including higher levels of output, better quality, and fewer errors. These are often larger than those of reducing labor costs. Regulatory and social-acceptance issues, such as the degree to which machines are acceptable in any particular setting, must also be weighed. A robot may, in theory, be able to replace some of the functions of a nurse, for example. But for now, the prospect that this might actually happen in a highly visible

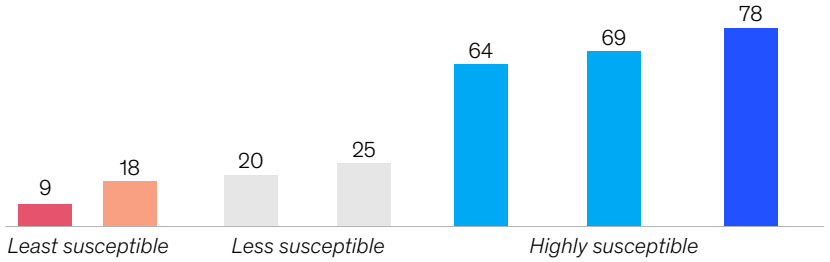
[1] For interim insights on our core findings, see Michael Chui, James Manyika, and Mehdi Miremadi, "Four fundamentals of workplace automation," *McKinsey Quarterly*, November 2015, McKinsey.com.

[2] We define "currently demonstrated technologies" as those that have already exhibited the level of performance and reliability needed to automate 1 or more of the 18 capabilities involved in carrying out work activities. In some cases, that level of performance has been demonstrated through commercially available products, in others through research projects.

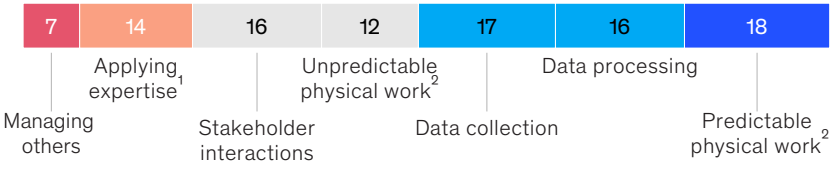
Exhibit 1

Analyzing work activities rather than occupations is the most accurate way to examine the technical feasibility of automation.

Technical feasibility, % of time spent on activities that can be automated by adapting currently demonstrated technology



Time spent in all US occupations, %



Note: In practice, automation will depend on more than just technical feasibility. Five factors are involved: technical feasibility; costs to automate; the relative scarcity, skills, and cost of workers who might otherwise do the activity; benefits (eg, superior performance) of automation beyond labor-cost substitution; and regulatory and social-acceptance considerations.

[1] Applying expertise to decision making, planning, and creative tasks.

[2] Unpredictable physical work (physical activities and the operation of machinery) is performed in unpredictable environments, while in predictable physical work, the environments are predictable.

way could prove unpalatable for many patients, who expect human contact. The potential for automation to take hold in a sector or occupation reflects a subtle interplay between these factors and the trade-offs among them.

Even when machines do take over some human activities in an occupation, this does not necessarily spell the end of the jobs in that line of work. On the contrary, their number at times increases in occupations that have been partly automated, because overall demand for their remaining activities has continued to grow. For example, the large-scale deployment of bar code scanners and associated point-of-sale systems in the United States in the 1980s reduced labor costs per store by an estimated 4.5 percent and the cost of the groceries consumers bought by 1.4 percent.[3] It also enabled a number of innovations, including increased promotions. But cashiers were still needed; in fact, their employment grew at an average rate of more than 2 percent between 1980 and 2013.

The most automatable activities

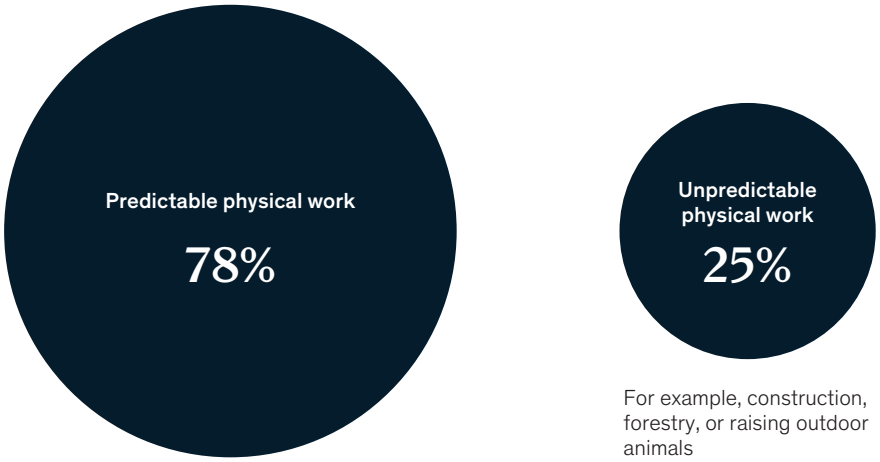
Almost one-fifth of the time spent in US workplaces involves performing physical activities or operating machinery in a predictable environment: workers carry out specific actions in well-known settings where changes are relatively easy to anticipate. Through the adaptation and adoption of currently available technologies, we estimate the technical feasibility of automating such activities at 78 percent, the highest of our seven top-level categories (Exhibit 2). Since predictable physical activities figure prominently in sectors such as manufacturing, food

[3] Emek Basker, "Change at the checkout: Tracing the impact of a process innovation," *The Journal of Industrial Economics*, June 2015, Volume 63, Number 2, pp. 339–70.

Exhibit 2

It's more technically feasible to automate predictable physical activities than unpredictable ones.

Technical feasibility of automation, %[1]



[1] Percent of time spent on activities that can be automated by adapting currently demonstrated technology.

service and accommodations, and retailing, these are the most susceptible to automation based on technical considerations alone.

In manufacturing, for example, performing physical activities or operating machinery in a predictable environment represents one-third of the workers' overall time. The activities range from packaging products to loading materials on production equipment to welding to maintaining equipment. Because of the prevalence of such predictable physical work, some 59 percent of all manufacturing activities could be automated, given technical considerations. The overall technical feasibility, however, masks considerable variance. Within manufacturing, 90 percent of what welders, cutters, solderers, and brazers do, for example, has the technical potential for automation, but for customer-service representatives that feasibility is below 30 percent. The potential varies among companies as well. Our work with manufacturers reveals a wide range of adoption levels—from companies with inconsistent or little use of automation all the way to quite sophisticated users.

Manufacturing, for all its technical potential, is only the second most readily automatable sector in the US economy. The top spot belongs to accommodations and food services, where almost half of all labor time involves predictable physical activities and the operation of machinery—including preparing, cooking, or serving food; cleaning food-preparation areas; preparing hot and cold beverages; and collecting dirty dishes. According to our analysis, 73 percent of the activities workers perform in food service and accommodations have the potential for automation, based on technical considerations.

Some of this potential is familiar. Automats, or automated cafeterias, for example, have long been in use. Now restaurants are testing new, more sophisticated concepts, like self-service ordering or

Artificial intelligence and the future of knowledge work

A lot of what's going on in AI is some mix of math, statistics, and theoretical computer science. It's basically probabilistic networks, with various strategies for how you design those networks in different layers. One of the things that has changed radically is the extent to which math and statistics and computer science talk to one another. And now economics is also talking, and sociology is talking—there's much more social-science interaction. We're going to need people who can help develop algorithms in these application areas, not just people who can use the tools that somebody else develops. I'm not a labor economist, but I am worried that there's going to be an incredible demand for people who can work with new technologies. And for the people who can't, maybe there aren't nearly the same kind of opportunities to earn a living. We know that things are going to change radically, and we have really no idea exactly how they're going to change.

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even robotic servers. Solutions such as Momentum Machines' hamburger-cooking robot, which can reportedly assemble and cook 360 burgers an hour, could automate a number of cooking and food-preparation activities. But while the technical potential for automating them might be high, the business case must take into account both the benefits and the costs of automation, as well as the labor-supply dynamics discussed earlier. For some of these activities, current wage rates are among the lowest in the United States, reflecting both the skills required and the size of the available labor supply. Since restaurant employees who cook earn an average of about $10 an hour, a business case based solely on reducing labor costs may be unconvincing.

Retailing is another sector with a high technical potential for automation. We estimate that 53 percent of its activities are automatable, though, as in manufacturing, much depends on the specific occupation within the sector. Retailers can take advantage of efficient, technology-driven stock management and logistics, for example. Packaging objects for shipping and stocking merchandise are among the most frequent physical activities in retailing, and they have a high technical potential for automation. So do maintaining records of sales, gathering customer or product information, and other data-collection activities. But retailing also requires cognitive and social skills. Advising customers which cuts of meat or what color shoes to buy requires judgment and emotional intelligence. We calculate that 47 percent of a retail salesperson's activities have the technical potential to be automated—far less than the 86 percent possible for the sector's bookkeepers, accountants, and auditing clerks.

As we noted above, however, just because an activity can be automated doesn't mean that it will be—broader economic factors are at play. Bookkeepers, accountants, and auditing clerks, for example, require skills and training, so they are scarcer than basic cooks. But the activities they perform cost less to automate, requiring mostly software and a basic computer.

Considerations such as these have led to an observed tendency for higher rates of automation for activities common in some middle-skill jobs—for example, in data collection and data processing. As automation advances in capability, jobs involving higher skills will probably be automated at increasingly high rates.

The heat map in Exhibit 3 highlights the wide variation in how automation could play out, both in individual sectors and for different types of activities within them.[4]

[4] For a deeper look across all sectors in the US economy, please see the data representations from McKinsey on automation and US jobs, on public.tableau.com.

Exhibit 3

Automation is technically feasible for many types of activities in industry sectors, but some activities can be more affected than others.

Note: In practice, automation will depend on more than just technical feasibility. Five factors are involved: technical feasibility; costs to automate; the relative scarcity, skills, and cost of workers who might otherwise do the activity; benefits (eg, superior performance) of automation beyond labor-cost substitution; and regulatory and social-acceptance considerations.

[1] Agriculture includes forestry, fishing, and hunting; other services excludes federal-, state-, and local-government services; real estate includes rental and leasing; administrative includes administrative support and government administration; healthcare and social assistance includes private, state-government, and local-government hospitals; professional includes scientific and technical services; educational services includes private, state-government, and local-government schools.
[2] Applying expertise to decision making, planning, and creative tasks.
[3] Unpredictable physical work (physical activities and the operation of machinery) is performed in unpredictable environments, while in predictable physical work, the environments are predictable.

Activities and sectors in the middle range for automation

Across all occupations in the US economy, one-third of the time spent in the workplace involves collecting and processing data. Both activities have a technical potential for automation exceeding 60 percent. Long ago, many companies automated activities such as administering procurement, processing payrolls, calculating material-resource needs, generating invoices, and using bar codes to track flows of materials. But as technology progresses, computers are helping to increase the scale and quality of these activities. For example, a number of companies now offer solutions that automate entering paper and PDF invoices into computer systems or even processing loan applications. And it's not just entry-level workers or low-wage clerks who collect and process data; people whose annual incomes exceed $200,000 spend some 31 percent of their time doing those things, as well.

Financial services and insurance provide one example of this phenomenon. The world of finance relies on professional expertise: stock traders and investment bankers live off their wits. Yet about 50 percent of the overall time of the workforce in finance and insurance is devoted to collecting and processing data, where the technical potential for automation is high. Insurance sales agents gather customer or product information and underwriters verify the accuracy of records. Securities and financial sales agents prepare sales or other contracts. Bank tellers verify the accuracy of financial data.

As a result, the financial sector has the technical potential to automate activities taking up 43 percent of its workers' time. Once again, the potential is far higher for some occupations than for others. For example, we estimate that mortgage brokers spend as much as 90 percent of their time processing applications. Putting in place more sophisticated verification processes for documents and credit applications could reduce that proportion to just more than 60 percent. This would free up mortgage advisers to focus more of their time on advising clients rather than routine processing. Both the customer and the mortgage institution get greater value.

Other activities in the middle range of the technical potential for automation involve large amounts of physical activity or the operation of machinery in *unpredictable* environments. These types of activities make up a high proportion of the work in sectors such as farming, forestry, and construction and can be found in many other sectors as well.

Examples include operating a crane on a construction site, providing medical care as a first responder, collecting trash in public areas, setting up classroom materials and equipment, and making beds in hotel rooms. The latter two activities are unpredictable largely because the environment keeps changing. Schoolchildren leave bags, books, and coats in a seemingly random manner. Likewise, in a hotel room, different guests throw pillows in different places, may or may not leave clothing on their beds, and clutter up the floor space in different ways.

These activities, requiring greater flexibility than those in a predictable environment, are for now more difficult to automate with currently demonstrated technologies: their automation potential is 25 percent. Should technology advance to handle unpredictable environments with the same ease as predictable ones, the potential for automation would jump to 67 percent. Already, some activities in less predictable settings in farming and construction (such as evaluating the quality of crops, measuring materials, or translating blueprints into work requirements) are more susceptible to automation.

Activities with low technical potential for automation

The hardest activities to automate with currently available technologies are those that involve managing and developing people (9 percent automation potential) or that apply expertise to decision making, planning, or creative work (18 percent). These activities, often characterized as knowledge work, can be as varied as coding software, creating menus, or writing promotional materials. For now, computers do an excellent job with very well-defined activities, such as optimizing trucking routes, but humans still need

to determine the proper goals, interpret results, or provide commonsense checks for solutions. The importance of human interaction is evident in two sectors that, so far, have a relatively low technical potential for automation: healthcare and education.

Overall, healthcare has a technical potential for automation of about 36 percent, but the potential is lower for health professionals whose daily activities require expertise and direct contact with patients. For example, we estimate that less than 30 percent of a registered nurse's activities could be automated, based on technical considerations alone. For dental hygienists, that proportion drops to 13 percent.

Nonetheless, some healthcare activities, including preparing food in hospitals and administering non-intravenous medications, could be automated if currently demonstrated technologies were adapted. Data collection, which also accounts for a significant amount of working time in the sector, could become more automated as well. Nursing assistants, for example, spend about two-thirds of their time collecting health information. Even some of the more complex activities that doctors perform, such as administering anesthesia during simple procedures or reading radiological scans, have the technical potential for automation.

Of all the sectors we have examined, the technical feasibility of automation is lowest in education, at least for now. To be sure, digital technology is transforming the field, as can be seen from the myriad classes and learning vehicles available online. Yet the essence of teaching is deep expertise and complex interactions with other people. Together, those two categories—the least automatable of the seven identified in the first exhibit—account for about one-half of the activities in the education sector.

Even so, 27 percent of the activities in education—primarily those that happen outside the classroom or on the sidelines—have the potential to be automated with demonstrated technologies. Janitors and cleaners, for example, clean and monitor building premises. Cooks prepare and serve school food. Administrative assistants maintain inventory records and personnel information. The automation of these data-collection and processing activities may help to reduce the growth of the administrative expenses of education and to lower its cost without affecting its quality.

Looking ahead

As technology develops, robotics and machine learning will make greater inroads into activities that today have only a low technical potential for automation. New techniques, for example, are enabling safer and more enhanced physical collaboration between robots and humans in what are now considered unpredictable environments. These developments could enable the automation of more activities in sectors such as construction. Artificial intelligence can be used to design components in engineer-heavy sectors.

One of the biggest technological breakthroughs would come if machines were to develop an understanding of natural language on par with median human performance—that is, if computers gained the ability to recognize the concepts in everyday communication between people. In retailing, such natural-language advances would increase the technical potential for automation from 53 percent of all labor time to 60 percent. In finance and insurance, the leap would be even greater, to 66 percent, from 43 percent. In healthcare, too, while we don't believe currently demonstrated technologies could accomplish all of the activities needed to diagnose and treat patients, technology will become more capable over time. Robots may not be cleaning your teeth or teaching your children quite yet, but that doesn't mean they won't in the future.

As stated at the outset, though, simply considering the technical potential for automation is not enough to assess how much of it will occur in particular activities. The actual level will reflect the interplay of the technical potential, the benefits and costs (or the business case), the supply-and-demand dynamics

of labor, and various regulatory and social factors related to acceptability.

Leading more automated enterprises

Automation could transform the workplace for everyone, including senior management. The rapid evolution of technology can make harnessing its potential and avoiding its pitfalls especially complex. In some industries, such as retailing, automation is already changing the nature of competition. E-commerce players, for example, compete with traditional retailers by using both physical automation (such as robots in warehouses) and the automation of knowledge work (including algorithms that alert shoppers to items they may want to buy). In mining, autonomous haulage systems that transport ore inside mines more safely and efficiently than human operators do could also deliver a step change in productivity.

Top executives will first and foremost need to identify where automation could transform their own organizations and then put a plan in place to migrate to new business processes enabled by automation. A heat map of potential automation activities within companies can help to guide, identify, and prioritize the potential processes and activities that could be transformed. As we have noted, the key question will be where and how to unlock value, given the cost of replacing human labor with machines. The majority of the benefits may come not from reducing labor costs but from raising productivity through fewer errors, higher output, and improved quality, safety, and speed.

It is never too early to prepare for the future. To get ready for automation's advances tomorrow, executives must challenge themselves to understand the data and automation technologies on the horizon today. But more than data and technological savvy are required to capture value from automation. The greater challenges are the workforce and organizational changes that leaders will have to put in place as automation upends entire business processes, as well as the culture of organizations, which must learn to view automation as a reliable productivity lever. Senior leaders, for their part, will need to "let go" in ways that run counter to a century of organizational development.[5]

Understanding the activities that are most susceptible to automation from a technical perspective could provide a unique opportunity to rethink how workers engage with their jobs and how digital labor platforms can better connect individuals, teams, and projects.[6] It could also inspire top managers to think about how many of their own activities could be better and more efficiently executed by machines, freeing up executive time to focus on the core competencies that no robot or algorithm can replace—as yet.

[5] See Martin Dewhurst and Paul Willmott, "Manager and machine: The new leadership equation," *McKinsey Quarterly*, September 2014, McKinsey.com.
[6] See Aaron De Smet, Susan Lund, and William Schaninger, "Organizing for the future," *McKinsey Quarterly*, January 2016, McKinsey.com.

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Why digital strategies fail

Most digital strategies don’t reflect how digital is changing economic fundamentals, industry dynamics, or what it means to compete. Companies should watch out for five pitfalls.

by Jacques Bughin, Tanguy Catlin, Martin Hirt, and Paul Willmott

The processing power of today's smartphones are several thousand times greater than that of the computers that landed a man on the moon in 1969. These devices connect the majority of the human population, and they're only ten years old.[1]

In that short period, smartphones have become intertwined with our lives in countless ways. Few of us get around without the help of ridesharing and navigation apps such as Lyft and Waze. On vacation, novel marine-transport apps enable us to hitch a ride from local boat owners to reach an island. While we're away, we can also read our email, connect with friends back home, check to make sure we turned the heat down, make some changes to our investment portfolio, and buy travel insurance for the return trip. Maybe we'll browse the Internet for personalized movie recommendations or for help choosing a birthday gift that we forgot to buy before leaving. We also can create and continually update a vacation photo gallery—and even make a few old-fashioned phone calls.

Then we go back to work—where the recognition and embrace of digital is far less complete. Our work involves advising the leaders of large organizations. And as we look at this small device and all the digital change and revolutionary potential within it, we feel the urge to send every CEO we know a wake-up call. Many think that having a few digital initiatives in the air constitutes a digital strategy—it does not. Going forward, digital strategy needs to be a heck of a lot different from what they have today, or they're not going to make it.

We find that a surprisingly large number underestimate the increasing momentum of digitization, the behavioral changes and technology driving it, and, perhaps most of all, the scale of the disruption bearing down on them. Many companies are still locked into strategy-development processes that churn along on annual cycles. Only 8 percent of companies we surveyed recently said their current business model would remain economically viable if their industry keeps digitizing at its current course and speed.

How can this be, at a moment when virtually every company in the world is worried about its digital future? In other words, why are so many digital strategies failing? The answer has to do with the magnitude of the disruptive economic force digital has become and its incompatibility with traditional economic, strategic, and operating models. This article unpacks five issues that, in our experience, are particularly problematic. We hope they will awaken a sense of urgency and point toward how to do better.

Pitfall 1: Fuzzy definitions

When we talk with leaders about what they mean by digital, some view it as the upgraded term for what their IT function does. Others focus on digital marketing or sales. But very few have a broad, holistic view of what digital really means. We view digital as the nearly instant, free, and flawless ability to connect people, devices, and physical objects anywhere. By 2025, some 20 billion devices will be connected, nearly three times the world population. Over the past two years, such devices have churned out 90 percent of the data ever produced. Mining this data greatly enhances the power of analytics, which leads directly to dramatically higher levels of automation—both of processes and, ultimately, of decisions. All this gives birth to brand-new business models.[2] Think about the opportunities that telematics have created for the insurance industry. Connected cars collect real-time information about a customer's driving behavior. The data allow insurers to price the risk associated with a driver automatically and more accurately, creating an opportunity to offer direct, pay-as-you-go coverage and bypassing today's agents.

Lacking a clear definition of digital, companies struggle to connect digital strategy to their business, leaving them adrift in the fast-churning

[1] Early versions of the smartphone date to the mid-1990s, but today's powerful, multipurpose devices originated with the iPhone's launch, in 2007.

[2] See Andrew McAfee and Erik Brynjolfsson, *Machine, Platform, Crowd: Harnessing Our Digital Future*, New York, NY: W. W. Norton & Company, 2017.

waters of digital adoption and change. What's happened with the smartphone over the past ten years should haunt you—and no industry will be immune.

Pitfall 2: Misunderstanding the economics of digital

Many of us learned a set of core economic principles years ago and saw the power of their application early and often in our careers. (For more on the changing economics of digital competition, see the infographic on pages 66–67.) This built intuition—which often clashes with the new economic realities of digital competition. Consider these three:

Digital is destroying economic rent

One of the first concepts we learned in microeconomics was economic rent—profit earned in excess of a company's cost of capital. Digital is confounding the best-laid plans to capture surplus by creating—on average—more value for customers than for firms. This is big and scary news for companies and industries hoping to convert digital forces into economic advantage. Instead, they find digital unbundling profitable product and service offerings, freeing customers to buy only what they need. Digital also renders distribution intermediaries obsolete (how healthy is your nearest big-box store?), with limitless choice and price transparency. And digital offerings can be reproduced almost freely, instantly, and perfectly, shifting value to hyperscale players while driving marginal costs to zero and compressing prices.

Competition of this nature already has siphoned off 40 percent of incumbents' revenue growth and 25 percent of their growth in earnings before interest and taxes (EBIT), as they cut prices to defend what they still have or redouble their innovation investment in a scramble to catch up. "In-the-moment" metrics, meanwhile, can be a mirage: a company that tracks and maintains its performance relative to its usual competitors seems to be keeping pace, even as overall economic performance deteriorates.

There are myriad examples where these dynamics have already played out. In the travel industry, airlines and other providers once paid travel agents to source customers. That all changed with the Internet, and consumers now get the same free services that they once received from travel agents anytime, anyplace, at the swipe of a finger—not to mention recommendations for hotels and destinations that bubble up from the "crowd" rather than experts. In enterprise hardware, companies once maintained servers, storage, application services, and databases at physical data centers. Cloud-service offerings from Amazon, Google, and Microsoft, among others, have made it possible to forgo those capital investments. Corporate buyers, especially smaller ones, won because the scale economies enjoyed by these giants in the cloud mean that the all-in costs of buying storage and computing power from them can be less than those incurred running a data center. Some hardware makers lost.

The lesson from these cases: Customers were the biggest winners, and the companies that captured the value that was left were often from a completely different sector than the one where the original value pool had resided. So executives need to learn quickly how to compete, create value for customers, and keep some for themselves in a world of shrinking profit pools.

Digital is driving winner-takes-all economics

Just as sobering as the shift of profit pools to customers is the fact that when scale and network effects dominate markets, economic value rises to the top. It's no longer distributed across the usual (large) number of participants. (Think about how Amazon's market capitalization towers above that of other retailers, or how the iPhone regularly captures over 90 percent of smartphone industry profits.) This means that a company whose

Insurance: Getting a better grip on consumer surplus

If you set a digital strategy without focusing squarely on the potential for customers to reap massive gains, you are likely to be blindsided. Consider the insurance sector, where digital competitors are poised to disintermediate agents and, at the same time, intensify competition with lower prices and higher levels of service. One major insurer is fighting back by writing and marketing its own digital policies. This entails risks, starting with the alienation of agencies that have traditionally distributed its products. But the insurer strongly believes that smart digital approaches will enable better pricing and superior customer experience compared with that currently received from agents, and it sees no reason to cede this battlefield to someone else.

strategic goal is to maintain share relative to peers could be doomed—unless the company is already the market leader.

A range of McKinsey research shows how these dynamics are playing out. At the highest level, our colleagues' research on economic profit distribution highlights the existence of a power curve that has been getting steeper over the past decade or so and is characterized by big winners and losers at the top and bottom, respectively (see "Strategy to beat the odds," on page 30). Our research on digital revenue growth, meanwhile, shows it turning sharply negative for the bottom three quartiles of companies, while increasing for the top quartile. The negative effects of digital competition on a company's growth in earnings before interest, taxes, depreciation, and amortization (EBITDA), meanwhile, are twice as large for the bottom three-quarters of companies as for those at the top.

A small number of winners—often in high tech and media—are actually doing better in the digital era than they were before. They marshal huge volumes of customer data drawn from their scale and network advantages. That triggers a virtuous cycle in which information helps identify looming threats and the best partners in defending value chains under digital pressure. In this environment, incumbents often find themselves snared in some common traps. They assume market share will remain stable, that profitable niches will remain defendable, and that it's possible to maintain leadership by outgrowing traditional rivals rather than zeroing in on the digital models that are winning share.

This phenomenon of major industry shakeouts isn't new, of course. Well before digital, we saw industry disruptions in automobiles, PC manufacturing, tires, televisions, and penicillin. The number of producers typically peaked, and then fell by 70 to 97 percent.[3] The issue now is that digital is causing such disruptions to happen faster and more frequently.

Digital rewards first movers and some superfast followers

In the past, when companies witnessed rising levels of uncertainty and volatility in their industry, a perfectly rational strategic response was to observe for a little while, letting others incur the costs of experimentation and then moving as the dust settled. Such an approach represented a bet on the company's ability to "outexecute" competitors. In digital scrums, though, it is first movers and *very* fast followers that gain a huge advantage over their competitors. We found that the three-year revenue growth (of over 12 percent) for the fleetest was nearly twice that of companies playing it safe with average reactions to digital competition.

[3] Boyan Jovanovic and Glenn M. MacDonald, "The life cycle of a competitive industry," *The Journal of Political Economy*, April 1994, Volume 102, Number 2, pp. 322–47.

John Deere: Staying ahead of the digital threats

Farming-equipment manufacturer
John Deere is responding to the potential for digital entrants to sweep up value as sensors, data analytics, and artificial intelligence boost farming productivity beyond what has been feasible previously. That could commoditize farming "hardware" such as tractors and harvesting equipment. John Deere is trying to stay ahead of this shift by creating a data-driven service business that collects soil samples and analyzes weather patterns to help farmers optimize crop yields. Sensors in tractors and other machinery provide data for predictive maintenance; automated sprinkler systems sync up with weather data; and an open-software platform lets third parties build new service apps. As the company's chairman and chief executive officer, Samuel R. Allen, told shareholders recently, "Precision agriculture may evolve to a point that farmers will be able to monitor, manage, and measure the status of virtually every plant in the field."

Although still in the early days, the company's moves position it to lead in the new business of data-enabled agriculture while differentiating its traditional products and services.

Why is that? First movers and the fastest followers develop a learning advantage. They relentlessly test and learn, launch early prototypes, and refine results in real time—cutting down the development time in some sectors from several months to a few days. They also scale up platforms and generate information networks powered by artificial intelligence at a pace that far outstrips the capabilities of lower-pulsed organizations. As a result, they are often pushing ahead on version 3.0 or 4.0 offerings before followers have launched their "me too" version 1.0 models. Early movers embed information across their business model, particularly in information-intensive functions such as R&D, marketing and sales, and internal operations. They benefit, too, from word of mouth from early adopters. In short, first movers gain an advantage because they can skate to where the puck is headed.

How Tesla captured first-mover value in electric vehicles offers a lesson in the discomfiting effects of a wait-and-see posture. Four years ago, incumbent automakers could have purchased Tesla for about $4 billion. No one made the move, and Tesla sped ahead. Since then, companies have poured money into their own electric-vehicle efforts in a dash to compete with Tesla's lead in key dimensions. Over the past two years alone, competitors have spent more than $20 billion on sensor technologies and R&D.

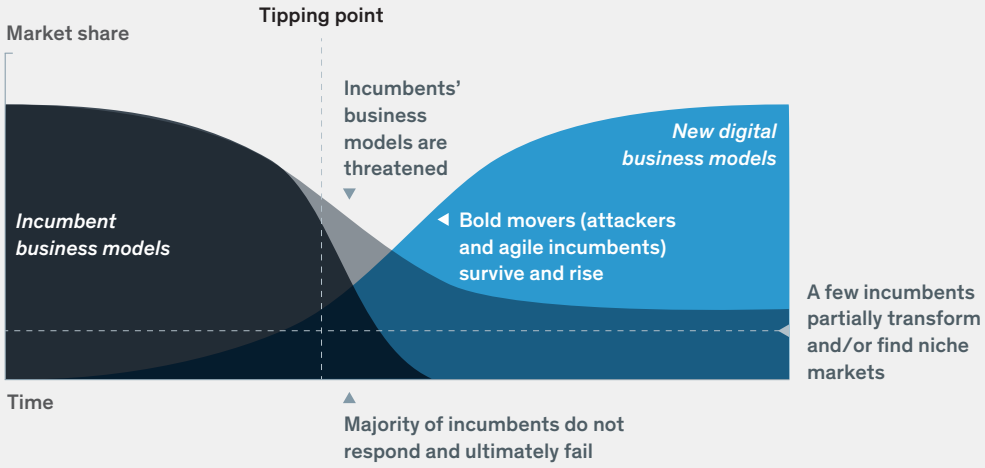
Pitfall 3: Overlooking ecosystems

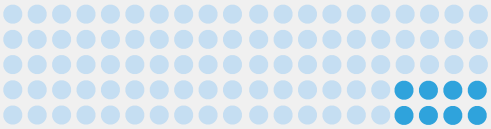
Understanding the new economic rules will move you ahead, but only so far. Digital means that strategies developed solely in the context of a company's industry are likely to face severe challenges. Traditional approaches such as tracking rivals' moves closely and using that knowledge to fine-tune overall direction or optimize value chains are increasingly perilous.

Industries will soon be ecosystems
Platforms that allow digital players to move easily across industry and sector borders are destroying the traditional model with its familiar lines of sight. Grocery stores in the United States, for example, now need to aim their strategies toward the moves of Amazon's platform, not just the chain down the street, thanks to the Whole Foods acquisition. Apple Pay and other platform-cum-banks are entering the competitive set of financial institutions. In China, Tencent and Alibaba are expanding their ecosystems. They are now platform enterprises

Don’t underestimate how digital disrupts the nature of competition.

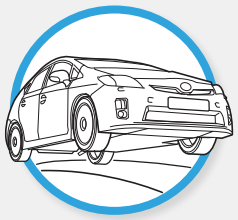
Disruption is always dangerous, but digital disruptions are happening faster than ever.





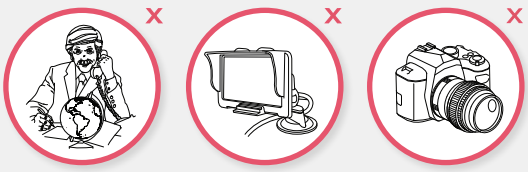
8% of companies believe their business model will remain economically viable through digitization

Digital competition shrinks value. Customers win, and companies lose. Products/services become obsolete, and value pools consolidate.



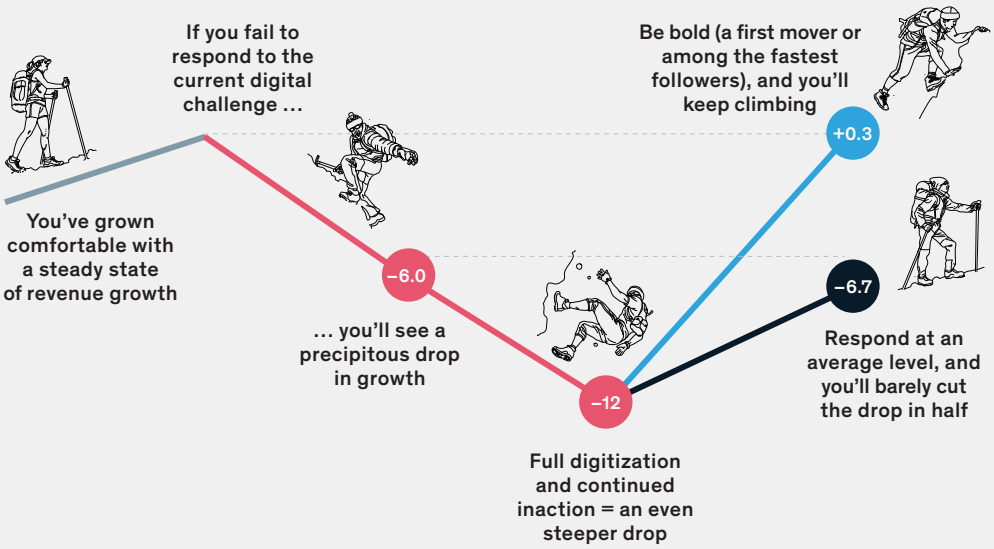
A ridesharing service is 40% cheaper than a regular cab for a 5-mile trip into Los Angeles

When was the last time you used a travel agent, bought a GPS device, or carried a point-and-shoot camera separate from your phone?



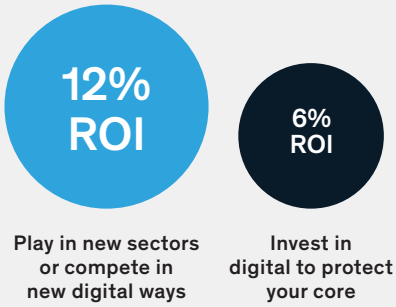
Growth rates will plummet. To survive, companies must be first movers …

Percentage-point change in 3-year revenue growth



… and the payoff will go to those who move

boldly.



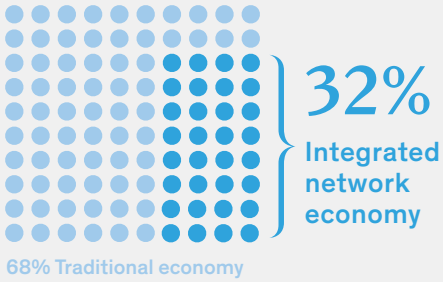
Play in new sectors or compete in new digital ways

Invest in digital to protect your core

Winners will think in terms of

ecosystems.

By 2025, almost a third of total global sales will come from ecosystems.



Companies need to change where and how they play—by creating their own network or by partnering with companies within and beyond industry borders.

Source: McKinsey Digital Global Survey, 2016 and 2017; McKinsey analysis

BMW and Qantas: Meeting the need for speed

In an industry where long product life cycles have been the norm, BMW has moved from an annual model cycle to one with continual improvements throughout the year. This has helped it to learn and apply digital and other technology advances at a faster pace than that of some competitors that have stayed with traditional cycle times. "All aspects of our products—whether design, handling, or everyday usage—will be modeled more closely than ever before on the customer's needs," Klaus Fröhlich, BMW's board of management member responsible for development, noted recently.

Moving fast sometimes necessitates competing with oneself. Anticipating increased cost pressures and a faster competitive landscape as the pace of digitization in travel and tourism progressed, Qantas Airways launched its stand-alone lower-fare Jetstar. Intensive use of digital technology in booking, app-based loyalty programs, automated check-in, and baggage service, as well as digitization in other service and operations arenas, prompted the creation of the Jetstar brand, which is differentiated by lower fares and a better customer experience.

To speed up its response time and disrupt (rather than follow) the industry, Qantas was open to cannibalizing its flagship brand. Today, Jetstar's margins on its earnings before interest and taxes (EBIT) exceed those of the Qantas brand.

that link traditional and digital companies (and their suppliers) in the insurance, healthcare, real-estate, and other industries. A big benefit: they can also aggregate millions of customers across these industries.

How ecosystems enable improbable combinations of attributes

Can you imagine a competitor that offers the largest level of inventory, fastest delivery time, greatest customer experience, and lower cost, all at once? If you think back to your MBA strategy class, the answer would probably be no. In the textbook case, the choice was between costlier products with high-quality service and higher inventory levels or cheaper products with lower service levels and thinner inventories. Digital-platform and -ecosystem economics upend the fundamentals of supply and demand. In this terrain, the best companies have the scale to reach a nearly limitless customer base, use artificial intelligence and other tools to engineer exquisite levels of service, and benefit from often frictionless supply lines. Improbable business models become a reality. Facebook is now a major media player while (until recently) producing no content. Uber and Airbnb sell global mobility and lodging without owning cars or hotels.

This will all accelerate. Our research shows that an emerging set of digital ecosystems could account for more than $60 trillion in revenues by 2025, or more than 30 percent of global corporate revenues. In a world of ecosystems, as industry boundaries blur, strategy needs a much broader frame of reference. CEOs need a wider lens when assessing would-be competitors—or partners. Indeed, in an ecosystem environment, today's competitor may turn out to be a partner or "frenemy." Failure to grasp this means that you will miss opportunities and underplay threats.

While it's true that not all businesses are able to operate in nearly frictionless digital form, platforms are fast rewiring even physical markets, thus redefining how traditional companies need to respond. Look around and you will see the new digital structures collapsing industry barriers, opening avenues for cross-functional products and services, and mashing up previously segregated

markets and value pools. With vast scale from placing customers at the center of their digital activity, ecosystem leaders have captured value that was difficult to imagine a decade ago. Seven of the top 12 largest companies by market capitalization—Alibaba, Alphabet (Google), Amazon, Apple, Facebook, Microsoft, and Tencent—are ecosystem players. What's not encouraging is how far incumbents need to travel: our research shows that only 3 percent of them have adopted an offensive platform strategy.

Pitfall 4: Overindexing on the 'usual suspects'

Most companies worry about the threats posed by digital natives, whose moves get most of the attention—and the disruptive nature of their innovative business models certainly merits some anxiety. Excessive focus on the usual suspects is perilous, though, because incumbents, too, are digitizing and shaking up competitive dynamics. And the consumer orientation of many digital leaders makes it easy to overlook the growing importance of digital in business-to-business (B2B) markets.

Digitizing incumbents are very dangerous

Incumbents are quite capable of self-cannibalizing and disrupting the status quo. In many industries, especially regulated ones such as banking or insurance, once an incumbent (really) gets going, that's when the wheels come off. After all, incumbents control the lion's share of most markets at the outset and have brand recognition across a large customer base. When they begin moving with an offensive, innovative strategy, they tip the balance. Digitization goes from being an incremental affair to a headlong rush as incumbents disrupt multiple reaches of the value chain. Digital natives generally zero in on one segment.

Our research confirms this. Incumbents moving boldly command a 20 percent share, on average, of digitizing markets. That compares with only 5 percent for digital natives on the prowl. Using another measure, we found that revved-up incumbents create as much risk to the revenues of traditional players as digital attackers do. And it's often incumbents' moves that push an industry to the tipping point. That's when the ranks of slow movers get exposed to life-threatening competition.

The B2B opportunity

The importance of B2B digitization, and its competitive implications, is easy to overlook because the digital shifts under way are less immediately obvious than those in B2C sectors and value chains. However, B2B companies can be just as disruptive. In the industries we studied, more B2B companies had digitized their core offerings and operations over the past three years than had B2C players. Digitizing B2B players are lowering costs and improving the reach and quality of their offerings. The Internet of Things, combined

Intuit: Buiding an ecosystem by acquisition

Intuit began taking an ecosystem view of its markets when a strategic review showed that fintech start-ups had the potential to target its customers with digital products. The review also showed ways the company could flex its financial power and scale. Leadership decided to acquire new digital assets to expand beyond its existing small-business and tax products, in an effort to reach digitally adept consumers who were happy to use software apps to help manage their money as well as to get a reading on their overall financial health.

Three offerings—Mint (for consumers), QuickBooks (for small businesses), and TurboTax (for both)—have been integrated with one login, and the company offers banks the ability to integrate customer accounts with its products, allowing customers easier access to online bill paying.

Telefónica: Leveraging incumbency

After a wide-ranging strategic review, Telefónica saw that it was vulnerable to digital players that were offering mobile customers lower-cost plans and more flexible models. In an effort to meet the challenges, the company launched an independent "brownfield" start-up, giffgaff. Its hallmark was an online-first model for customer support that uses community-based digital forums to resolve customer queries. Incumbency offered an important advantage: one of the company's key assets was its O2 digital network, which provided resources and technical capabilities in support of giffgaff's innovative business model.

with advanced analytics, enables leading-edge manufacturers to predict the maintenance needs of capital goods, extending their life and creating a new runway for industrial productivity. Robotic process automation (RPA) has quietly digitized 50 to 80 percent of back-office operations in some industries. Artificial intelligence and augmented reality are beginning to raise manufacturing yields and quality. Meanwhile, blockchain's digitized verification of transactions promises to revolutionize complex and paper-intensive processes, with successful applications already cropping up in smart grids and financial trading. Should the opportunities associated with shifts like these be inspirational for incumbents? Threatening? The answer is both.

Pitfall 5: Missing the duality of digital

The most common response to digital threats we encounter is the following: "If I'm going to be disrupted, then I need to create something completely new." Understandably, that becomes the driving impetus for strategy. Yet for most companies, the pace of disruption is uneven, and they can't just walk away from existing businesses. They need to digitize their current businesses *and* innovate new models.

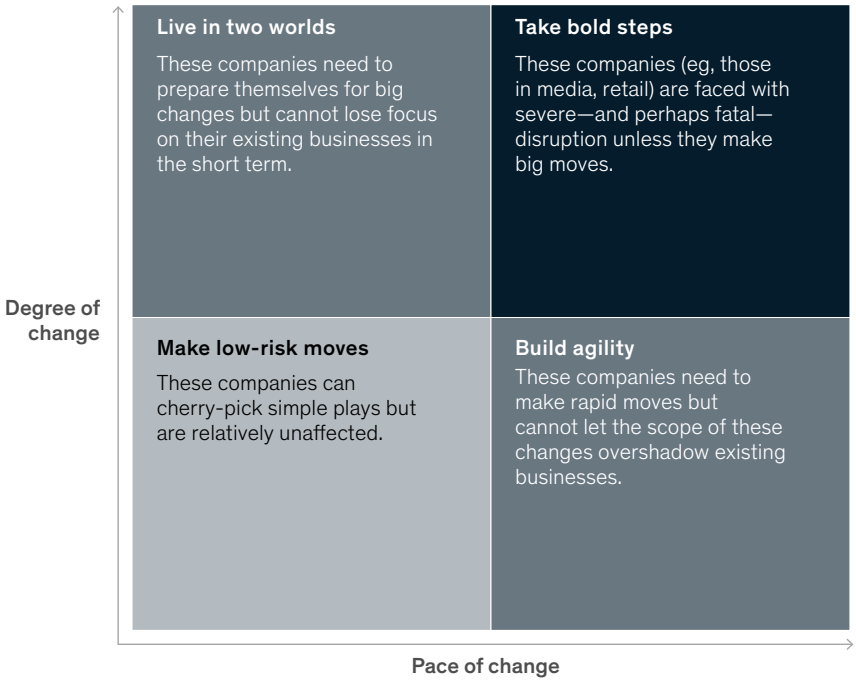
Think of a basic two-by-two matrix such as the exhibit on the following page, which shows the magnitude and pace of digital disruption. Where incumbents fall in the matrix determines how they calibrate their dual response. For those facing massive and rapid disruption, bold moves across the board are imperative to stay alive. Retail and media industries find themselves in this quadrant. Others are experiencing variations in the speed and scale of disruption; to respond to the ebbs and flows, those companies need to develop a better field of vision for threats and a capacity for more agile action. Keep in mind that transforming the core leads to much lower costs and greater customer satisfaction for existing products and services (for example, when digitization shrinks mortgage approvals from weeks to days), thus magnifying the impact of incumbents' strategic advantages in people, brand, and existing customers and their scale over attackers.

Beyond this dual mission, companies face another set of choices that seems binary at first. As we have indicated, the competitive cost of moving too slowly puts a high priority on setting an aggressive digital agenda. Yet senior leaders tell us that their ability to *execute* their strategy—amid a welter of cultural cross-currents—is what they worry about most. So they struggle over where to place their energies—placing game-changing bets or remaking the place. The fact is that strategy and execution can no longer be tackled separately or compartmentalized. The pressures of digital mean that you need to adapt both simultaneously and iteratively to succeed.

Needless to say, the organizational implications are profound. Start with people. Our colleagues estimate that half the tasks performed by today's

Exhibit

Since the extent and speed of disruption varies, companies will need to calibrate their response.



full-time workforce may ultimately become obsolete as digital competition intensifies.[4] New skills in analytics, design, and technology must be acquired to step up the speed and scale of change. Also needed are new roles such as a more diverse set of digital product owners and agile-implementation guides. And a central organizational question remains: whether to separate efforts to digitize core operations from the perhaps more creative realm of digital innovation.

While the details of getting this balance right will vary by company, two broad principles apply:

— *Bold aspiration.* The first-mover and winner-takes-all dynamics we described earlier demand big investments in where to play and often major changes to business models. Our latest research shows that the boldest companies, those we call *digital reinventors*, play well beyond the margins. They invest at much higher levels in technology, are more likely to make digitally related acquisitions, and are much more aggressive at investing in business-model innovation. This inspired boldness also turns out to be a big performance differentiator.

— *Highly adaptive.* Opportunities to move boldly often arise as a result of changing circumstances and require a willingness to pivot. The watchwords are failing fast and often and innovating even faster—in other words, learning from mistakes. Together they allow a nuanced sensing of market direction, rapid reaction, and a more unified approach to implementation. Adaptive players flesh out initial ideas through pilots. Minimum viable products trump overly polished, theoretical business cases. Many

[4] See "What the future of work will mean for jobs, skills, and wages," McKinsey Global Institute, November 2017, McKinsey.com.

companies, however, have trouble freeing themselves from the mindsets that take root in operational silos. This hinders risk taking and makes bold action difficult. It also diminishes the vital contextual awareness needed to gauge how close a market is to a competitive break point and what the disruption will mean to core businesses.

As digital disruption accelerates, we often hear a sense of urgency among executives—but it rarely reaches the level of specificity needed to address the disconnects we've described in the five aforementioned pitfalls. Leaders are far more likely to describe initiatives—"taking our business to the cloud" or "leveraging the Internet of Things"—than they are to face the new realities of digital competition head-on: "I need to develop a strategy to become number one, and I need to get there very quickly by creating enormous value to customers, redefining my role in an ecosystem, and offering new business-value propositions while driving significant improvement in my existing business."

Such recognition of the challenge is a first step for leaders. The next one is to develop a digital strategy that responds. While that's a topic for a separate article, we hope it's clear, from our description of the reasons many digital strategies are struggling today, that the pillars of strategy (where and how to compete) remain the cornerstones in the digital era. Clearly, though, that's just the starting point, so we will leave you with four elements that could help frame the strategy effort you will need to address the hard truths we had laid out here.

First there's the *who*. The breadth of digital means that strategy exercises today need to involve the entire management team, not just the head of strategy. The pace of change requires new, hard thinking on *when* to set direction. Annual strategy reviews need to be compressed to a quarterly time frame, with real-time refinements and sprints to respond to triggering events. Ever more complex competitive, customer, and stakeholder environments mean that the *what* of strategy needs updating to include role playing, scenario-planning exercises, and war games. Traditional frameworks such as Porter's Five Forces will no longer suffice. Finally, the importance of strategic agility means that, now more than ever, the "soft stuff" will determine the *how* of strategy. This will enable the organization to sense strategic opportunities in real time and to be prepared to pivot as it tests, learns, and adapts.

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Blockchain beyond the hype: What is the strategic business value?

Companies can determine whether they should invest in blockchain by focusing on specific use cases and their market position.

by Brant Carson, Giulio Romanelli, Patricia Walsh, and Askhat Zhumaev

Speculation on the value of blockchain is rife, with Bitcoin—the first and most infamous application of blockchain—grabbing headlines for its rocketing price and volatility. That the focus of blockchain is wrapped up with Bitcoin is not surprising given that its market value surged from less than $20 billion to more than $200 billion over the course of 2017.[1] Yet Bitcoin is only the first application of blockchain technology that has captured the attention of government and industry.

Blockchain was a priority topic at Davos; a World Economic Forum survey suggested that 10 percent of global GDP will be stored on blockchain by 2027.[2] Multiple governments have published reports on the potential implications of blockchain, and the past two years alone have seen more than half a million new publications on and 3.7 million Google search results for blockchain.

Most tellingly, large investments in blockchain are being made. Venture-capital funding for blockchain start-ups consistently grew and were up to $1 billion in 2017.[3] The blockchain-specific investment model of initial coin offerings (ICOs), the sale of cryptocurrency tokens in a new venture, has skyrocketed to $5 billion. Leading technology players are also heavily investing in blockchain: IBM has more than 1,000 staff and $200 million invested in the blockchain-powered Internet of Things (IoT).[4]

Despite the hype, blockchain is still an immature technology, with a market that is still nascent and a clear recipe for success that has not yet emerged. Unstructured experimentation of blockchain solutions without strategic evaluation of the value at stake or the feasibility of capturing it means that many companies will not see a return on their investments. With this in mind, how can companies determine if there is strategic value in blockchain that justifies major investments?

Our research seeks to answer this question by evaluating not only the strategic importance of blockchain to major industries but also who can capture what type of value through what type of approach. In-depth, industry-by-industry analysis combined with expert and company interviews revealed more than 90 discrete use cases of varying maturity for blockchain across major industries. We evaluated and stress tested the impact and feasibility of each of these use cases to understand better blockchain's overall strategic value and how to capture it.

Our analysis suggests the following three key insights on the strategic value of blockchain:

— Blockchain does not have to be a disintermediator to generate value, a fact that encourages permissioned commercial applications.

— Blockchain's short-term value will be predominantly in reducing cost before creating transformative business models.

— Blockchain is still three to five years away from feasibility at scale, primarily because of the difficulty of resolving the "coopetition" paradox to establish common standards.

Companies should take the following structured approach in their blockchain strategies:

1. Identify value by pragmatically and skeptically assessing impact and feasibility at a granular level and focusing on addressing true pain points with specific use cases within select industries.

2. Capture value by tailoring strategic approaches to blockchain to their market position, with consideration of measures such as ability to shape the ecosystem, establish standards, and address regulatory barriers.

With the right strategic approach, companies can start extracting value in the short term. Dominant players who can establish their blockchains as the market solutions should make big bets now.

[1] Cryptocurrency market value is subject to high variation due to the specific volatility of the market.
[2] *Deep shift: Technology tipping points and societal impact*, World Economic Forum, September 2015, weforum.org.
[3] "Blockchain startups absorbed 5X more capital via ICOs than equity financings in 2017," CB Insights, January 2018, cbinsights.com.
[4] "IBM invests to lead global Internet of Things market–shows accelerated client adoption," IBM, October 2016, ibm.com.

The nuts and bolts of blockchain

With all the hype around blockchain, it can be hard to nail down the facts (Exhibit 1). Blockchain is a distributed ledger, or database, shared across a public or private computing network. Each computer node in the network holds a copy of the ledger, so there is no single point of failure. Every piece of information is mathematically encrypted and added as a new "block" to the chain of historical records. Various consensus protocols are used to validate a new block with other participants before it can be added to the chain. This prevents fraud or double spending without requiring a central authority. The ledger can also be programmed with "smart contracts," a set of conditions recorded on the blockchain, so that transactions automatically trigger when the conditions are met. For example, smart contracts could be used to automate insurance-claim payouts.

Blockchain's core advantages are decentralization, cryptographic security, transparency, and immutability. It allows information to be verified and value to be exchanged without having to rely on a third-party authority. Rather than there being a singular form of blockchain, the technology can be configured in multiple ways to meet the objectives and commercial requirements of a particular use case.

To bring some clarity to the variety of blockchain applications, we structured blockchain use cases into six categories across its two fundamental functions—record keeping and transacting (Exhibit 2). Some industries have applications across

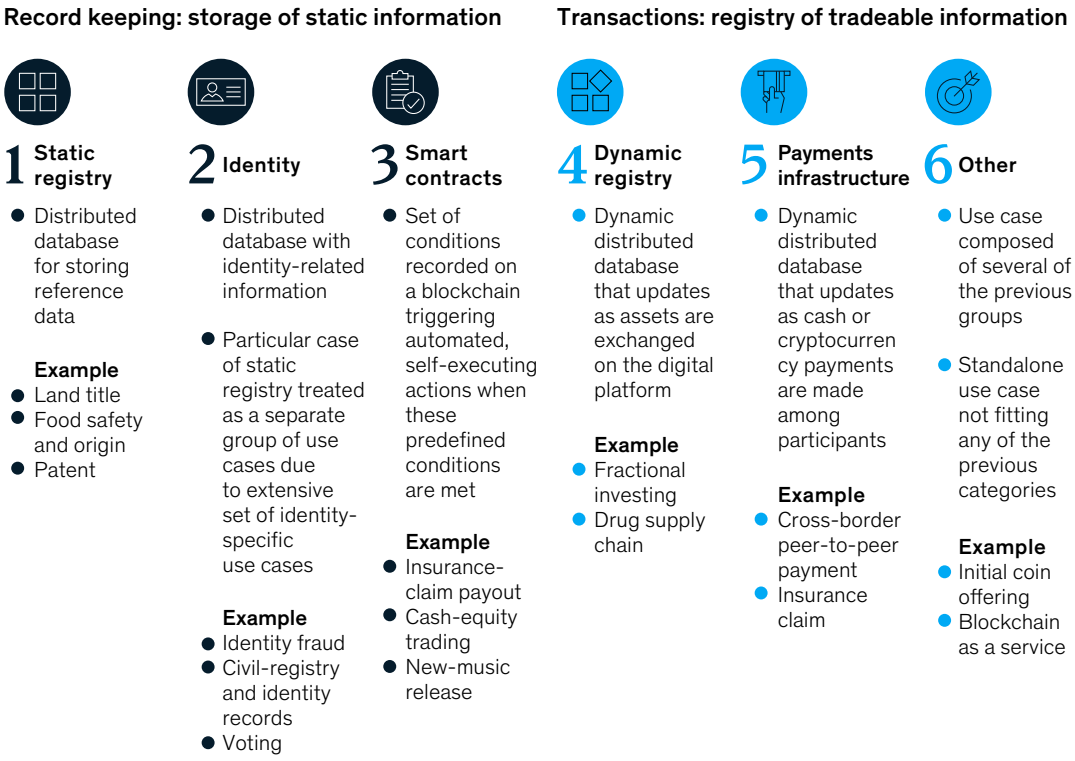
Exhibit 1

Five common blockchain myths create misconceptions about the advantages and limitations of the technology.

	Myth	Reality
1	**Blockchain is Bitcoin**	Bitcoin is just one cryptocurrency application of blockchain Blockchain technology can be used and configured for many other applications
2	**Blockchain is better than traditional databases**	Blockchain's advantages come with significant technical trade-offs that mean traditional databases often still perform better Blockchain is particularly valuable in low-trust environments where participants can't trade directly or lack an intermediary
3	**Blockchain is immutable or tamper-proof**	Blockchain data structure is append only, so data can't be removed Blockchain could be tampered with if >50% of the network-computing power is controlled and all previous transactions are rewritten—which is largely impractical
4	**Blockchain is 100% secure**	Blockchain uses immutable data structures, such as protected cryptography Overall blockchain system security depends on the adjacent applications—which have been attacked and breached
5	**Blockchain is a "truth machine"**	Blockchain can verify all transactions and data entirely contained on and native to blockchain (eg, Bitcoin) Blockchain cannot assess whether an external input is accurate or "truthful"—this applies to all off-chain assets and data digitally represented on blockchain

Exhibit 2

There are six distinct categories of blockchain use cases addressing two major needs.



multiple categories, while others are concentrated on only one or two. This framework, along with further industry and use-case level analysis, led to our key insights on the nature and accessibility of the strategic value of blockchain.

Three core insights about the strategic value of blockchain

Our analysis revealed some key takeaways about blockchain.

Blockchain does not need to be a disintermediator to generate value

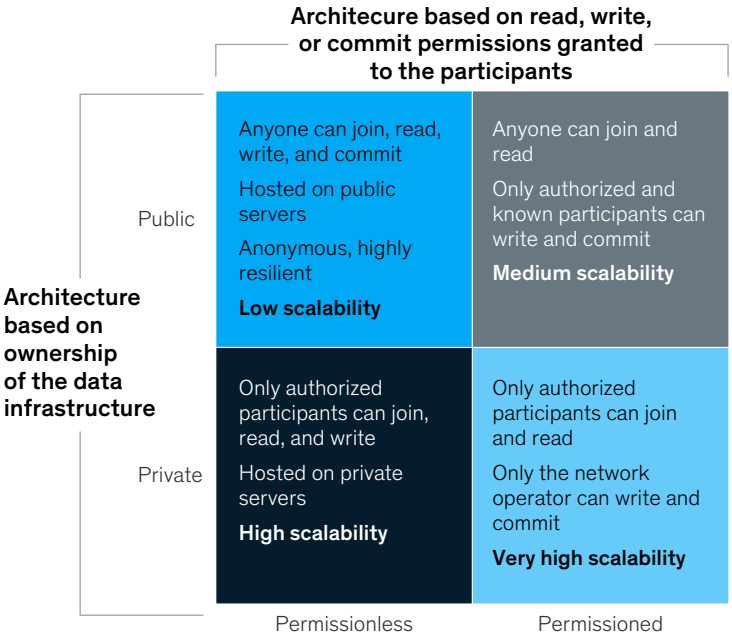
Benefits from reductions in transaction complexity and cost, as well as improvements in transparency and fraud controls can be captured by existing institutions and multiparty transactions using appropriate blockchain architecture. The economic incentives to capture value opportunities are driving incumbents to harness blockchain rather than be overtaken by it. Therefore, the commercial model that is most likely to succeed in the short term is permissioned rather than public blockchain. Public blockchains, like Bitcoin, have no central authority and are regarded as enablers of total disruptive disintermediation. Permissioned blockchains are hosted on private computing networks, with controlled access and editing rights (Exhibit 3).

Private, permissioned blockchain allows businesses both large and small to start extracting commercial value from blockchain implementations. Dominant players can maintain their positions as central authorities or join forces with other industry players to capture and share value. Participants can get the value of securely sharing data while automating control of what is shared, with whom, and when.

Exhibit 3

Most commercial blockchain will use private, permissioned architecture to optimize network openness and scalability.

Blockchain-architecture options



For all companies, permissioned blockchains enable distinctive value propositions to be developed in commercial confidence, with small-scale experimentation before being scaled up. Current use cases include the Australian Securities Exchange, for which a blockchain system is being deployed for equities clearing to reduce back-office reconciliation work for its member brokers.[5] IBM and Maersk Line, the world's largest shipping company, are establishing a joint venture to bring to market a blockchain trade platform. The platform's aim is to provide the users and actors involved in global shipping transactions with a secure, real-time exchange of supply-chain data and paperwork.[6]

The potential for blockchain to become a new open-standard protocol for trusted records, identity, and transactions cannot be simply dismissed. Blockchain technology can solve the need for an entity to be in charge of managing, storing, and funding a database. True peer-to-peer models can become commercially viable due to blockchain's ability to compensate participants for their contributions with "tokens" (application-specific cryptoassets) as well as give them a stake in any future increases in the value. However, the mentality shift required and the commercial disruption such a model would entail are immense.

If industry players have already adapted their operating models to extract much of the value from blockchain and, crucially, passed on these benefits to their consumers, then the aperture for radical new entrants will be small. The degree to which incumbents adapt and integrate blockchain technology will be the determining factor on the scale of disintermediation in the long term.

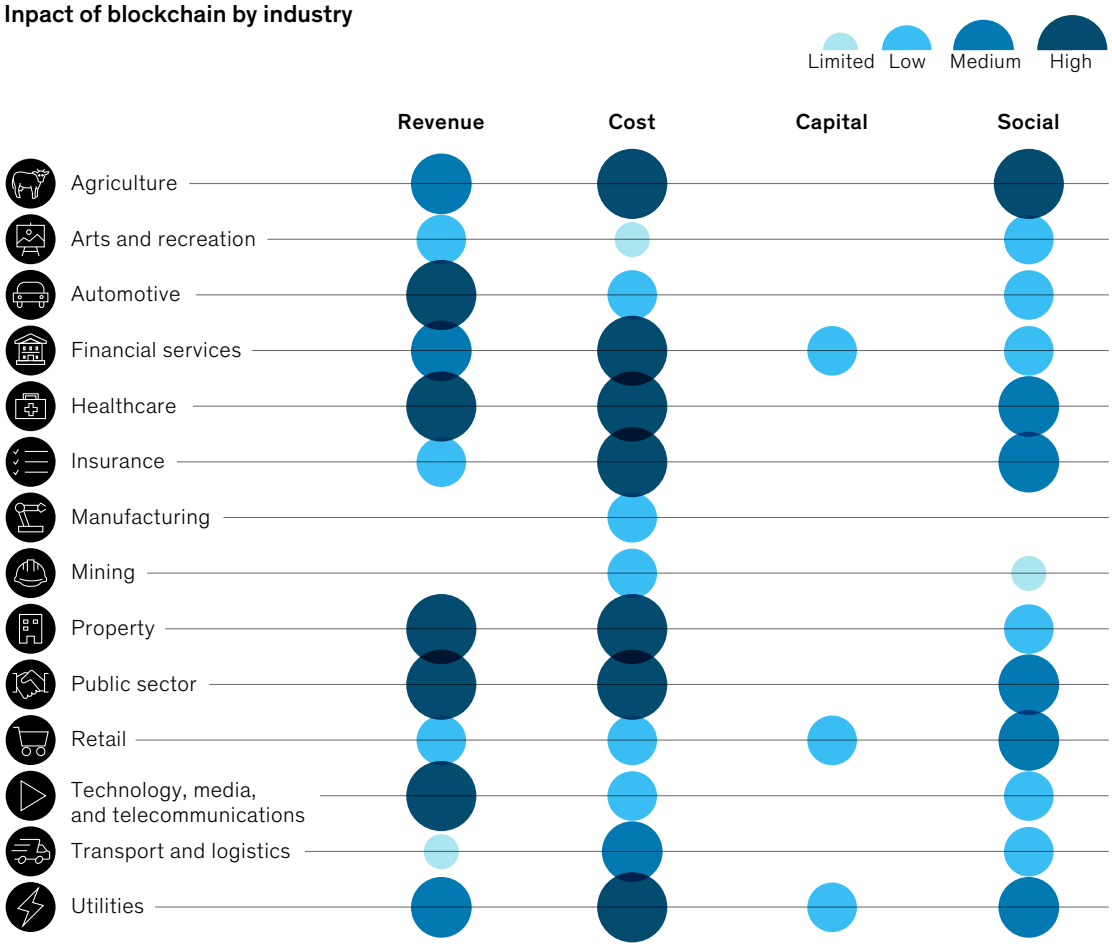
[5] "ASX selects distributed ledger technology to replace CHESS," ASX, December 2017.
[6] "Maersk and IBM to form joint venture applying blockchain to improve global trade and digitize supply chains," IBM, January 2018, ibm.com.

In the short term, blockchain's strategic value is mainly in cost reduction

Blockchain might have the disruptive potential to be the basis of new operating models, but its initial impact will be to drive operational efficiencies. Cost can be taken out of existing processes by removing intermediaries or the administrative effort of record keeping and transaction reconciliation. This can shift the flow of value by capturing lost revenues and creating new revenues for blockchain-service providers. Based on our quantification of the monetary impact of the more than 90 use cases we analyzed, we estimate approximately 70 percent of the value at stake in the short term is in cost reduction, followed by revenue generation and capital relief (Exhibit 4).

Exhibit 4

The value at stake from blockchain varies across industries.



Certain industries' fundamental functions are inherently more suited to blockchain solutions, with the following sectors capturing the greatest value: financial services, government, and healthcare. Financial services' core functions of verifying and transferring financial information and assets very closely align with blockchain's core transformative impact. Major current pain points, particularly in cross-border payments and trade finance, can be solved by blockchain-based solutions, which reduce the number of necessary intermediaries and are geographically agnostic. Further savings can be realized in capital markets post-trade settlement and in regulatory reporting. These value opportunities are reflected in the fact that approximately 90 percent of major Australian, European, and North American banks are already experimenting or investing in blockchain.

As with banks, governments' key record-keeping and verifying functions can be enabled by blockchain infrastructure to achieve large administrative savings. Public data is often siloed as well as opaque among government agencies and across businesses, citizens, and watchdogs. In dealing with data from birth certificates to taxes, blockchain-based records and smart contracts can simplify interactions with citizens while increasing data security. Many public-sector applications, such as blockchain-based identity records, would serve as key enabling solutions and standards for the wider economy. More than 25 governments are actively running blockchain pilots supported by start-ups.

Within healthcare, blockchain could be the key to unlocking the value of data availability and exchange across providers, patients, insurers, and researchers. Blockchain-based healthcare records can not only facilitate increased administrative efficiency, but also give researchers access to the historical, non–patient-identifiable data sets crucial for advancements in medical research. Smart contracts could give patients more control over their data and even the ability to commercialize data access. For example, patients could charge pharmaceutical companies to access or use their data in drug research. Blockchain is also being combined with IoT sensors to ensure the integrity of the cold chain (logistics of storage and distribution at low temperatures) for drugs, blood, and organs.

Over time, the value of blockchain will shift from driving cost reduction to enabling entirely new business models and revenue streams. One of the most promising and transformative use cases is the creation of a distributed, secure digital identity—for both consumer identity and the commercial know-your-customer process—and the services associated with it. However, the new business models this would create are a longer-term possibility due to current feasibility constraints.

Feasibility at scale is likely to be three to five years away

The strategic value of blockchain will only be realized if commercially viable solutions can be deployed at scale. Our analysis evaluated each of the more than 90 potential use cases against the four key factors that determine a use case's feasibility in a given industry: standards and regulations, technology, asset, and ecosystem (Exhibit 5). While many companies are already experimenting, meaningful scale remains three to five years away for several key reasons.

Common standards are essential

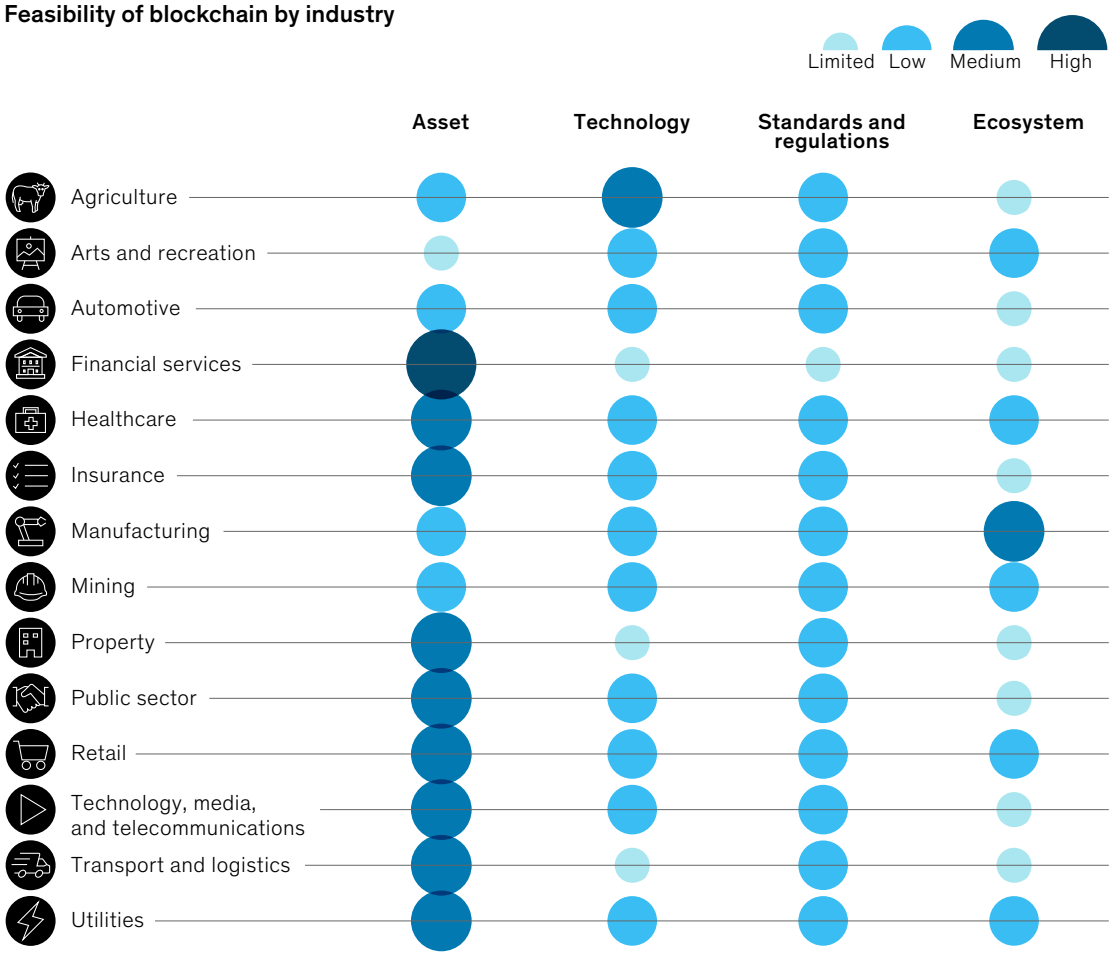
The lack of common standards and clear regulations is a major limitation on blockchain applications' ability to scale. However, where there is strong demand and commitment, work is already under way to resolve this issue. Standards can be established with relative ease if there is a single dominant player or a government agency that can mandate the legal standing. For example, governments could make blockchain land registries legal records.

When cooperation between multiple players is necessary, establishing such standards becomes more complex but also more essential. Strong headway has already been made by industry consortiums, as seen with the R3 consortium of more than 70 global banks that collaborated to develop the financial-grade open-source Corda blockchain platform. Such platforms could establish the common standards needed for blockchain systems.

Exhibit 5

Blockchain feasibility in each industry will depend on the type of asset, technology maturity, standards and regulation, and the ecosystem.

Feasibility of blockchain by industry



Globally, regulators have taken varying positions, but most are engaged rather than opposed. For example, the US Securities and Exchange Commission's recognition of ICOs as securities brought ICOs under the agency's regulation and into the mainstream.[7] In 2017, Standards Australia took a leadership position in developing a road map of priorities on behalf on the International Organization for Standardization and helping establish common terminology as a key first step.[8] So far, many governments are following a technologically neutral regulatory approach—not promoting or banning specific technologies like blockchain.

Technology must advance

The relative immaturity of blockchain technology is a limitation to its current viability. The misconception that blockchain is not viable at scale due to its energy consumption and transaction speed is a conflation of Bitcoin with blockchain. In reality, the technical configurations are a series of design choices in which the levers on speed (size of block), security (consensus protocol), and storage (number of notaries) can be selected to make most use cases commercially viable. As an example, health records in Estonia are still in databases "off chain" (meaning not stored on blockchain), but blockchain is used to identify, connect, and monitor these health records as well as who can access and alter them. These trade-offs mean blockchain performance might be suboptimal to traditional databases at this stage, but the constraints are diminishing as the technology rapidly develops.

The immaturity of blockchain technology also increases the switching costs, which are considerable given all the other system components. Organizations need a trusted enterprise solution, particularly because most cost benefits will not be realized until old systems are decommissioned. Currently, few start-ups have sufficient credibility and technology stability for government or industry deployment at scale. Major technology players are strongly positioning themselves to address this gap with their own blockchain as a service (BaaS) offerings in a model similar to cloud-based storage.

Assets must be able to be digitized

Asset type determines the feasibility of improving record keeping or transacting via blockchain and whether end-to-end solutions require the integration of other technologies. The key factor here is the digitization potential of the asset; assets like equities, which are digitally recorded and transacted, can be simply managed end to end on a blockchain system or integrated through application programming interfaces (APIs) with existing systems.

However, connecting and securing physical goods to a blockchain requires enabling technologies like IoT and biometrics. This connection can be a vulnerability in the security of a blockchain ledger because while the blockchain record might be immutable, the physical item or IoT sensor can still be tampered with. For example, certifying the chain of custody of commodities like grain or milk would require a tagging system like radio-frequency identification that would increase the assurance being provided but not deliver absolute provenance.

The coopetition paradox must be resolved

The nature of the ecosystem is the fourth key factor because it defines the critical mass required for a use case to be feasible. Blockchain's major advantage is the network effect, but while the potential benefits increase with the size of the network, so does the coordination complexity. For example, a blockchain solution for digital media, licenses, and royalty payments would require a massive amount of coordination across the various producers and consumers of digital content.

Natural competitors need to cooperate, and it is resolving this coopetition paradox that is proving the

[7] Jay Clayton, "Statement on cryptocurrencies and initial coin offerings," U.S. Securities and Exchange Commission, December 2017, sec.gov.
[8] "Roadmap for blockchain standards," Standards Australia, March 2017.

hardest element to solve in the path to adoption at scale. The issue is not identifying the network—or even getting initial buy-in—but agreeing on the governance decisions around how the system, data, and investment will be led and managed. Overcoming this issue often requires a sponsor, such as a regulator or industry body, to take the lead. Furthermore, it is essential that the strategic incentives of the players are aligned, a task that can be particularly difficult in highly fragmented markets. Critical mass is much lower in some industries and applications than in others, while in some cases, networks need to be established across industries to achieve material benefits.

What strategic approach should companies take?

Our research and emerging insights suggests following a structured approach to answer the classic questions of blockchain business strategy.

Where to compete: Focus on specific, promising use cases

There is a plethora of use cases for blockchain; companies face a difficult task when deciding which opportunities to pursue. However, they can narrow their options by taking a structured approach through a lens of pragmatic skepticism. The first step involves determining whether there is sufficient accessible value at stake for a given use case. Companies can only avoid the trap of developing a solution without a problem by rigorously investigating true pain points—the frictions for customers that blockchain could eliminate.

Identification of specific pain points enables granular analysis of the potential commercial value within the constraints of the overall feasibility of the blockchain solution. Overall industry characteristics as well as a company's expertise and capabilities will further influence this decision, as companies need to understand the nuances of all these components to decide which use case will generate a solid return on investment. If a use case does not meet a minimum level of feasibility and potential return, then companies do not even have to consider the second step of which blockchain strategy to adopt.

How to compete: Optimize blockchain strategy based on market position

Once companies have identified promising use cases, they must develop their strategies based on consideration of their market positions relative to their target use cases. Many of the feasibility factors already discussed are within a business's sphere of influence; even technology and asset constraints can be managed through trade-offs and a series of design choices to shape a viable solution. Therefore, a company's optimal strategic approach to blockchain will fundamentally be defined by the following two market factors, which are those they can least affect:

- market dominance—the ability of a player to influence the key parties of a use case
- standardization and regulatory barriers—the requirement for regulatory approvals or coordination on standards

These two factors are critical in determining a company's optimal strategic approach because they are integral to achieving the coordination required (Exhibit 6). Blockchain's value comes from its network effects and interoperability, and all parties need to agree on a common standard to realize this value—multiple siloed blockchains provide little advantage over multiple siloed databases. As the technology develops, a market standard will emerge, and investments into the nondominant standard will be wasted.

This consideration of a company's market position will inform which of four distinct strategic approaches to blockchain should be deployed and, in fact, further refine which type of use cases to focus on first.

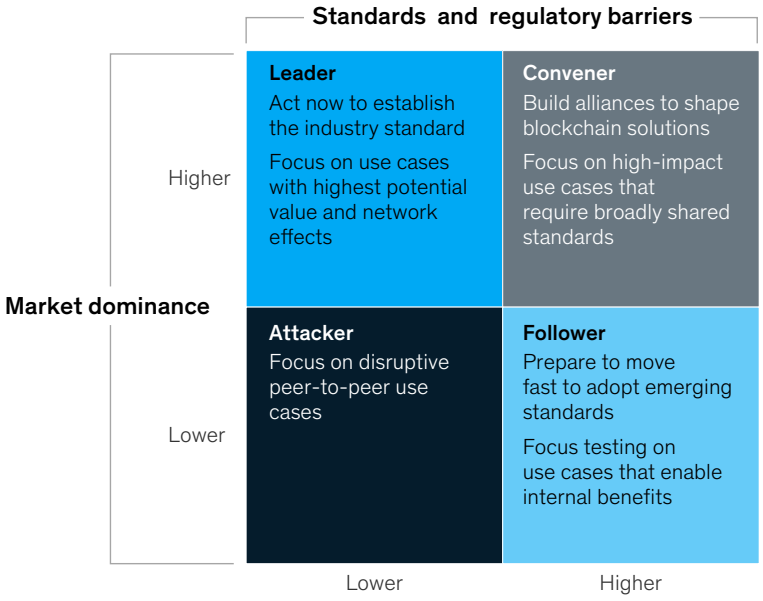
Leaders

Leaders should act now to maintain their market positions and take advantage of the opportunity

Exhibit 6

Optimal blockchain strategy for each use case is dependent on market position and ability to influence standards and regulatory barriers.

Blockchain strategies



to set industry standards. As dominant players pursuing use cases with fewer requirements for coordination and regulatory approval, they can establish market solutions.

The greatest risk for these companies is inaction, which would cause them to lose the opportunity to strengthen their competitive advantages compared to competitors. An example of a leader following this strategy is Change Healthcare, one of the largest independent healthcare IT companies in the United States, when it launched an enterprise-scale healthcare blockchain for claims processing and payment.[9]

Conveners

Conveners need to be driving the conversations and consortiums that are shaping the new standards that will disrupt their current businesses. Despite being dominant players, they cannot single handedly direct blockchain adoption as they face greater regulatory and standardization barriers. Instead, they can position themselves to shape and capture the value of new blockchain standards.

Convening tactics should be deployed for high-value use cases—like trade finance—that cannot be realized without a broadly shared set of standards. An example of a convener following this strategy is Toyota, whose Research Institute set up the Blockchain Mobility Consortium with four global partners to focus on blockchain solutions for critical accelerators of autonomous vehicles: data sharing, peer-to-peer transaction, and usage-based insurance.[10]

Followers

Followers should also carefully consider and implement an appropriate blockchain strategy. Most companies do not have the capability to influence all necessary parties, especially when applications of blockchain require high standardization or regulatory approval. Such companies cannot be unaware of market innovations—they should keep a

[9] "Change Healthcare announces general availability of first enterprise-scale blockchain solution for healthcare," Change Healthcare, January 2018, changehealthcare.com.
[10] "Toyota Research Institute explores blockchain technology for development of new mobility ecosystem," Toyota, May 2017, toyota.com.

watching brief on blockchain developments and be prepared to move fast to adopt emerging standards. Just as businesses have developed risk and legal frameworks for adopting cloud-based services, they should focus on developing a strategy for how they will implement and deploy blockchain technology.

Followership is a particularly risky strategy for blockchain, given the likelihood of select players in an industry establishing private-permissioned networks, as in freight, for example. A follower, no matter how fast, might already be locked out of the exclusive club that established the initial proof of concept. Companies can mitigate this risk by joining select existing and emerging consortia early, when the short-term investment costs of membership are outweighed by the long-term costs of getting left behind.

Attackers

Attackers are often new market entrants without an existing market share to protect, so they need to seek disruptive or transformative business models and blockchain solutions. Attacker approaches are suited to use cases with the highest disruptive potential through offering a service to the market that would disintermediate existing players. Most peer-to-peer applications, from finance to insurance to property, fall into this category. An example of an attacker following this strategy is Australian start-up PowerLedger, a peer-to-peer marketplace for renewable energy that raised 34 million Australian dollars through its ICO.[11]

Incumbents should deploy an attacker blockchain strategy in a separate noncore digital business. Blockchain as a service (BaaS) providers often adopt an attack strategy because they are selling the services into—and disrupting—industries in which they are not currently participants. Companies pursuing an attacker strategy often seek partnership with a dominant company in the market to leverage their leadership influence.

The insights from our analysis suggest that, beyond the hype, blockchain has strategic value for companies by enabling both cost reduction without disintermediation as well as, in the longer term, the creation of new business models. Existing digital infrastructure and the growth of blockchain as a service (BaaS) offerings have lowered the costs of experimentation, and many companies are testing the waters. However, fundamental feasibility factors delimit what can be scaled and when as well as the realistic time scales for return on investment on proof of concepts.

Assessing these factors with pragmatic skepticism about the scale of impact and speed to market will reveal the correct strategic approach on where and how to compete to enable companies to start extracting value in the short term. Indeed, those dominant players who can establish their blockchain as the market solution should be making the moves—and making them now.

[11] "Power Ledger token generation event closes with A$34million raised," Power Ledger, October 2017, web.powerledger.io.

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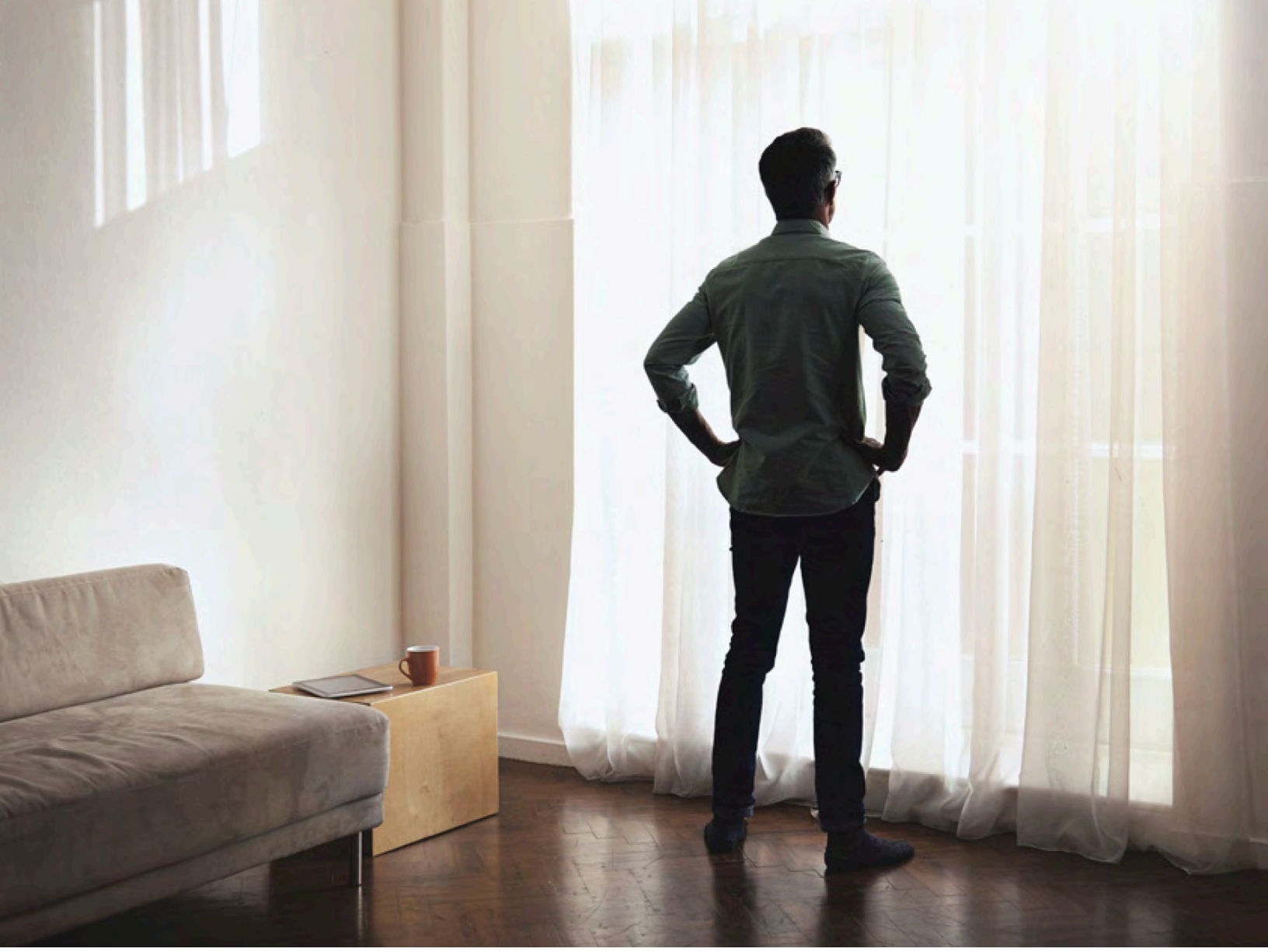
Articles by Kate Smaje



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The digital-led recovery from COVID-19: Five questions for CEOs

A digital future lies ahead. By acting early and being bold and decisive, CEOs can accelerate their digital transformation and reach the next normal sooner.

by Matt Fitzpatrick, Isha Gill, Ari Libarikian, Kate Smaje, and Rodney Zemmel

There's a popular meme going around that neatly captures the tipping point of digital. It's a short questionnaire asking who is driving your digital transformation. The first two options are "CEO" and "chief digital officer." Below that, highlighted with a bright red circle, is "COVID-19."

The coronavirus pandemic is a humanitarian crisis that continues to take a tragic toll on people's lives. There's no denying it is also acting as a catalyst for change—economic, societal, personal, and corporate—on a scale not seen since wartime. The scale of the change and the speed at which it's happening is shining a bright light on the fact that companies are facing a once-in-a-generation shift. And for all the uncertainty about what the future will look like, it's clear already that it will be digital.

The challenging economic outlook and continued uncertainty are forcing CEOs to contemplate some difficult choices. Some are pulling in, making cuts, and focusing on riding out the storm. Others, however, are taking decisive action to make sure that when the crisis ends, they'll be stronger than they are today.

Research and experience show that those acting with a through-cycle mindset will be best positioned to accelerate out of the downturn. In the recessions of 2007–08, the top quintile of companies was ahead of their peers by about 20 percentage points as they moved into the recovery in terms of cumulative total returns to shareholders (TRS). Eight years later, their lead had grown to more than 150 percentage points.[1] One key lesson from that experience is the companies that move early and decisively in a crisis do best.

Accelerating your digital transformation

We believe the COVID-19 crisis is likely to significantly accelerate the shift to digital and fundamentally shake up the business landscape. Even before COVID-19 hit, 92 percent of companies

[1] Martin Hirt, Kevin Laczkowski, and Mihir Mysore, "Bubbles pop, downturns stop," *McKinsey Quarterly*, May 2019, McKinsey.com.

Core principles

As CEOs consider how to move ahead, certain mindsets and capabilities matter more than others. They were important before COVID-19 hit but are particularly crucial today:

— *Flexibility and speed.* The speed at which the change hit us caught everyone off guard. It's become obvious that entrenched systems that have supported businesses for years—tech stacks, reporting lines, processes—have been no match for the dynamic fluidity of the current crisis. Building in redundancies, modularized systems for quick switch-outs, and devolved decision making (based on clear guidelines) will need to be the norm.

— *Bold actions backed by a solid understanding of risk.* The scale of the crisis needs to be matched by boldness in response. Incremental change and half measures are unlikely to provide businesses with the economic horsepower needed to ride out the storm and come out of the crisis in a strong position. Boldness of action should be tempered with a full appreciation of risk, from the impact of cyberattacks to the loss of crucial talent.

— *Commitment to a holistic approach.* The crisis has highlighted systemic and organizational weaknesses. These flaws highlight the need to ensure that digital initiatives take into account the complete range of dependencies and build in cross- functional mechanisms that integrate systems, people, and processes across the business.

thought their business models would need to change given digitization.[2] The companies listed on the S&P 500 Index have an average age of 22 years, down from 61 years in 1958.[3]

Despite herculean efforts and significant accomplishments at many businesses, the pandemic has brought into sharp relief how vulnerable companies really are. One consumer-packaged-goods (CPG) company saw its online orders go through the roof, only to have its operations descend into chaos in an effort to process and fulfill the surge. Tech-enabled businesses, on the other hand, were able to move at speed, such as India food-tech business Zomato, which used its platform to work with grocery start-ups to meet surging online-order demand.[4]

For many companies, the only option is to accelerate their digital transformation. That means moving from active experimentation to active scale-up supported by ongoing testing and continuous improvement. These moves should happen across two dimensions: at the core of the company and through the development of new businesses. Top-performing digital companies take this twin approach.[5]

Despite the immense challenges CEOs are managing today, now is the time to act. In fact, we've seen that the reduction in time spent traveling has given CEOs and their top teams more time to focus on new initiatives. One leader at a large bank, for instance, said recently that it was finally getting around to launching an important customer-relationship-management (CRM) program that it had no time for before. Given how fast change is happening, waiting until you see signs of recovery will be too late.

There is much we don't know. But drawing on our experience and lessons learned from companies that are moving ahead—particularly in China—we believe that CEOs should ask the following questions to help prepare their businesses for the recovery when it finally comes.

1. Do you have a clear view of where the value is going to be and a road map that will get you there?

Despite noteworthy successes in adjusting to COVID-19, many leaders have been frustrated by how slowly necessary changes have moved, from serving a surge of customers migrating to digital channels to scaling back-end operations. We believe that one of the biggest reasons for these difficulties is that, while companies have had many digital pilots and initiatives in place, they didn't add up to a coherent and integrated digital engine to drive the business forward.

Accelerating their digital transformation requires CEOs to take a step back and reassess their road maps (the coordinated and detailed plans for what needs to be done, by whom and when, from the leadership level down to the front line) as well as the assumptions about value and feasibility underlying them. Those assumptions need to be based on emerging new customer behaviors, supplier dynamics, and regulation. Our consumer-sentiment analysis, for example, has revealed whole new consumer groups trying out digital products and services for the first time. As of this writing, in the United States, some 35 percent of Gen Zers, for example, have used video chat for the first time (versus just 6 percent for boomers), while 54 percent of households with incomes greater than $100,000 have tried online streaming for the first time (versus 35 percent of those households earning less than $50,000).[6]

[2] Jacques Bughin, Tanguy Catlin, Martin Hirt, and Paul Willmott, "Why digital strategies fail," *McKinsey Quarterly*, January 2018, McKinsey.com.
[3] Matt Banholzer, Markus Berger-de Leon, Ralf Dreischmeier, Ari Libarikian, and Erik Roth, "Building new businesses: How incumbents use their advantages to accelerate growth," December 2019, McKinsey.com.
[4] Pramugdha Mamgain, "India's Zomato sees business opportunity in grocery amid COVID-19 crisis," *Deal Street Asi*a, March 23, 2020, dealstreetasia.com.
[5] "How digital reinventors are pulling away from the pack," October 2017, McKinsey.com.
[6] "Survey: US consumer sentiment during the coronavirus crisis," April 2020, McKinsey.com.

On the B2B side, our recent customer-behavior research shows that digital interaction with B2B customers is now two times more important than traditional channels—more than a 30 percent jump since before the COVID-19 crisis hit.[7] In telemedicine, regulation, licensing, and reimbursement questions that had traditionally hampered its adoption have been swept away to help fight the coronavirus, laying open a scenario of reduced—or, at least, different—regulation in the next normal. These developments have to be closely monitored, of course. Some behaviors are likely to stick—early research suggests that more than 55 percent of Chinese consumers are likely to permanently buy more groceries online, for example[8]—while others won't.

Having a road map doesn't mean, of course, that it will be executed. Among the most important tasks in operationalizing the road map is getting alignment with the leadership team—the chief digital officer (CDO) as well as key line and functional leaders—and putting in place the resources needed to deliver on it. Alignment is challenging in normal times but is now that much more difficult with your leadership team all working from home. Through video chat or phone, the CEO needs to be explicit in calling out members of the top team so that everyone understands not only what the road map is but also what their responsibilities are and how they will be resourced.

CEOs should then work with their top team to identify critical roles (roughly 30 to 40 for an enterprise). For these roles, it's important to spell out the job and eliminate tasks that are not essential, and then provide solid teams, enough budget, and clear (usually enhanced) decision rights. Selection is critical—you need absolutely the best talent in these roles.

2. What role should business building have in helping you accelerate your entrance into new markets or access new customers?

Many businesses can only match the pace of both the crisis and the change in customer behavior by building something outside of the core company. This allows them to build something in a modern way—fully agile with microservice architecture and entrepreneurial talent.

The issue, however, is that fewer than 10 percent of business builds succeed. When enterprises take a more structured approach—including a clear strategy, entrepreneurial talent, and the proper balance between corporate support and operational freedom—the success rate jumps to 67 percent. Corporate support is particularly important now. Besides access to cash and relative stability, large enterprises provide a "safe harbor" during the crisis, allowing the entrepreneurial spirit to thrive free from the broader economic concerns. Our recent B2B survey indicates that large B2B companies remain more stable, with approximately 50 percent planning to increase or maintain their spending in the short and long term.[9]

[7] McKinsey B2B Decision Maker Pulse Survey.
[8] Julien Boudet, Jonathan Gordon, Brian Gregg, Jesko Perrey, and Kelsey Robinson, "How marketing leaders can both manage the coronavirus crisis and plan for the future," April 2020, McKinsey.com.
[9] McKinsey B2B Decision Maker Pulse Survey.

Executive checklist

— Do you have a business-led technology road map that reflects new assumptions about your industry and the pace of digital adoption by your customers, suppliers, employees, and regulators?

— Does your resourcing—including where your very best talent is deployed—match your digital aspirations?

— Does your road map reflect the "last-mile behavior changes" that will be necessary to make your transformation program stick?

We have already seen and, frankly, been deeply inspired by, what is possible during this current coronavirus crisis. In China, engineers built two hospitals (2,600 beds in total) from scratch in just over a week. In select catchment areas, the National Health Service (NHS) in the United Kingdom was able to execute long-term telehealth plans in 15 days or fewer. What this demonstrates to us—as in the proverbial "necessity being the mother of invention"—is that people can move with astonishing speed to build something new. One European retailer was able to launch a new e-commerce business in just 13 weeks. Overturning assumptions about the way organizations and consumers operate, we see a number of early archetypes for postcrisis business builders. Remote-service providers, for example, can take advantage of the big shift to online access by delivering services and providing support. Data visionaries are finding ways through analytics and automation to use new types and sources of data to generate value.

CEOs will have a key role in making sure that the enterprise develops a business-building capability rather than simply launching a new business. That's because it will be necessary to launch multiple businesses over time to sustain new sources of growth and as a hedge against future uncertainties.

3.How can you lock in the benefits of a more agile operating model to increase the metabolic rate of your business?

Once an almost exclusive domain of IT, agile has now permeated almost every part of the business. Companies are being forced to move and take action at unprecedented speed—and almost exclusively remotely. A large bank, for example was faced with a 20-fold rise in origination volumes as part of a loan program to support small businesses. It "stood up" a cross-functional executive team to tackle the issue, from customer communication to underwriting to product development and training for 500-plus employees. The bank did this via twice-daily agile huddles, rapid backlog management, and issue resolution, all in a fully virtual setting.

The nature of the crisis has required teams to act quickly amidst uncertainty, make decisions with limited oversight, and react to fast-changing situations. There are typically 50 people that make 80 percent of the decisions, but, as the crisis has shown, moving to agile allows you to take advantage of thousands of brains.

Some new ways of working are an "all hands on deck" response to the pandemic that are not likely to be sustainable. But as CEOs look to accelerate the metabolic rate of their business in preparation for the recovery, they will need to be deliberate in protecting what has worked well and guard against the legacy ways of working creeping back when the crisis abates. Centralization can be good for managing a crisis, but it should not be mistaken for a model for growth, and CEOs will need to keep any overly centralized action from being the status quo. Protecting the benefits of new ways of working also doesn't mean just cutting costs on travel. It's about harnessing the vitality and effectiveness of extended agile teams working on objectives, not simply tasks.

For one thing, we suspect that executives are realizing something that we ourselves are also

Executive checklist

— How are you balancing the advantages the large enterprise can provide with the freedom that the new business needs to thrive?

— How will the management team measure success—including incorporating the high volumes of customer feedback—of the new business at the three-, six-, and 12-month mark from launch?

— What external partnerships are you exploring to build and scale the new business?

seeing: videoconferencing can be much more productive, especially for quick check-ins. While in-person meetings will be needed—previous research has shown that productivity among teams drops as the number of locations they work from increases—some hybrid models will likely emerge to take advantage of the benefits of remote and in-person connection. Video meetings have exposed what agile gurus have been saying for years: that the ideal effective team size is five to nine people. A 20-person virtual meeting, where you can see only nine people on an iPad screen, has shown itself to often be an exercise in frustration. Many CEOs should be able to see how much a skeleton crew can get done when given the right tools, support, and mission.

Other benefits are emerging as well, ones that CEOs need to make sure stick. For one, it will be crucial to preserve the empowered and iterative ways of working. Another is that clarity of purpose and a tight focus on just a few things can do wonders for animating an organization and driving results.

The necessity to figure out things on the fly has underscored another crucial capability: being able to learn and adapt. Even before the crisis, we found that the top 10 percent of companies in terms of revenue growth are more than 50 percent more effective than peers in testing, measuring, and executing based on what they've learned. Building up this corporate muscle isn't about improving training (although that is important, more on that later); it's about embedding a culture of experimentation, learning, and iterating.

The words of Beth Galetti, the senior vice president of HR at Amazon, are instructive: "We are frequently doing things that have never been done before. For this reason, there is often no playbook to teach nor experts to follow, so we empower people to try new things and learn along the way."[10]

The CEO can start building support for agile now by calling attention to the ways in which work has improved as well as by identifying processes and incentives that can hardwire the benefits.

4. How should you rethink your talent strategy so that you have the people you need when the recovery starts?

As the full economic impact of the crisis hits, pressure will continue to build to cut costs. CEOs will be faced with difficult people decisions. However, given the importance of talent in accelerating progress, it's critical to adopt a through-cycle mindset on people—not just in keeping the right talent but also in building the skills of the people you already have. For CEOs, this means developing a talent road map that's as detailed as a technology one.

CEOs at several large businesses are acting on this through-cycle mentality by articulating what critical skill pools are needed for recovery. In the technology realm, for example, the focus should be on building your base of top engineers, who are ten times more productive than less accomplished developers. These are the people who will be rapidly deployed and redeployed to do the most important work. This exercise includes determining how many of them will be needed so that there is sufficient

[10] "How Amazon is built to try and learn," February 2020, McKinsey.com.

Executive checklist

— Are your business leaders, technologists, and control functions working together to continuously deliver incremental improvements (every two weeks) grounded in customer value?

— What does "test and learn" look like week to week for each of your strategic initiatives, so that you can capture learning from failure and build on it?

— Have you identified which elements of your current way of working you want to preserve and created a plan for doing so?

resiliency, developing an approach to building their skills, and identifying both the people who have emerged as stars during the crisis and those whose skills can be upgraded through training.

Training itself is likely to see profound change. Before COVID-19 hit, most companies struggled to get online learning to work. The new world of remote working, however, is acclimatizing people to the tools and processes that are core to distance education. This represents an opportunity for training to scale the programs built for how people actually learn best: shorter, "bite size" learning modules tailored to the individual and delivered when they're needed as part of a thoughtful learning journey. CEOs should prioritize remote boot camps, self-serve modules, simulations, and collaborative learning environments supplemented by a rigorous certification program and in-field trials to accelerate how teams learn.

5.What investments are the most necessary to create the technology environment that will allow your company to thrive in the next normal?

The disruptions of the coronavirus have underscored the crucial role of technology, from supporting remote working to scaling digital channels for surging customers. Despite the outstanding accomplishments in managing the technology response to the crisis, the many setbacks have highlighted systemic weaknesses. That shouldn't be a huge surprise, since of the organizations that have pursued digitization, 79 percent are still in the early stages of their technology transformation.[11] More important, they've highlighted a point that's been made before but can no longer be ignored: technology is a core driver of value, not merely a support function.

This insight is crucial because too often the overriding factor when it comes to technology has been cost. CEOs have a leading role to play now in expanding that definition to include value creation as well as flexibility, cybersecurity, and resiliency. To make that happen, CEOs will need to work much more directly with their chief information officers (CIOs) or chief technology officers (CTOs) to make tech investments in legacy-system modernization and in microservice-architecture development, or in building a new tech stack altogether (for instance, for developing a new business). To enable this kind of effective decision making, some CEOs have added CIOs to the leadership team and have asked them to report directly. Having

CIOs closely involved with shaping the business strategy and agenda is shown to enable faster progress in achieving a company's digital goals.[12]

That focus on value extends to data and advanced analytics as well. Never before has the need for accurate and timely data been greater. The government of South Korea proved that point when it worked with private companies to launch a COVID-19 data platform that reduced contact-tracing time from 24 hours in early February to less than ten minutes on March 26. To do so, they developed a digital surveillance system that consolidates information from 27 public and private organizations.[13] This example highlights the

[11] "Can IT rise to the digital challenge?," October 2018, McKinsey.com.
[12] "Can IT rise to the digital challenge?," October 2018, McKinsey.com.
[13] Park Han-na, "Seoul to launch 10-minute contact-tracing program," *The Korea Herald*, March 26, 2020, koreaherald.com.

Executive checklist

— Can you articulate why a recent engineering graduate would join you rather than a digital competitor?

— Do you have a skill road map that is as detailed as your tech road map?

— How are you tracking value at the individual level, and linking the learning to talent and performance management?

Executive checklist

— Is your digital transformation powered by modern software-development methods and delivery capabilities like a tech company?

— Do you have robust and federated data governance to enable broad and continuous use of data by the front line and to enrich the data over time?

— Are you investing at least as much to build conviction and the ability to act as you are in technology?

importance of tapping new data sources going forward. Additional initiatives could include developing 360-degree views of the customer, adopting consistent tool sets and processes, or modernizing data architecture and moving to the cloud. To get the full value from data in the future, it will be important to retrain algorithms based on new realities. At the same time, CEOs will need to work with their risk leaders to ensure that the scramble to harness data follows strict privacy rules and cyber best practice.

Increased digitalization has also highlighted the increasing importance of ecosystems.

Responding to customer needs during the crisis, for example, we've seen how some banks integrated medical-care advice, doctor-appointment services, and automotive services for their customers. As protocols and standards increasingly normalize these connections, the CEO will need to help guide which ecosystems can drive the greatest value for the business and how to navigate the implications for customer relationships, data sharing, and intellectual property—key sources of advantage in the digital age.

We have not seen the end of the crisis. Nor do we know exactly when the recovery will come. But it will come, and the CEOs who can best prepare their businesses effectively for a more digital future will give their companies the best chance for a brighter future.

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Driving digital change during a crisis: The chief digital officer and COVID-19

Chief digital officers play a crucial role in driving the digital changes needed for their organizations to respond to the crisis and prepare for the next normal.

by Tarik Alatovic, Meraj Chhaya, Shweta Juneja, Kate Smaje, and Alex Sukharevsky

Amid the humanitarian crisis that has upended lives and cast a veil of uncertainty over the future, one thing is clear: we are living in a much more digital world. As governments around the world institute nationwide lockdowns, the demand for digital services and products, from both customers and employees stuck at home, has hit record levels.

McKinsey's consumer-sentiment surveys have shown how significantly online sales have increased across the globe, with new digital activities—from ordering groceries online to telemedicine—becoming standard behavior. At the same time, hundreds of millions of remote employees are relying on collaboration tools and online processes to get work done.

This new digital reality presents a unique challenge for chief digital officers (CDOs). Often the most digital person in the organization, the CDO, as "transformer in chief," is charged with leading a business's digital transformation while working closely with the CEO and the C-suite to help shape the business response to the crisis. Since the CDO role is relatively new, this is also likely to be the first major crisis he or she has faced. As such, the CDO now also has a true opportunity to demonstrate resilience in a crisis by driving the digital changes a business needs to survive.

Having spoken to many CDOs since the crisis began, and relying on our experience in helping businesses navigate crises and drive digital transformations, we believe CDOs can lead their companies' digital response across four dimensions: resilient leadership; recrafting the digital strategy and rebalancing the product road map; engaging with customers; and updating agile practices to accelerate remote delivery (exhibit).

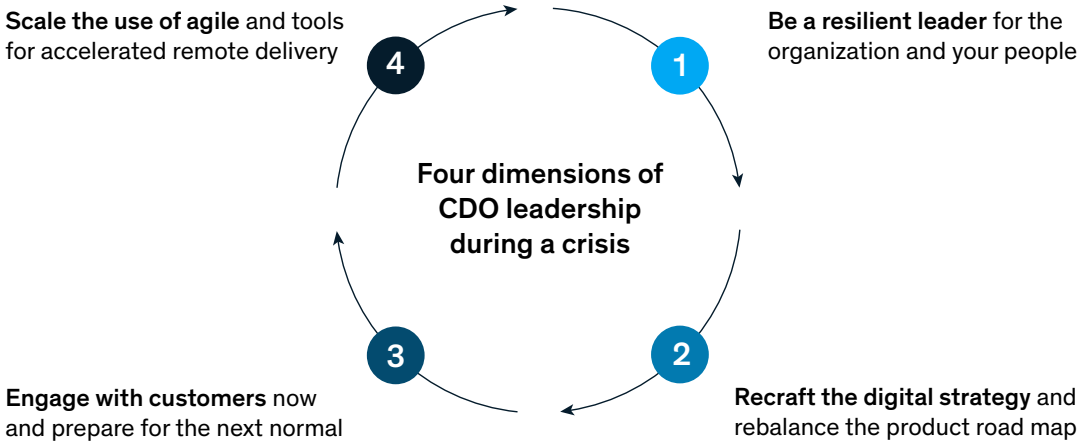
1. Be a resilient leader for the organization and your people

The coronavirus is a humanitarian crisis that is wreaking havoc on people's lives. Amid the fear, confusion, and disruption, CDOs have a leading role to play in supporting their people by reassuring them with empathy and clear action.

The shift to working remotely and the "all-hands-on-deck" demands to manage the crisis have put incredible pressure on people. If poorly managed,

Exhibit

To lead their companies' digital response to the crisis, chief digital officers must act across four dimensions.



this situation could lead to burnout. CDOs should be considering how to build in work flexibility to account for employees taking care of kids at home by, for example, shifting schedules; ensure access to resources such as tools and information-sharing intranets; educate less digitally fluent colleagues so they don't feel overmatched by new demands with, for example, brief training sessions; and have frequent touchpoints such as digital town halls and pulse surveys, to gauge people's mental and physical well-being. This goes beyond the typical work check-ins and is absolutely necessary to help employees deal with the unprecedented stress of this current environment. People are a company's most precious resource, and how successful a CDO is in making sure that his or her employees are as healthy and supported as possible will be a testament to his or her true leadership skills.

That focus on connecting with people extends, of course, to the C-suite. Given the cross-functional nature of digital transformations, the CDO should be in constant communication with key leaders to help them navigate the crisis and prepare for the recovery. That could mean working with the CFO to identify digital initiatives that can help build up cash reserves, aligning with the CIO on technology priorities to support prioritized digital programs, working with the CHRO to determine talent needs given accelerated digital programs, and, of course, working with the CEO to mobilize the organization around concepts that, in many cases, are new or not particularly well known to him or her, such as digital elements of the operating model or digitally driven business models.

2. Recraft the digital strategy and rebalance the product road map

To meet the surge in use of digital channels by employees and customers, CDOs need to focus both on short-term needs and on developing a clear perspective of the business's longer-term digital future.

Our previous research has made it clear that the best-performing companies have a digital strategy that's tightly aligned with the business's overall strategy. While the COVID-19 crisis has introduced significant uncertainty about what the future holds, CDOs can help to develop digital strategies based on scenarios detailing customer behavior shifts, business-model opportunities, and their implications on digital and technology choices. They can help determine where potential sources of value might lie and determine which assets the business has—such as data, ecosystem collaborations, and platforms—and which business models to develop to help capture that value.

At the same time, the CDO should work closely with his or her product leads as well as with the CMO and CIO to shift product road-map priorities so that resources are available to address the most pressing needs, such as the following:

— *How to serve customers in a manner that safeguards their health,* such as launching QR payments or building contactless product-delivery capabilities. In the United States, Walgreens has launched a service where associates assemble orders and deliver them to customers at a drive-through window.

— *How to digitize interactions that used to be handled in person,* such as renewing debit cards or ensuring services. China-based Ping An Bank rolled out new "Do It At Home" functionality, which resulted in more than eight million page views and nearly 12 million transactions in two weeks. Singapore-based DBS used the CamelONE portal to settle trade-financing transactions.[1]

[1] "DBS accelerates trade digitalization efforts with more 'industry firsts' to drive greater efficiencies for customers," DBS, March 2, 2020, dbs.com.

— *How to help transition customers from offline to online channels,* such as creating incentives and support infrastructure (for example, scaling up help desks).

— *Identifying back-office tasks that can be digitized and automated to support employees working from home,* such as code tests and expense approvals.

— *How innovative solutions can be rapidly delivered as minimum viable products (MVPs) to meet immediate customer demands,* such as apps for access to healthcare or food delivery. Certain mobile-network operators are providing online coupons to customers for free mobile data for up to two months, while some media companies are offering free e-book and e-magazine subscriptions.

— *How to work with regulators to help solve pressing customer issues.* In telemedicine, for example, some regulations have been temporarily sidelined in an effort to accelerate how doctors help patients during the COVID-19 crisis. CDOs have a natural role in bringing together relevant parties from different functions across the business to be prepared to act in the case of changes to regulations.

— *What infrastructure needs to be in place to support the development of new digital channels and customer experiences,* such as using microservices or migrating particular capabilities to the cloud to enable rapid provisioning and load balancing.

Additional capacity will be necessary to deliver on this changing road map. The CDO should work closely with teams to temporarily reallocate digital staff and use outsourcing options for temporary staff augmentation. In the case where new people are needed, the CDO should work with the CHRO to create a plan for hiring people in the short term, including understanding how to find talent in previously unexplored geographies and use videoconferencing tools to conduct interviews remotely. Furthermore, given the paramount importance of talent, the CDO should develop a perspective on what sorts of talent will be needed in the future when the recovery comes.

3. Engage with customers now and prepare for the next normal

The best CDOs act as the voice of the customer and ensure that the customer is at the heart of all decisions. In the current environment, that means developing a clear view of how customer habits and behaviors are changing, which of them are likely to stick, and what the implications are for the business. This customer perspective should be communicated to both the C-suite and the entire organization.

Since customer behavior is in the midst of a massive shift, CDOs cannot rely on past truths. What's crucial is putting in place practices that allow for a continuous reevaluation of customers' priorities through test-and-learn exercises, close monitoring, and data analysis. A caring organization will also engage with customers for feedback beyond the usual channels.

CDOs should emphasize design-thinking principles, which are predicated on building empathy with customers, to understand their motivations. We know of CDOs who are reaching out to customers for one-on-one conversations, leading customer interviews, and compiling surveys to better understand the challenges that customers face.

As companies test new offers, channels, and communications, which have been necessitated by the crisis, the CDO needs to have in place a sensitive tracking and analysis capability to understand what's working and what's not so he or she can double down on those that are effective and eliminate those that aren't. To institutionalize this capability, CDOs should consider creating a dedicated squad whose sole

responsibility is developing a deep understanding of customers. Surveys, conversations, and detailed data analysis on channel behavior—in social media, online ads, and search engines—using updated algorithms that don't rely on outdated pattern recognition need to be part of a customer understanding "reset." The customer insights gathered should drive priorities in recrafting the product road map for product improvements and feature development.

The CDO of a major mining corporation, for example, learned that upstream partners were frustrated about the lack of visibility into production. So he created an online portal to ensure transparency. In another example, noting the concerns customers had around the coronavirus, the CDO of a leading bank launched a digital campaign to inform customers of the steps it was taking to stop the spread of the virus and offering digital options to support banking transactions.

4. Scale use of agile and collaboration tools for accelerated remote delivery

Agile working has been a well-established model for teams looking to work quickly and efficiently. In the past, however, the key issue has been how to scale. With remote working conditions the new standard, CDOs can use the moment as an opportunity to better understand what it takes to scale agile.

While co-locating agile teams has traditionally been the most productive working model, the necessity of remote working is putting that experience to the test. The first element of effective remote agile is just ensuring that established ceremonies are followed, such as the daily stand-up, sprint refinement and grooming, sprint planning, sprint demo and review, and sprint retrospective. Additionally, squads should have ad hoc huddles as needed for design and development, facilitated by the scrum master.

Ensuring that people can collaborate remotely is crucial for this new agile model to work. In the case of developers, for example, providing environments so they can contribute remotely and frequent automated deployments can take place should be a priority for the CDO. Many Chinese companies have rapidly adopted local productivity solutions, such as Alibaba's DingTalk or WeChat Work to communicate and deliver weekly meetings, training, and lectures.

Additionally, collaboration tools must be selected based primarily on their familiarity to employees and ease of integration, as opposed to cost, while also ensuring proper security protocols are followed. CDOs will need to collaborate with information security and risk departments to fast-track their approval, and take necessary precautions to safeguard corporate data, such as requiring the use of multifactor authentication, virtual private networks (VPNs), and regular automated backups. The CDO will also need to closely collaborate with the CIO in making the tools easily available to the digital employees.

Many of the tools are scalable because they live on the cloud. CDOs, however, will need to implement change-management efforts, including training teams on how to use them and defining new ways of working so that the tools are used properly—and actually help. A crucial component of this effort is for the CDO to be a role model. This includes communication of the importance of punctuality, of scheduling ceremonies consistently, and of motivating employees so that they always appear on video. Surprise "visits" by the the CDO to ceremonies can also help to motivate all tribes and squads.

Since teams are actively and continually learning from these new ways of working, CDOs should put in place systems to help share that learning across the organization. Sprint retrospective sessions should, in part, be used to determine how the new remote way of working fits the organization and to codify best practices. Gamification can help, through posting leaderboards and by rewarding those who contribute the most learnings to the organization.

Perhaps most important, the CDO has a critical role to play to ensure that a culture of experimentation is maintained. The best learning comes from doing, and trying something new inevitably results in failures. If people are afraid of being punished for failing, they won't experiment. This nervousness about failing is likely to be exacerbated during this time of uncertainty, so the CDO has to take a strong role in celebrating learnings based on failures, pointing out his or her own failures and learnings from them, and protecting people who are willing to experiment.

Leading an organization in a time of crisis is one of the greatest challenges a CDO can face. But by demonstrating resilient leadership and a clear view of how to use digital to navigate the crisis, CDOs can help the business not just to survive but also to be ready for the next normal.

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‘Transformer in chief’: The new chief digital officer

The CDO role is changing dramatically. Here are the skills today’s world demands.

by Tuck Rickards, Kate Smaje, and Vik Sohoni

In the alphabet soup that is today's crowded C-suite, few roles attract as much attention as that of the chief digital officer, or CDO. While the position isn't exactly new, what's required of the average CDO is. Gone are the days of being responsible for introducing basic digital capabilities and perhaps piloting a handful of initiatives. The CDO is now a "transformer in chief," charged with coordinating and managing comprehensive changes that address everything from updating how a company works to building out entirely new businesses. And he or she must make progress quickly.

Given these demands, it's not surprising that the number of people in CDO roles doubled from 2013 to 2014 and is expected to double again this year.[1] We find that companies bring in a CDO for two primary reasons. The first is when they need to approach the complex root causes that must be dissected, understood, and addressed before any substantive progress on digitization can be made. And the second is when the CEO realizes the organization can't meet the primary challenge of creating integrated transformation within its current construct (see sidebar, "Do you need a CDO?").

In fact, the true measure of a CDO's success is when the role becomes unnecessary: by its very nature, a high-functioning digital company does not need a CDO (however, it may want its former CDO to be the CEO). Of course, the vast majority of organizations are not yet at that point. And while there are numerous actions companies can and should take to help these executives work themselves out of a job—such as providing sufficient resources and active CEO support—this article focuses on five areas CDOs themselves must get right if their organizations are to successfully transition to digital.

1. Make digital integral to the strategy

Digital isn't merely a thing—it's a new way of doing things. Many companies are focused on developing a digital strategy when they should instead focus on integrating digital into all aspects of the business, from channels and processes and data to the operating model, incentives, and culture. Our analysis of how companies with a high Digital Quotient (DQ) operate shows that 90 percent of top performers have fully integrated digital initiatives into their strategic-planning process.[2]

Getting the strategy right requires the CDO to work closely with the CEO, the chief information officer (CIO), business-unit leaders, and the chief financial officer; the CDO also needs to be an active participant in and shaper of the strategy. An important foundation for CDOs to establish credibility and secure a seat at the strategy table is providing detailed analysis of market trends and developments in technology and customer behavior, both inside and outside the sector.

Yet CDOs can't stop there. They need to bring a bold vision: 65 percent of companies that are "digital leaders" in our DQ analysis have a high tolerance for bold initiatives; among average performers, 70 percent of companies don't see support for risk taking. This vision could include starting new businesses, acquiring technologies, or investing in innovations—one CDO we know made it his mantra to drive agile as a new software-development methodology for 40 percent of the company's projects. No matter how it's branded, CDOs need to be known within their organization for something that is courageous, new, and adds value.

In addition, CDOs must be specific about their goals. One international publishing house, for example, set a target of generating 50 percent of its revenue and profit from digital media within ten years, and it wound up doing so in almost half that time. Similarly, several banks that set the objective of increasing digital-channel sales to more than 50 percent are seeing that specific and measurable goal rally the organization.

2. Obsess over the customer

While most companies say they know their customers, CDOs must make it a driving passion and core competency of the organization. With

[1] Karl Greenberg, "Chief digital officers grow in ranks and prominence," MediaPost, May 7, 2015, mediapost.com.
[2] See Tanguy Catlin, Jay Scanlan, and Paul Willmott, "Raising your Digital Quotient," *McKinsey Quarterly*, June 2015.

Do you need a CDO?

Companies looking to begin or continue their digital transformation will benefit from considering five questions to help determine whether a CDO is necessary:

- Is the marketplace where I compete undergoing—or vulnerable to—significant changes that are reshaping value?
- Is my company ready to move beyond basic digital experiments and embark on a fundamental and integrated transformation of the business?
- Is my company ready to signal its digital-transformation efforts to audiences both internal and external?
- Do we need a disruptive perspective from someone who can objectively and credibly challenge the status quo with a "digital first" mindset?
- Does the current leadership team have the capacity to steward the digital transformation and support this new role?

technology and customer habits changing so quickly, developing a deep and detailed view of customer behavior across all channels provides a common reference point in any business discussion and arms the CDO to challenge the status quo and make changes. For example, one CDO used the concept of customer journeys and big data mapping of these paths to show her peers where opportunities and pain points existed—and, in doing so, destroyed several myths.

This type of analysis is critical, to be sure, but an equally important part of the CDO's job is communicating how essential the customer is to the organization. One CDO created clear and visually compelling dashboards on the customer journey and made a habit of consistently referencing them in meetings and when making decisions. Another set up a digitally enabled "war room" with real-time reporting on several key digital metrics, which soon will be piped to the tablets and smartphones of other C-suite executives. Yet another CDO sends regular company-wide emails highlighting customer breakthroughs, insights, and "voice of the customer" anecdotes. Such actions can help the business start to think more specifically about the customer so that everyone approaches all issues with a single crucial question: How will this affect the customer?

Digital capabilities ultimately provide an important foundation for improving the customer experience. It's up to the CDO to identify those functions where digital is critical: for example, investing in automation capabilities to rapidly respond to customer interactions, developing sophisticated reporting and analytics capabilities to interpret customer needs, building innovative interfaces to gather customer data (for example, an alternative payment method), and creating mechanisms to deliver content and offers across all relevant channels. While the CDO will need to work closely with marketing and IT leadership, he or she should define the customer-experience journey and identify the requirements for developing and then supporting a dynamic system that is constantly learning and evolving.

3. Build agility, speed, and data

CDOs can build strong foundations for change by creating a "spirit of digital" throughout the organization. That could include setting up coding days for the board or holding company-wide hackathons—one company we know even had drones flying around the atrium of its headquarters. Core to building this spirit, however, is increasing the "metabolic rate" of the organization. That starts with changing basic habits, such as having strategy leadership meetings weekly or even biweekly to help ingrain the idea of moving at a faster pace. CDOs must look at how the organization operates and find ways to inject speed into processes. In

some cases, it could be as straightforward as working with IT to automate existing development processes. But in others, it will require radically changing how the company works, such as setting extremely aggressive goals—as few as six weeks—for getting a product to market. Some CDOs do this by setting up "digital factories," which are cross-functional groups focused on developing one product or process using a different technology, operational, or managerial methodology from the rest of the company. Embedding these factories in business units has the advantage of spreading the new culture and making the digital-factory approach the norm.

Managing a portfolio of these types of initiatives requires leaders to be decisive. If the data show a prototype doesn't work, the CDO must be ruthless about killing the project, incorporating anything learned from the experience, and moving on. On the other hand, CDOs should establish flexible budgeting processes so that projects that show signs of success can get resources to scale quickly.

4. Extend networks

In a digital world, threats often do not come from established competitors but rather from innovative technologies that enable new businesses, start-ups that undermine established business models, or new developments outside the way the company defined its competitive space. For example, one of the big trends in the payments sector is the merging of commerce and payments functionalities in the same app—so, being able to pay for your restaurant meal using the OpenTable app you used to reserve your table.

Successful CDOs are keenly aware of such trends. They build networks of people, technologies, and ideas far outside of their company, constantly scanning the small-business landscape to identify possible acquisitions or partners that can provide complementary capabilities. Some CDOs spend as much as 50 percent of their time working with external partners to build effective working relationships that take advantage of every organization's capabilities. To help bring these outside voices into the organization, many CDOs establish advisory boards of start-up leaders or create "challenger" boards of people with digital experience and expertise to review corporate initiatives and strategies. At a more pedestrian level, they regularly invite technologists or entrepreneurs to team lunches.

Building an internal network is just as important because company systems and technologies need to be flexible enough to work with outside parties. In particular, CDOs need to work with IT leaders to develop application programming interfaces and cloud-based architecture that works with a broader ecosystem of providers. Some CDOs realize too late that functions such as compliance, finance, human resources, legal, procurement, and risk also need to change to support a more digitally focused company. At one company, for example, an effort to accelerate time to market is in full swing, but procurement still insists it requires six months to approve a vendor. Changing such supporting processes isn't easy—functions often have good reasons for why processes are undertaken as they are. But brokering compromises and testing new ways of operating that are necessary to make progress will be virtually impossible if a CDO doesn't build internal networks early and engage with leaders across the business.

5. Get stuff done

CDOs are ultimately judged not by the quality of their ideas but by their ability to lead different types of teams, guide projects, overcome hurdles, and deliver integrated change.

Getting stuff done often requires hard-nosed negotiating skills. Consider the CDO at a financial-services company who wanted to stop business units from draining IT resources on independent projects that didn't align with the overarching strategy. The CDO worked closely with the CIO and agreed to use her new budget to fund some of his projects; she also helped him retain and motivate key people by staffing them on important digital initiatives (which also assured him visibility into what she was doing). In return, the CIO agreed to stop

The importance of soft skills should not be understated: some CDOs estimate they spend 80 percent of their time building relationships.

supporting initiatives that the CDO didn't explicitly approve. Both won in the end, and they now have a close working relationship.

A new CDO will benefit from the early establishment of near-term goals that can yield quick wins and wow moments that help build enthusiasm and momentum. Some CDOs find that building the marketing-commerce function is a great way to quickly demonstrate value, while others embark on accelerated cost cutting by automating core processes. It pays to define how success is measured, whether it's tracking key digital and business metrics—such as digital-media revenue as a percentage of total revenue—or creating a full digital profit-and-loss statement (or both). To be meaningful for the business overall and to build credibility, key performance indicators must be aligned with those used by established business units.

Within his first month, for example, the new CDO at one financial-services company defined clear, discrete digital initiatives; developed a long-term vision in partnership with an anchor business-unit leader; and got his budget approved. Within six months, he hired a handful of key employees, launched several initiatives, identified gaps in the organization, and pulled together teams to fill them. A year and a half into the job, he was able to claim some solid wins and moved from a "shadow" profit and loss to an explicit one.

Of course, the projects CDOs commit to must be core to the business—such as developing new revenue streams, cutting costs, or getting to market faster—and not peripheral experiments, which could end up marginalizing their efforts. We've actually found it works best when a CDO's budget is funded through the efficiencies and growth that he or she drives. In addition, we believe that budgeting is critical to ensuring that things get done. Successful CDOs not only time their actions to maximize budgetary flexibility but also change how funding is allocated. One CDO shifted from annual approval of large capital expenses for IT to a more venture capital–like monthly cycle, ensuring he could get more projects funded and launched. This approach also served to maintain funding momentum, with small bites over the course of the year predicated on demonstrated effectiveness.

Defining characteristics of the new CDO

When hiring a CDO, people often agonize over finding someone with experience that is just right. Yet we've found it's the ability to lead transformation across an organization that is the true indicator of likely success in the role, and that requires a combination of hard and soft skills. Hard skills include the ability to articulate a strategic vision, the means to take on problems by identifying root causes across functions and making the tough decisions necessary to resolve them, experience in "pure play" digital and larger company transformations (typically in the consumer and technology sectors), and the managerial ability to lead and see programs through to fruition.

The importance of soft skills should not be understated: some CDOs estimate they spend 80 percent of their time building relationships. In our experience, successful CDOs have the patience to navigate the complex organizational structures of large businesses; additionally, they collaborate to get buy-in across functions and are able to diplomatically challenge the status quo and solidify relationships with a broad group of people. They

also demonstrate leadership and charisma that excites the organization to drive change forward.

Of course, companies would be lucky to have executives in any function with this skill set. But driving organization-wide change is different from the mandate for other senior roles. A recent Russell Reynolds Associates survey found that CDOs are meaningfully different from other senior executives across five categories: they are on average 34 percent more likely to be innovative and 32 percent more likely to be disruptive, and also differ with regard to determination, boldness of leadership, and social adeptness.[3] Leading an organizational transformation is messy work that requires masterful social skills to implement digital initiatives that create disruption by their very nature. Indeed, a CDO's strong bias for action, bold thinking, and high tolerance for risk requires someone who can also manage the ruffled feathers, bruised egos, and flaring tempers that are common fallout from his or her activities.

As the digital age scrambles the traditional organizational structure, CDOs must not only launch the organization on its digital trajectory but also help it fundamentally evolve. The role requires a "bifocal" approach: achieving the near-term imperative of getting things moving quickly, while setting in place the longer-term conditions of success so the organization can compete digitally. Those CDOs that succeed will truly have earned their place in the already-crowded C-suite.

[3] For more on this survey, see "Productive disruptors: Five characteristics that differentiate transformational leaders," Russell Reynolds Associates, August 12, 2015, russellreynolds.com.

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Five habits for executives to become more digital

Need to catch up to the digital revolution? Here's our cheat sheet for the C-suite.

by Kate Smaje and Chris Wigley

For many consumers, being digital is second nature. Activities unknown a few years ago are now commonplace: using a smartphone to compare prices while shopping, or seeking product recommendations using Facebook. Yet an organization's top table can take a while to catch up to this reality. After all, most of today's senior executives built their careers in the predigital age and for the past ten years have been too busy hitting their numbers to spend much time following tech trends or posting on social media.

If this sounds familiar, you're not alone: we often hear from leaders we work with that they feel left behind by the digital revolution. So here are a few practical tips that we've found help senior executives make the transition from analog to digital:

1. Think like a geek

Set up a challenge session. Get your senior leaders, tech team, and marketers together to confront the critical question: If software is eating the world, how could it eat us? For example, one European media company asked executives from a bunch of start-ups, "How could you disrupt us? Which activities would you replace with algorithms? What advantages do we have that you can't replicate?" Not only were they surprised by the results—they acted on them.

Teach your team to program an app. Demystify technology by taking a handful of direct reports—or your C-suite peers—to a one-day course. Even a novice can learn to write simple code in a day. It's the digital equivalent of looking under the bonnet (or hood) to see how the engine works.

2. Carve out time to look beyond your company

Get a news feed of tech developments in your industry. Try a "5 at 5": Every day, put aside five minutes at five o'clock to get smart about a topic. If a news item or an article or a blog makes you see your business in a new light, share it with others—why not tweet it?

Hold regular meetings with innovators. When people are perpetually fire-fighting, it's easy to miss what's going on in the outside world. Invite industry innovators to come in; you may find new talent to hire or new options to pursue. Build networks as well as knowledge, and raise your internal and external profile as a company that's receptive to fresh thinking.

3. Behave like your customer

Think mobile. Over a billion people have a smartphone in their pocket. Think what you like doing on yours, then honestly consider what your company is putting on that small screen. Does it make consumers' lives better, easier, faster? Are you putting their needs first or optimizing for a marketing campaign? You'll be amazed at how many things you could do better.

Don't ignore that app everyone's using. Download it; engage with it. Do you have an Instagram account, pin on Pinterest, rent your holiday home from Airbnb? It's time you did. Need pointers? Ask your kids. Keep going: What opportunities could social, curated, and marketplace approaches open up for your company?

4. Surround yourself with the right people

Find a "reverse mentor." Get that interesting new hire with the funny haircut to send you snippets to guide you through the digital world. Ask your CIO or CTO to suggest likely candidates, spend ten minutes talking to them, and select whoever gave you most to think about.

Be thoughtful about your team. Get your head of HR and commercial director to identify your top digital talent. Then ask, What are they are doing? Who are we hiring? Do we have the right roles and structures? Do we need a digital officer or an "innovator without portfolio"?

5. Remember it's 99 percent perspiration

Sweat the small stuff. Get excited about your backlog of tech improvements, not just your three-year plan. What's being launched in your next release? How will it enhance the customer experience? Improving load times on your website isn't just a detail for the tech team; ease of use is something you should be passionate about.

Increase your metabolic rate. Finish your meetings in half the time. Ask how you can complete a task in one month rather than six. Favor quick-and-dirty work-arounds over purpose-built solutions. Set a culture of try, fail fast, learn, move on. And don't reinvent the wheel. One company was planning to develop its own instant communication system but ended up using Snapchat instead; it was available, free, and it did the job.

Remember, these are tips, not a to-do list. Start with one or two and see how easily they fit into your everyday routine. They may be small, but their collective impact on you and your company could be enormous. Have fun!

Kate Smaje and **Chris Wigley** are principals in McKinsey's London office.

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The seven traits of effective digital enterprises

To stay competitive, companies must stop experimenting with digital and commit to transforming themselves into full digital businesses. Here are seven traits that successful digital enterprises share.

by Tunde Olanrewaju, Kate Smaje, and Paul Willmott

The age of experimentation with digital is over. In an often bleak landscape of slow economic recovery, digital continues to show healthy growth. E-commerce is growing at double-digit rates in the United States and most European countries, and it is booming across Asia. To take advantage of this momentum, companies need to move beyond experiments with digital and transform themselves into digital businesses. Yet many companies are stumbling as they try to turn their digital agendas into new business and operating models. The reason, we believe, is that digital transformation is uniquely challenging, touching every function and business unit while also demanding the rapid development of new skills and investments that are very different from business as usual. To succeed, management teams need to move beyond vague statements of intent and focus on "hard wiring" digital into their organization's structures, processes, systems, and incentives.

There is no blueprint for success, but there are plenty of examples that offer insights into the approaches and actions of a successful digital transformation. By studying dozens of these successes—looking beyond the usual suspects—we discovered that effective digital enterprises share these seven traits.

1. Be unreasonably aspirational

Leadership teams must be prepared to think quite differently about how a digital business operates. Digital leaders set aspirations that, on the surface, seem unreasonable. Being "unreasonable" is a way to jar an organization into seeing digital as a business that creates value, not as a channel that drives activities. Some companies frame their targets by measures such as growth or market share through digital channels. Others set targets for cost reduction based on the cost structures of new digital competitors. Either way, if your targets aren't making the majority of your company feel nervous, you probably aren't aiming high enough.

When Angela Ahrendts became CEO of Burberry, in 2006, she took over a stalling business whose brand had become tarnished. But she saw what no one else could: that a high-end fashion retailer could remake itself as a digital brand. Taking personal control of the digital agenda, she oversaw a series of groundbreaking initiatives, including a website (ArtoftheTrench.com) that featured customers as models, a more robust e-commerce catalog that matched the company's in-store inventory, and the digitization of retail stores through features such as radio-frequency identification tags. During Ahrendts's tenure, revenues tripled. (Apple hired Ahrendts last October to head its retail business.)

Netflix was another brand with an unreasonably aspirational vision. It had built a successful online DVD rental business, but leadership saw that the future of the industry would be in video streaming, not physical media. The management team saw how quickly broadband technology was evolving and made a strategic bet that placed it at the forefront of a surge in real-time entertainment. As the video-streaming market took off, Netflix quickly captured nearly a third of downstream video traffic. By the end of 2013, Netflix had more than 40 million streaming subscribers.

2. Acquire capabilities

The skills required for digital transformation probably can't be groomed entirely from within. Leadership teams must be realistic about the collective ability of their existing workforce. Leading companies frequently look to other industries to attract digital talent, because they understand that emphasizing skills over experience when hiring new talent is vital to success, at least in the early stages of transformation. The best people in digital product management or user-experience design may not work in your industry. Hire them anyway.

Tesco, the UK grocery retailer, made three significant digital acquisitions over a two-year span: blinkbox, a video-streaming service; We7, a digital music store; and Mobcast, an e-book platform. The acquisitions enabled Tesco to quickly build up the skills it needed to move into digital media. In the United States, Verizon followed a similar path with

The leaders of incumbent companies must aggressively challenge the status quo rather than accepting historical norms.

strategic acquisitions that immediately bolstered its expertise in telematics (Hughes Telematics in 2012) and cloud services (CloudSwitch in 2011), two markets that are growing at a rapid pace.

This "acqui-hire" approach is not the only option. But we have observed that significant lateral hiring is required in the early stages of a transformation to create a pool of talent deep enough to execute against an ambitious digital agenda and plant the seeds for a new culture.

3. 'Ring fence' and cultivate talent

A bank or retailer that acquires a five-person mobile-development firm and places it in the middle of its existing web operations is more likely to lose the team than to assimilate it. Digital talent must be nurtured differently, with its own working patterns, sandbox, and tools. After a few false starts, Wal-Mart Stores learned that "ring fencing" its digital talent was the only way to ensure rapid improvements. Four years ago, the retail giant's online business was lagging. It was late to the e-commerce market as executives protected their booming physical-retail business. When it did step into the digital space, talent was disbursed throughout the business. Its $5 billion in online sales in 2011 paled next to Amazon's $48 billion.

In 2011, however, Wal-Mart established @WalmartLabs, an "idea incubator," as part of its growing e-commerce division in Silicon Valley—far removed from the company's Bentonville, Arkansas, headquarters. The group's innovations, including a unified company-wide e-commerce platform, helped Wal-Mart increase online revenues by 30 percent in 2013, outpacing Amazon's rate of growth.

Wal-Mart took ring fencing to the extreme, turning its e-commerce business into a separate vertical with its own profit and loss. This approach won't work for every incumbent, and even when it does, it is not necessarily a long-term solution. Thus Telefónica this year recombined with the core business Telefónica Digital, a separate business unit created in 2011 to nurture and strengthen its portfolio of digital initiatives. To deliver in an omnichannel world, where customers expect seamless integration of digital and analog channels, seamless internal integration should be the end goal.

4. Challenge everything

The leaders of incumbent companies must aggressively challenge the status quo rather than accepting historical norms. Look at how everything is done, including the products and services you offer and the market segments you address, and ask "Why?" Assume there is an unknown start-up asking the exact same question as it plots to disrupt your business. It is no coincidence that many textbook cases of companies redefining themselves come from Silicon Valley, the epicenter of digital disruption. Think of Apple's transformation from struggling computer maker into (among other things) the world's largest music retailer, or eBay's transition from online bazaar to global e-commerce platform.

Digital leaders examine all aspects of their business—both customer-facing and back-office systems and processes, up and down the supply chain—for digitally driven innovation. In 2007, car-rental company Hertz started to deploy self-service kiosks similar to those used by airlines for flight check-in. In 2011, it leapfrogged airlines by moving to dual-screen kiosks—one screen to select rental options via touch screen, a second screen at eye level to communicate with a customer agent using real-time video.

We see digital leaders thinking expansively about partnerships to deliver new value-added experiences and services. This can mean alliances that span industry sectors, such as the Energy@home partnership among Electrolux, Enel, Indesit, and Telecom Italia to create a communications platform for smart devices and domestic appliances.

5. Be quick and data driven

Rapid decision making is critical in a dynamic digital environment. Twelve-month product-release cycles are a relic. Organizations need to move to a cycle of continuous delivery and improvement, adopting methods such as agile development and "live beta," supported by big data analytics, to increase the pace of innovation. Continuous improvement requires continuous experimentation, along with a process for quickly responding to bits of information.

Integrating data sources into a single system that is accessible to everyone in the organization will improve the "clock speed" for innovation. P&G, for example, created a single analytics portal, called the Decision Cockpit, which provides up-to-date sales data across brands, products, and regions to more than 50,000 employees globally. The portal, which emphasizes projections over historical data, lets teams quickly identify issues, such as declining market share, and take steps to address the problems.

U.S. Xpress, a US transportation company, collects data in real time from tens of thousands of sources, including in-vehicle sensors and geospatial systems. Using Apache Hadoop, an open-source tool set for data analysis, and real-time business-intelligence tools, U.S. Xpress has been able to extract game-changing insights about its fleet operations. For example, looking at the fuel consumption of idling vehicles led to changes that saved the company more than $20 million in fuel consumption in the first year alone.

6. Follow the money

Many organizations focus their digital investments on customer-facing solutions. But they can extract just as much value, if not more, from investing in back-office functions that drive operational efficiencies. A digital transformation is more than just finding new revenue streams; it's also about creating value by reducing the costs of doing business.

Investments in digital should not be spread haphazardly across the organization under the halo of experimentation. A variety of frequent testing is critical, but teams must quickly zero in on the digital investments that create the most value—and then double down.

Often, great value is found in optimizing back-office functions. At Starbucks, one of the leaders in customer-experience innovation, just 35 of 100 active IT projects in 2013 were focused on customer- or partner-facing initiatives. One-third of these projects were devoted to improving efficiency and productivity away from the retail stores, and one-third focused on improving resilience and security. In manufacturing, P&G collaborated with the Los Alamos National Laboratory to create statistical methods to streamline processes and increase uptime at its factories, saving more than $1 billion a year.

7. Be obsessed with the customer

Rising customer expectations continue to push businesses to improve the customer experience across all channels. Excellence in one channel is no longer sufficient; customers expect the same frictionless experience in a retail store as they do when shopping online, and vice versa. Moreover,

they are less accepting of bad experiences; one survey found that 89 percent of consumers began doing business with a competitor following a poor customer experience. On the flip side, 86 percent said they were willing to pay more for a better customer experience.[1]

A healthy obsession with improving the customer experience is the foundation of any digital transformation. No enterprise is perfect, but leadership teams should aspire to fix every error or bad experience. Processes that enable companies to capture and learn from every customer interaction—positive or negative—help them to regularly test assumptions about how customers are using digital and constantly fine-tune the experience.

This mindset is what enables companies to go beyond what's normal and into the extraordinary. If online retailer Zappos is out of stock on a product, it will help you find the item from a competitor. Little wonder that 75 percent of its orders come from repeat customers.

Leaders of successful digital businesses know that it's not enough to develop just one or two of these traits. The real innovators will learn to excel at all seven of them. Doing so requires a radically different mindset and operating approach.

[1] *2011 Customer Experience Impact Report: Getting to the Heart of the Consumer and Brand Relationship*, Oracle, 2012, oracle.com.

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