McKinsey Digital

# Managing tech transformations

Managing transformational and organizational change in a rapidly changing technological landscape

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# Introduction

With COVID-19 increasing the need for technology to be a competitive advantage, technology transformations have become increasingly important. This sentiment was echoed in last year's annual McKinsey Global Survey on technology strategy, where almost all respondents had conducted some type of technology transformation in the past two years, with more planned on the horizon.

This emphasis on transformation seems to be paying off. In this year's technology strategy survey, most companies report some or significant impact from their companies' technology transformations. For all that progress, however, huge value from technology is still untapped at most large incumbent companies. As technology moves front and center in the business, successful transformations require changes across three dimensions, or vectors, to become truly "tech forward":

— Reimagining the role of IT

— Reinventing tech delivery

— Future-proofing the foundation

Our latest survey shows that there are no silver bullets. Tech leaders have to frame and orchestrate the full transformation across all these vectors—in a constantly shifting and dynamic landscape.

To help bring clarity to this reality, this collection explores the structural shifts needed on each of these vectors to drive sustainable change and business value.

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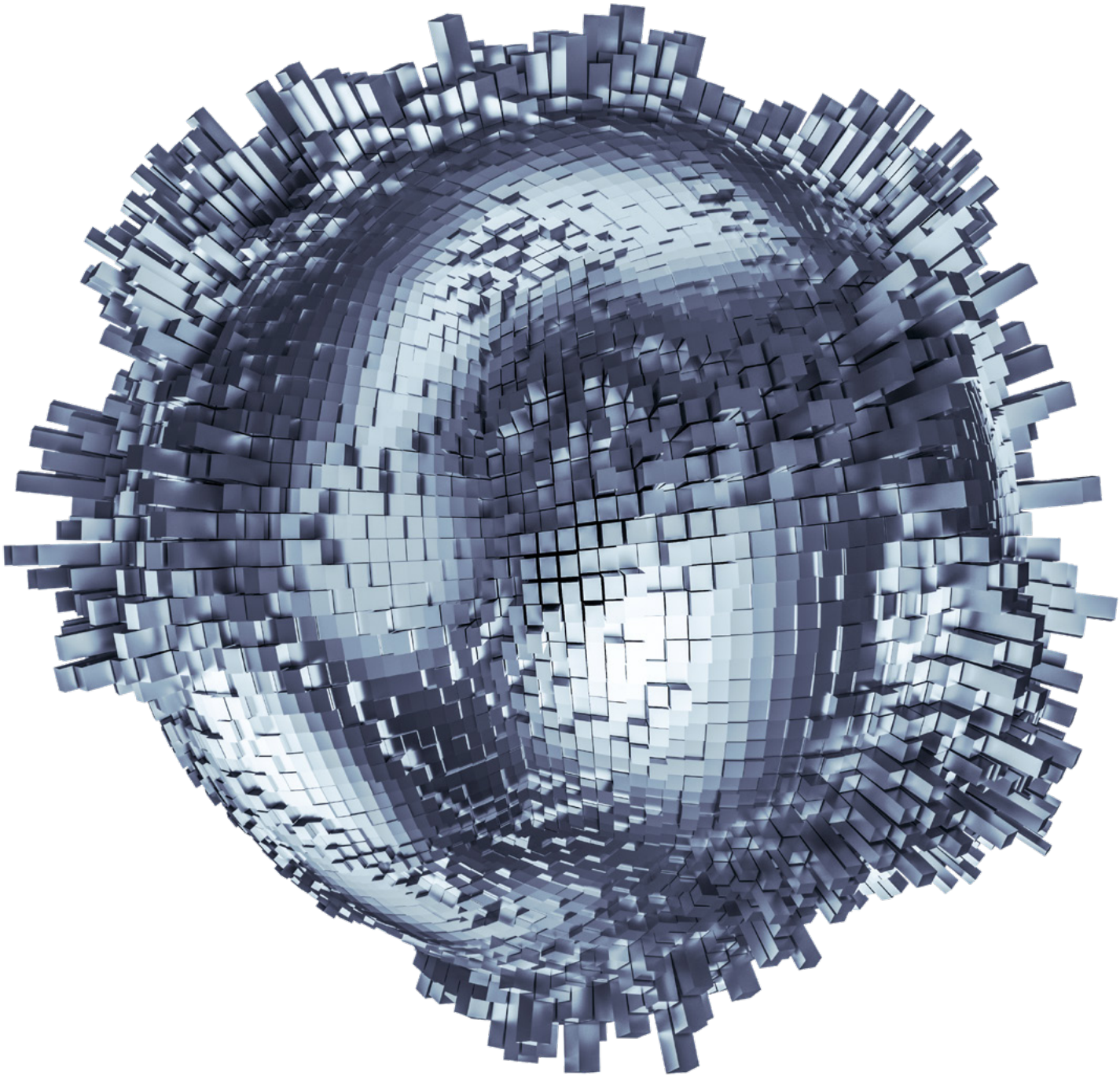
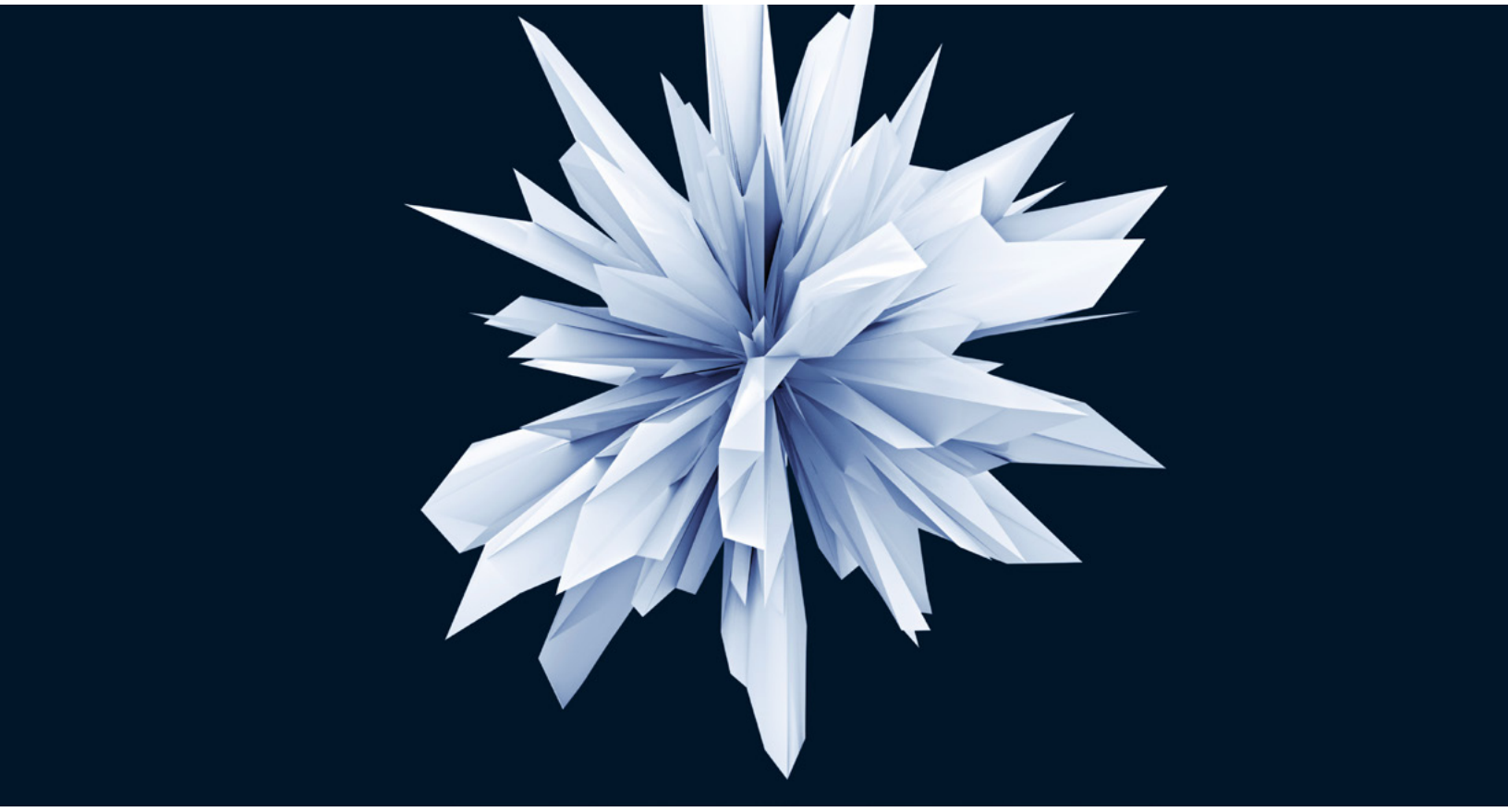
# 1. Transformation that works



# How to become ‘tech forward’: A technology-transformation approach that works

Getting value from tech relies on tackling multiple interdependent programs at once.

*This article was a collaborative effort by Anusha Dhasarathy, Isha Gill, Naufal Khan, Sriram Sekar, and Steve Van Kuiken, representing views from McKinsey Technology.*





November 2020

**For executives looking for lessons** in the wake of COVID-19, one has emerged clearly: every company needs to become a tech company.

Whether it's been the shift to online working, the spike in online demand, or the increase in cyber assaults, technology has emerged as a critical business capability. That reality has injected a renewed importance and new urgency into modernizing the technology function. Companies can no longer afford the long timelines and often-disappointing business returns that have hampered many of the large tech-transformation projects of the past.

Instead, some technology leaders have pursued a new approach that is comprehensive enough to account for the myriad interlinkages of modern technology joined at the hip with the business so that change delivers value, and self-funded so that the scope of the change can continue to expand. We think of this comprehensive approach as "tech forward."

## Counteracting the most devastating tech-transformation failure modes

Some companies are starting to see real impact from their tech transformations. In a recent McKinsey study, some 50 percent of surveyed companies reported moderate to significant impact on realizing new revenue streams, almost 70 percent reported impact on increasing existing revenue streams, and 76 percent reported impact on reducing costs.[1]

Tech transformations, nonetheless, remain notoriously difficult and complex. Though many companies are transforming their tech organizations, about 50 percent of them report that they're still in the pilot phase (small tech teams working with advanced technologies but isolated from the rest of the technology function).[2]

To understand better what successful tech transformations look like—as well as what the most important pitfalls are—we spoke with nearly 700 CIOs at some of the largest companies across the world. These conversations illuminated a number of consistent factors that most consistently kill off even the most promising tech transformations and revealed antidotes to address them. Following are three of the most common failure modes.

### Piecemeal activity and limited scope

There is no shortage of technology-transformation initiatives, all of them with good intentions and promising payoffs. In fact, our latest analysis shows that companies are expanding the range of tech-related transformations (Exhibit 1).

But too often companies focus on a series of initiatives without accounting for crucial dependencies that need to be in place to enable the change. Simply migrating systems to the cloud without also thoughtfully implementing cyber strategy, agile, and DevOps, for example, would leave a company unable to take advantage of the automation, scale, and flexibility that cloud-based systems offer. The other side of the coin is that activities in one area can have unintended consequences in another, often breaking or disabling tangential systems. Modernizing the architecture, for example, changes how development teams deploy to it; using old methods results in errors and delays. Successful CIOs, in contrast, are explicit in identifying system dependencies and deliberate in managing them so that the full scope of potential benefits can be captured.

### No link to business value

New technologies continually hit the market, many with tempting promises to solve many of tech's ills. Unfortunately, many of these "shiny objects" in which technology functions invest have limited value to the business due to limited partnering between technology and the business, the inability of technology to communicate the value of tech to the business, and an often unclear sense of the business value at stake.

[1] McKinsey Global Survey on IT and the Business, August 2020.
[2] Ibid.

Exhibit 1

## Companies are pursuing a larger range of transformations and moving beyond modernizing infrastructure.

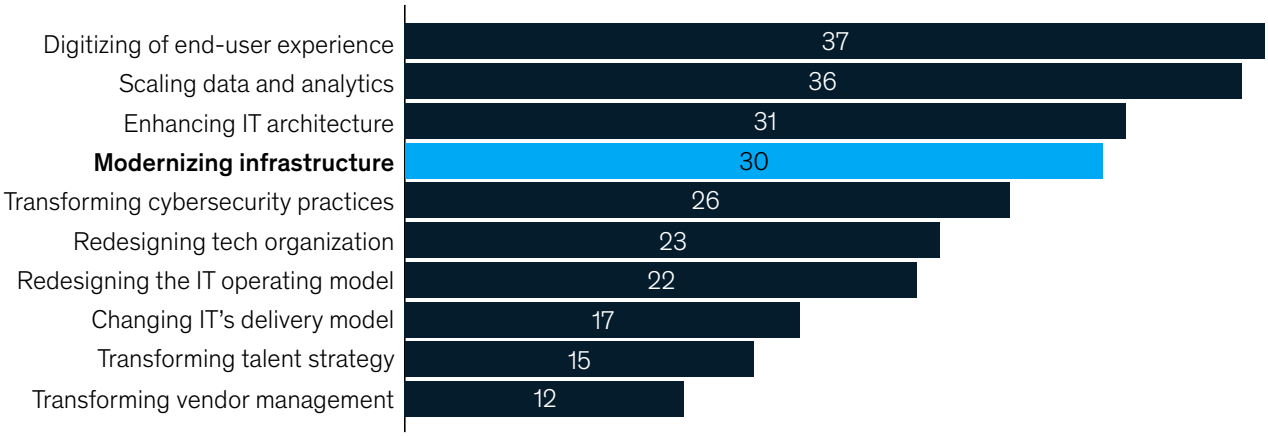
**Over the past three years, infrastructure transformations have led the way** as the most-cited type of transformation pursued in the past two years by

**60%**

of respondents[1]

… but **this year, respondents are planning a wider spread of transformations**, with more focus upward along the tech stack

**Types of transformations most likely to be pursued over next two years,[2]** %




Companies that modernized their infrastructure have a more modern, stable, and flexible infrastructure in place—and are ready to pursue new types of transformations.

[1]Q: *Of the following types of IT transformations (large-scale change efforts that are more comprehensive than short-term improvement programs), which, if any, has your organization pursued in the past two years?* (n = >450). Data for "Scaling data and analytics" not available for 2017 and 2016.
[2]Q: *Which of the following IT transformations, if any, is your organization most likely to pursue in the next two years?* (n = 487).

Top organizations instead are deliberate in developing a governance program tied to the business, grounding each initiative in an explicit P&L result and building in specific metrics to track progress against business targets. This becomes even more critical in a post-COVID-19 world in which budgets are tightening and return on investment (ROI) is essential.

**Too expensive to sustain**

Tech transformations are expensive. When their ROI lies too far in the future (or is disappointing, as has happened in the past), critical investment is too often pulled back. That doesn't need to happen.

Successful transformations, in contrast, frontload activities that unlock value quickly. Those activities

can include agile sourcing strategies, clean-sheeting the portfolio, or optimizing the balance of engineering and non-engineering roles—changes that often unlock millions of dollars.

## What a 'tech forward' transformation looks like

Detailed conversations with CIOs as well as our own experience helping businesses execute complex technology transformations yielded a broad array of insights, best practices, and guidelines. We've synthesized them into a "tech forward" model that highlights three interconnected vectors, within which are ten specific "plays," or domains of activity (Exhibit 2).

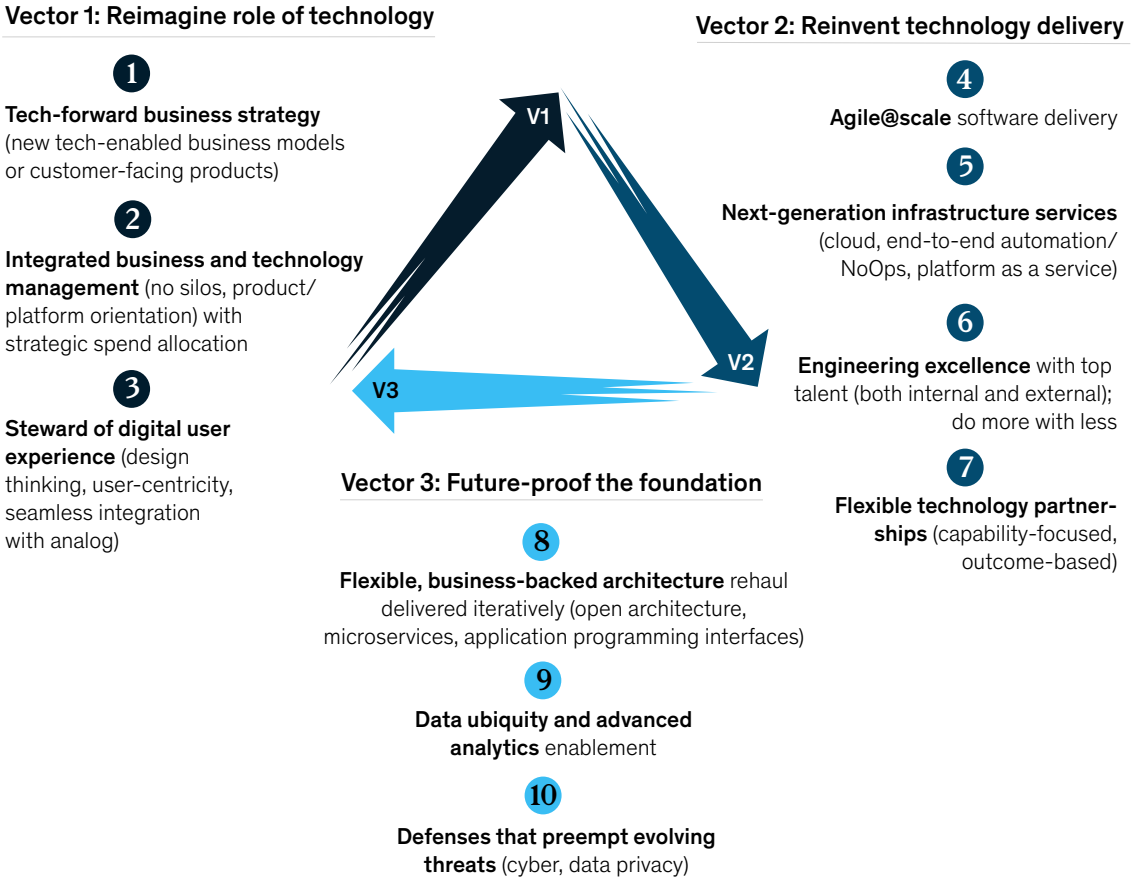
It is important to call out that the identification of the activities themselves isn't the main reveal—CIOs will be familiar with most if not all of them. This tech-forward model has proven most useful, however, in helping organizations understand the scale of needed change and think through interdependencies across vectors and plays.

**Vector #1: A reimagined role for technology that's focused on the business**

Effective technology functions maintain close ties with other business functions, but best-in-class CIOs take this a step further, with technology *driving* the business. That requires reimagining technology's role through technology-led business models (play #1), a

Exhibit 2

**Successful technology transformations span three vectors of activity, each consisting of a specific set of plays.**



product- and platform-centered operating model with ingrained strategic funding allocation (play #2), and technology functions becoming the steward of digital user journeys (play #3) given their unique perspective across functions such as marketing, sales, and operations. In organizations that have truly reimagined technology's role, the role of the CIO is also often elevated.

This vector of change often isn't the first one we see. Rather, this reimagined role for technology develops over time as the other two vectors begin delivering value and the credibility of the technology function grows. However, this aspiration for technology to drive business value must be explicitly defined up front or the results may fall short, as they often do.

**Vector #2: A technology delivery model built for flexibility and speed**

Modern technology functions set up their delivery models to keep pace with the fast-evolving needs of customers and employees. Using agile methods, tech teams prioritize and carry out activities that have the greatest potential to help their companies realize sought-after performance gains (play #4). Next-generation infrastructure services based in the cloud accelerate delivery and stabilize the tech environment by automating development, testing, and deployment processes (play #5). To improve the quality and efficiency of their work, modern tech functions hire highly skilled engineers to deliver mission-critical engineering in house (play #6). They also partner thoughtfully with a variety of vendors, ranging from hyperscalers to software-as-a-service (SaaS) firms to niche engineering organizations to large-scale systems integrators, for help in building or augmenting capabilities that are more challenging to develop or scale, using contracts that reward vendors for producing business outcomes rather than merely augmenting in-house capacity (play #7).

**Vector #3: A future-proof foundation of core tech systems that support innovation, collaboration, and security**

Renewing core systems so they support new digital functionalities, multiple daily production releases, and frequent upgrades can provide significant performance benefits. Such modern systems are arranged according to a flexible architecture consisting of self-contained applications connected with easy-to-configure application programming interfaces (APIs) (play #8). A modern technology core includes data and analytics systems that provide technology teams across the enterprise with the high-quality information and powerful tools they need to gain insights into customer and employee preferences, design innovative applications, and enrich user experiences (play #9). It also enables tech teams to integrate security and privacy protections as they develop solutions, rather than adding them after solutions development is complete. This approach greatly accelerates delivery while maintaining or even improving information security (play #10).

The challenge in using this model lies not just in coordinating the interdependencies, as challenging as that can be; it's in sequencing the transformation initiatives so that they build value quickly. It is essential that a tech transformation deliver value within a year; beyond that, skepticism builds and support fades. To enable this focus on value, the transformation road map should take on a few interdependent changes at a time, with a series of coordinated efforts, each of which can be completed within three to six months.

## Tech forward in action

**A consumer-services company transforms its tech function to support better customer experiences**

A major institution in the consumer-services sector was losing business to its rivals, who were aggressively rolling out new and better digital products and channels. Working closely with the CEO and other business-unit leaders, the CIO determined IT needed to develop a set of digital channels and products to improve customer retention, increase share of wallet, and improve customer experience (play #1).

With this clear articulation of how new digital products would deliver business value, the CIO was ready to start building them. But he quickly realized

that progress would be difficult unless IT changed how it developed products that customers actually wanted (play #3), how IT worked with the business to ensure that the technology products delivered value (play #2), and how teams collaborated to make better and faster progress. Without these changes, he knew the company would run into the same delays and issues that had dogged its earlier technology initiatives.

Acting on this understanding, the CIO partnered with business leaders to design a new model for how business and technology would partner. That included, for example, creating a single "point of entry" for any technology requests and frequent meetings to jointly review and prioritize them. Each month, they reviewed the tech road map against the business strategy. One result was the creation of a fast track for product requests that didn't require significant work, a simple solution to the previous monolithic development process that every request had to go through.

Simultaneously, he implemented a new, agile, product-engineering model (play #4) where cross-functional teams made up of people with design, development, operations, and other expertise collaborated around a specific user experience (mobile ordering or setting up an account, for example). To ensure speed and momentum, these teams were trained to use agile ways of working together, such as breaking initiatives into two-week projects (sprints), piloting new products to get user input, and rapidly testing operational effectiveness before scaling. To help focus their work, the teams used design thinking to build clear pictures of true user needs and pain points.

This initial phase of work allowed technology teams to roll out the first set of digital offerings successfully and under budget—and three to five times faster than similar technology projects undertaken in the past.

With the digital-products workstream well under way, the CIO focused his attention on another cluster of critical dependencies: scaling cloud-based services (play #5), modernizing and migrating foundational systems to microservices (play #8), and leveraging data to find new sources of value (play #9). SWAT teams of engineers and architects came together to anticipate system-reliability issues and their root causes. They tackled the most urgent ones first and managed the backlog. They also actively checked that fixes were working and stepped in quickly to address any that weren't.

At the same time, another team modernized foundational systems by building out a microservices-based architecture for all new development. To enable this shift, more easily accommodate new digital solutions, and help improve time to market, they worked on updated cloud-based platforms, which allowed them to use cloud-based data services to rapidly process and analyze their data to identify new business opportunities. Working collaboratively, business and IT teams created almost 50 use cases, such as improved demand and inventory forecasting, that have the potential to add as much as $1 billion of incremental revenue.

## Questions that help orchestrate a successful tech-forward transformation

To get the sequence of transformation activities right, executives need to be clear about where they're going and what their current capabilities are. Companies often have an incomplete understanding of these two elements, which creates confusion in the executive suite and will derail a tech transformation before it ever gets started.

To plot a company's tech-transformation road map, we find the following questions particularly helpful:

— What is your expectation from technology?

— Which strategic outcomes are most critical (for example, speed and quality of delivery)?

— Which are the most urgent pain points and what causes them?

The following questions help executives understand the current state of the technology

function and its experience with transformation programs:

— Which, if any, of the ten plays from the tech-forward approach are in place, and what is their maturity?

— Is transforming your company's tech one of the top two priorities in your C-suite? If not, why not?

— How well does the technology function support your company's strategic objectives or digital ambitions?

— What tech-transformation efforts has your company launched to date? What effect have they had? What went well, and what didn't?

— What factors might restrict the pace of your tech-transformation efforts? In particular, how much capital and other resources can the company devote to tech transformation?

The current COVID-19 crisis, of course, is having a significant impact on how CIOs and businesses manage tech transformations. Despite the pressures it has added to costs, however, the urgency to get moving and transform has never been higher, according to many CIOs. But while the demands placed on the technology function have grown, so too have the opportunities. Experience suggests that the most effective transformations are not only comprehensive, covering the function's role, delivery model, and core systems, but also sequenced to ensure that changes that reinforce each other are carried out together. With up-front planning focused on business value and careful delivery, a company can bring its technology function forward and gain the capabilities to thrive in challenging digital markets.

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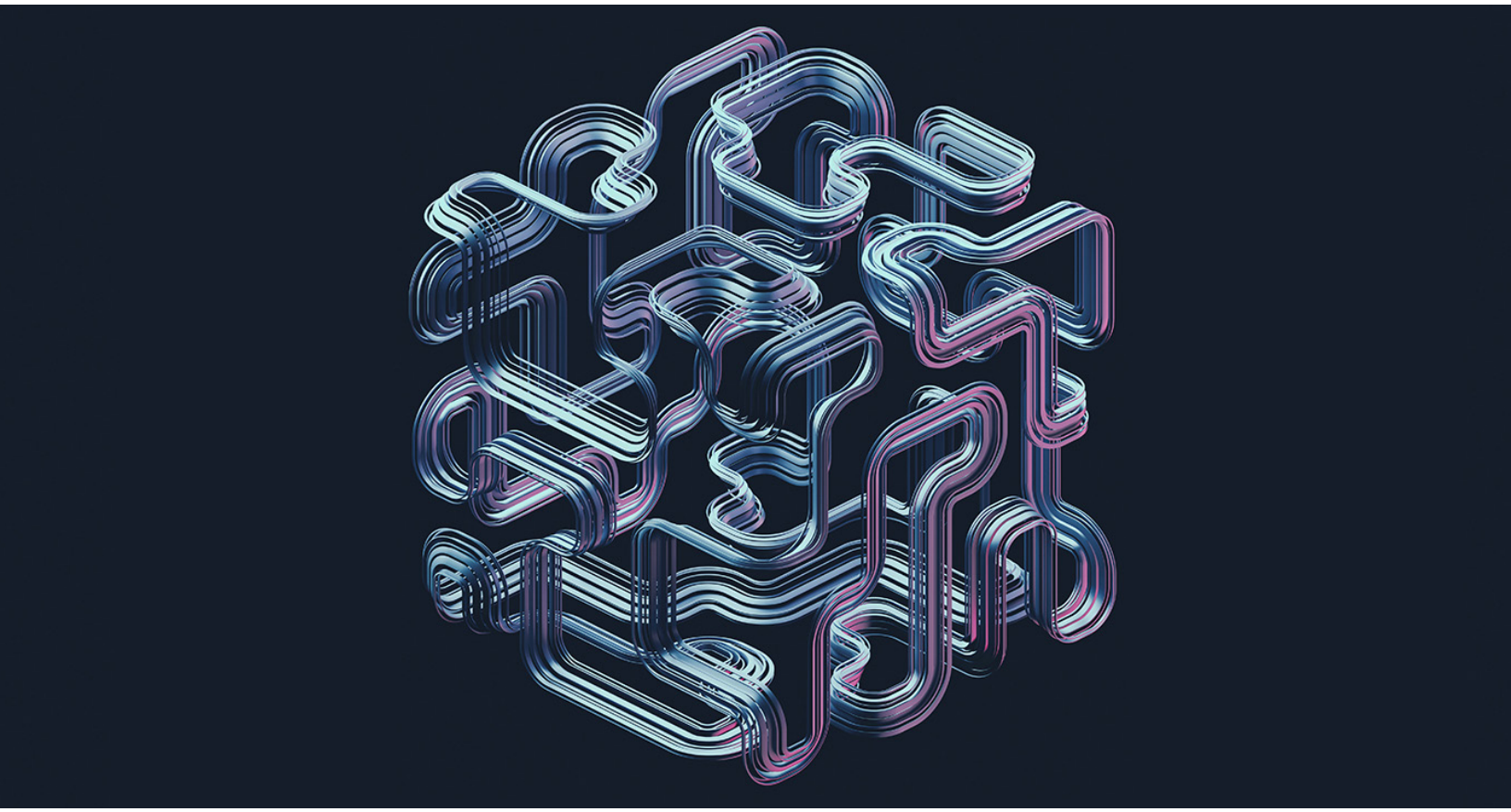
# Seven lessons on how technology transformations can deliver value

Our annual IT strategy survey shows how technology investments are proving their worth, especially at companies making more tech-based changes and bridging more of the technology–business divide.





March 2021

**In the past year,** the COVID-19 crisis has made clear the business imperative of making technology-driven changes, which are more ubiquitous now than ever.[1] Indeed, our latest McKinsey Global Survey on technology and the business suggests that even in the crisis's earlier days,[2] respondents were reporting progress on their integration of technology and business—and that these efforts were creating tangible business value across four measures, including new revenue streams and lower costs. The results also suggest that, on average, some transformation activities result in more impact than others (namely, those related to talent and capabilities). And according to the data, the companies with top-performing IT organizations[3] have differentiated themselves from others in their efforts to create value, adopt new technologies, and bring technology and business closer together.

More specifically, the results point to seven key lessons about technology transformations.[4]

## Lesson #1: Technology investments are creating significant business value

In the latest survey, companies' tech-transformation activities appear to be paying off. The survey asked about ten different types of transformation initiatives (for more information on the ten plays in our "tech forward" approach,[5] see sidebar, "A tech-forward transformation").[6] According to respondents, more than three-quarters of the initiatives their companies pursued have yielded some or significant cost reductions and improvements to employee experience. What's more, more than two-thirds of respondents say these change efforts increased revenue from existing streams, and more than half cite the creation of new revenue streams: for example, a new product line or new business (Exhibit 1).

The results also suggest that these investments aren't one-off attempts to catch up, with nearly all respondents reporting plans to pursue at least one transformation play in the next one to two years.

## Lesson #2: People-focused plays result in the most value

With regard to impact, the results suggest that not all types of transformations are created equal. Across the ten transformation initiatives, respondents say that changes to their companies' people and talent strategies are among the highest-value moves to make (Exhibit 2). At companies that have transformed their approaches to technology talent—that is, changed practices to attract, retain, and upskill talent with digital and engineering skills—respondents report the greatest impact on all four measures of business impact.

Meanwhile, those that pursued changes to their sourcing strategies report a significant impact on three of the four measures: realizing new revenue streams, reducing costs, and improving employee experience. And according to the results, scaling up data analytics is a critical enabler of new revenue and increases to existing revenue streams. By the same token, respondents whose companies saw no or negative value across these measures say they were least likely to pursue talent transformations or the scaling of their data and analytics capabilities.

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[1] "How COVID-19 has pushed companies over the technology tipping point—and transformed business forever," October 5, 2020, McKinsey.com.

[2] The online survey was in the field from April 14 to April 30, 2020, and garnered responses from 487 participants. Of these, 275 have a technology focus, and the remaining 212 are C-level executives representing other functions. The participants represent the full range of regions, industries, company sizes, and tenures. To adjust for differences in response rates, the data are weighted by the contribution of each respondent's nation to global GDP.

[3] We define "top-performing IT organizations" as those that, according to respondents, had an average effectiveness score in the top 25 percent of the survey sample, based on ratings of 15 key IT activities that were tested in the survey.

[4] We define "technology transformations" as large-scale change efforts—which are more comprehensive than short-term improvement programs—to modernize the technology function.

[5] See "How to become 'tech forward': A technology-transformation approach that works," on p. 5 of this compendium.

[6] The ten initiatives the survey asked about were changing IT's delivery model (for example, lean IT, agile at scale); digitizing of end-user experience (that is, digitization of end-to-end business processes or end-user/customer journeys across the organization); enhancing IT architecture (for example, using a flexible, services-based architecture, modernizing legacy applications); modernizing infrastructure (for example, cloud migration, infrastructure automation); redesigning the IT operating model (for example, establishing a stronger partnership between the business and IT functions, changing processes such as budgeting and IT demand management, organizing around product-focused teams); redesigning the technology organization to support new digital products or services; scaling data and analytics (for example, deploying artificial-intelligence models, building next-generation data platforms); transforming cybersecurity practices (for example, strengthening defenses against cyberthreats and data-privacy threats, proactively running cyberthreat drills); transforming talent strategy (for example, changing practices to attract, retain, or upskill talent with digital and engineering skills); and transforming vendor management (for example, revamping sourcing strategy, consolidating suppliers, entering new types of strategic partnerships).

## A tech-forward transformation

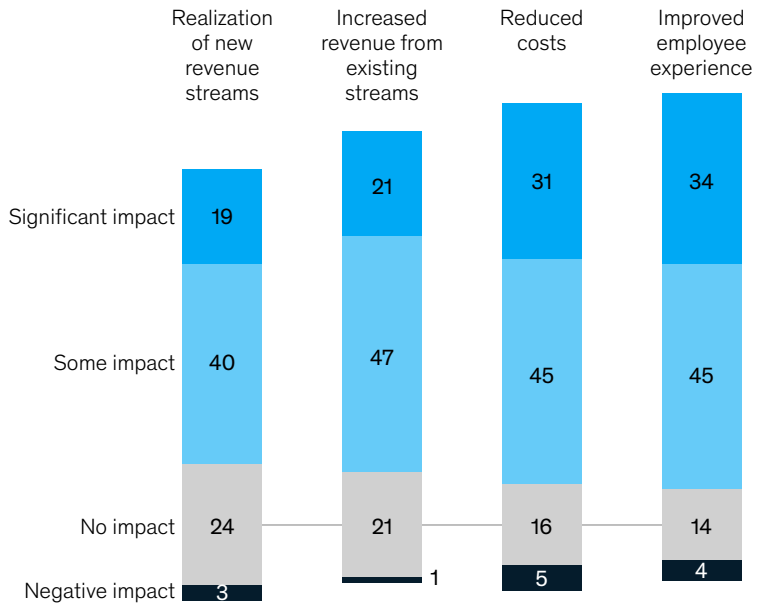
**Through detailed conversations** with nearly 700 chief information officers at some of the world's largest companies, as well as through our own experience helping businesses execute complex technology transformations, we've synthesized our findings into a "tech forward" model of guidelines and best practices. This model includes the following ten "plays," or domains of activity:

1. *Tech-forward business strategy* (new tech-enabled business models or customer-facing products)
2. *Integrated business and technology management* (no silos, and a product/platform orientation with strategic spend allocation)
3. *Steward of digital user experience* (design thinking, user centricity, and seamless integration with analog technologies)
4. *Agile@scale* software delivery
5. *Next-generation infrastructure services* (cloud; end-to-end automation/no operations, or NoOps; platform as a service)
6. *Engineering excellence* with top talent, both internal and external (do more with less)
7. *Flexible technology partnerships* (capability focused, outcome based)
8. *Flexible, business-backed architecture* rehaul delivered iteratively (open architecture, microservices, application programming interfaces
9. *Data ubiquity and advanced-analytics enablement*
10. *Defenses that preempt evolving threats* (cyber, data privacy)

Exhibit 1

### Most respondents report some or significant impact from their companies' technology transformations.

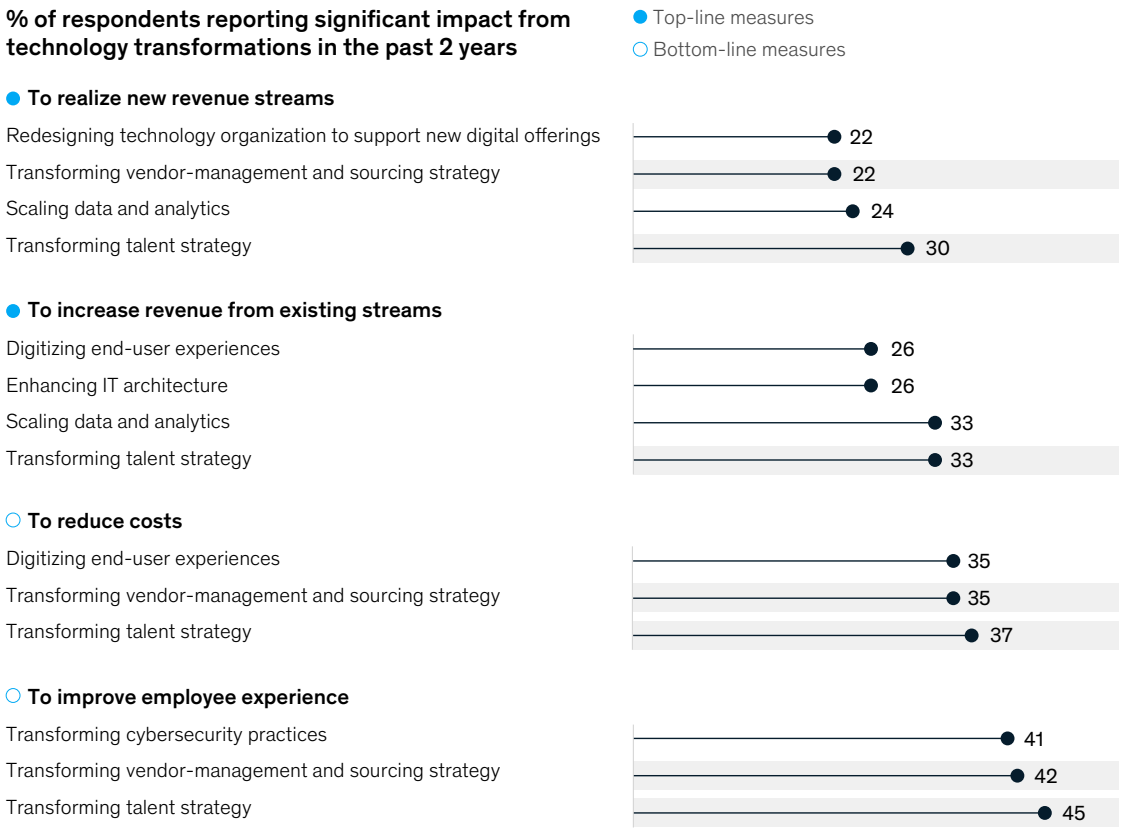
**Impact from technology transformations over the past 2 years,** % of respondents,[1] n = 487




[1]Figures do not sum to 100%, because respondents who answered "don't know" are not shown.

Exhibit 2

## Talent- and sourcing-related transformations tend to result in more value to both the top and bottom line.




Yet even though the people-focused initiatives link most closely with value creation, they are the least likely ones that companies plan to pursue in the future (Exhibit 3). Instead, the largest shares of respondents predict their companies will pursue digitization of the end-user experience, scaling of data and analytics, and enhancements of IT architecture. That is a notable shift from our past three annual surveys, when infrastructure transformations were the most-cited play that companies pursued. Now, respondents are half as likely to say their companies will modernize infrastructure in the next one to two years.

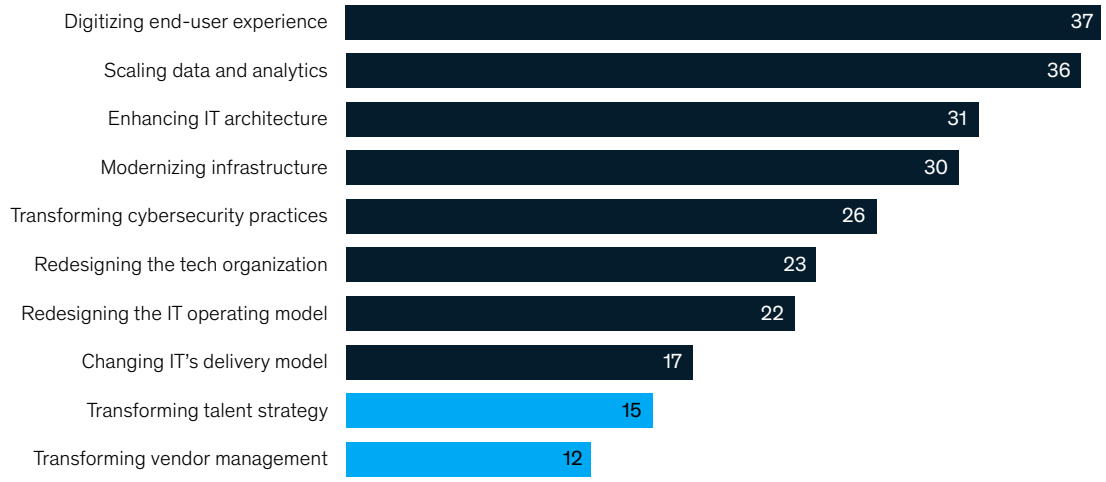
### Lesson #3: Talent remains the holy grail of technology transformations—valuable to pursue but difficult to execute

Not only do the transformations focused on talent strategy stand out in their value potential, but they are also much more commonplace at top-performing companies. Top-quartile respondents are more than three times likelier than their bottom-quartile peers (41 percent, compared with 12 percent) to say they've pursued a transformation of their talent strategy in recent years.

Exhibit 3

## Despite their high value potential, people-focused initiatives are the least likely to be pursued by companies.

**Types of transformations most likely to be pursued over next 2 years,**[1] % of respondents




[1]Respondents who answered "other" or "don't know/not applicable" are not shown. We define "technology transformations" as large-scale change efforts that are more comprehensive than short-term improvement programs.

Yet the need to address talent is universal and urgent. Respondents believe that more than 40 percent of their workforce will need to be either replaced or fundamentally retrained to make up for their organizations' skills gaps. But only 15 percent of respondents say their companies plan to pursue a talent-strategy transformation in the next two years, even though the talent challenge remains considerable (Exhibit 4). At companies that have pursued recent transformations, the top challenges to doing so continue to revolve around talent as well as culture: namely, skill gaps and cultural differences, the difficulty of changing cultures and ways of working, and difficulty finding talent to fill new roles—which is as challenging for top performers as it is for everyone else. Talent also appears to impede progress at the companies that *haven't* pursued technology transformations; 42 percent of respondents say they have stuck with the status quo because it's difficult to source the talent they need.

## Lesson #4: The talent challenge has clear implications for sourcing

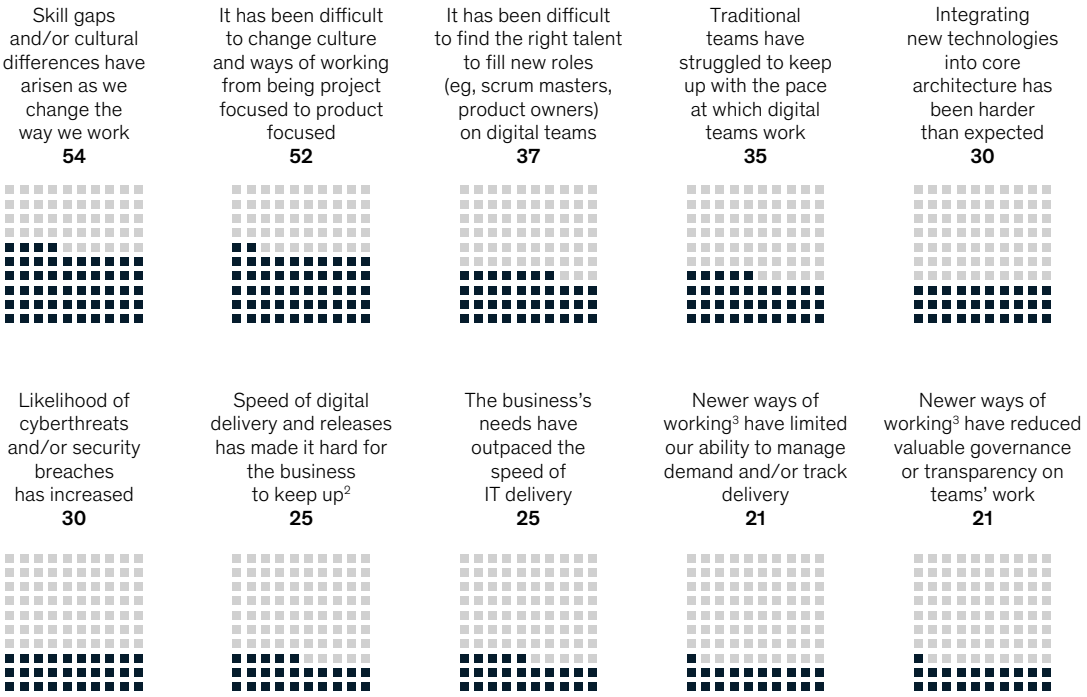
Perhaps because companies have found talent-related changes so difficult to pursue, responses suggest that they have been using new or different approaches to sourcing to fill some of the gaps. We asked technology executives and respondents about recent changes to their technology-sourcing strategies, and they tend to say that reliance on external providers to support both core IT activities *and* digital activities has increased. Among respondents reporting changes to their sourcing strategies, 47 percent say they are relying more on sourcing partners to supplement internal capabilities. Overall, most respondents say their companies have engaged partners in a range of sourcing models, from traditional time-and-materials to managed services and joint ventures.[7]

[7] Other changes to sourcing strategy that the survey asked about: moving work on digital or front-end applications from global providers to niche sourcing partners; changing commercial models (that is, from time-and-materials or contingent workers to managed service providers); and pursuing larger sourcing models (for example, joint ventures or build-operate-transfer models where partners develop assets that they hand over to an organization to operate).

Exhibit 4

## Talent-related and cultural issues pose the greatest challenges to technology transformations.

**Challenges to changing organizations' technology operating models,** % of respondents[1]




[1]Out of 12 challenges that were offered as answer choices. Question was asked only of respondents who said the target state of their organizations' technology operating models are digitally integrated or fully digital; n = 334.
[2]Eg, not enough time to train end users on the new changes, poor adoption of products by end users.
[3]Eg, agile, cross-functional teams.

## Lesson #5: No silver bullets—the top performers execute more transformation plays than others

We looked more closely at the results from a subset of respondents whose companies are in the top quartile of performance on core technology activities, or our "top performers." These companies not only have seen more value as a result of their technology transformations but also have focused on multiple initiatives—and more so than their peers. On average, they have run five out of ten transformation initiatives in recent years, versus three initiatives at the bottom-quartile companies.

This result is consistent with our experience that building capabilities in one area often requires the development of others at the same time because these capabilities reinforce one another. For example, companies that work on scaling their agile-development capabilities often invest in hiring new talent—and accelerating their cloud or automation strategies to enable continuous integration/continuous delivery (CI/CD) and DevOps—in parallel.

## Lesson #6: The broader use of advanced technologies supports greater value creation

The results suggest that overall, advanced technologies can generate outsize value in tech transformations. Forty-four percent of respondents reporting the use of the Internet of Things (IoT) or edge-computing technologies in recent transformations say they saw significant cost reductions—compared with an average of only 31 percent who saw significantly reduced costs overall. Yet these technologies are relatively uncommon. Only one-quarter of respondents say their companies use IoT in the first place. At the same time, 45 percent of respondents at companies using the cloud to process data at scale report a significant improvement in employee experience from their transformations, versus an average of 34 percent of all respondents.

What's more, the top-performing respondents report using a slightly larger suite of technologies. Out of the six we asked about,[8] nearly one-quarter of top performers say their companies used four to six advanced technologies, compared with 10 percent of all other respondents. Inversely, the top performers are half as likely as others to report using only one advanced technology.

## Lesson #7: Bridging the business-technology chasm is critical to outperformance

Beyond their focus on talent, deployment of new technologies, and a broad transformation agenda, the top performers also follow several practices that foster a stronger partnership between technology and the business (Exhibit 5). At top-performing IT organizations, 57 percent of respondents say their senior leaders are very involved in strategic planning, versus 17 percent in the bottom quartile.

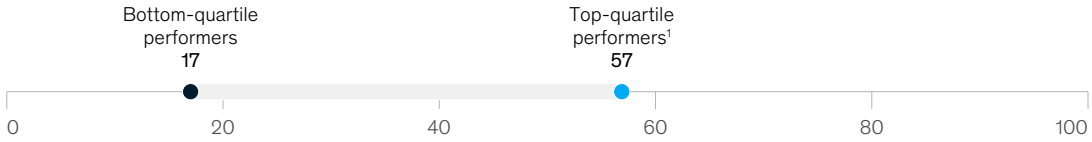
**At top-quartile organizations, 57 percent of respondents say their senior tech leaders are very involved in strategic planning—versus 17 percent in the bottom quartile.**

[8] The survey asked respondents about the following technologies, and which their organizations had deployed at scale in their technology transformations: automation; advanced analytics (that is, artificial-intelligence and machine-learning-based solutions); large-scale data processing through the cloud; design thinking (that is, user-centered product development); the Internet of Things or edge computing; and advanced mobility (for example, use of 5G mobile networks).

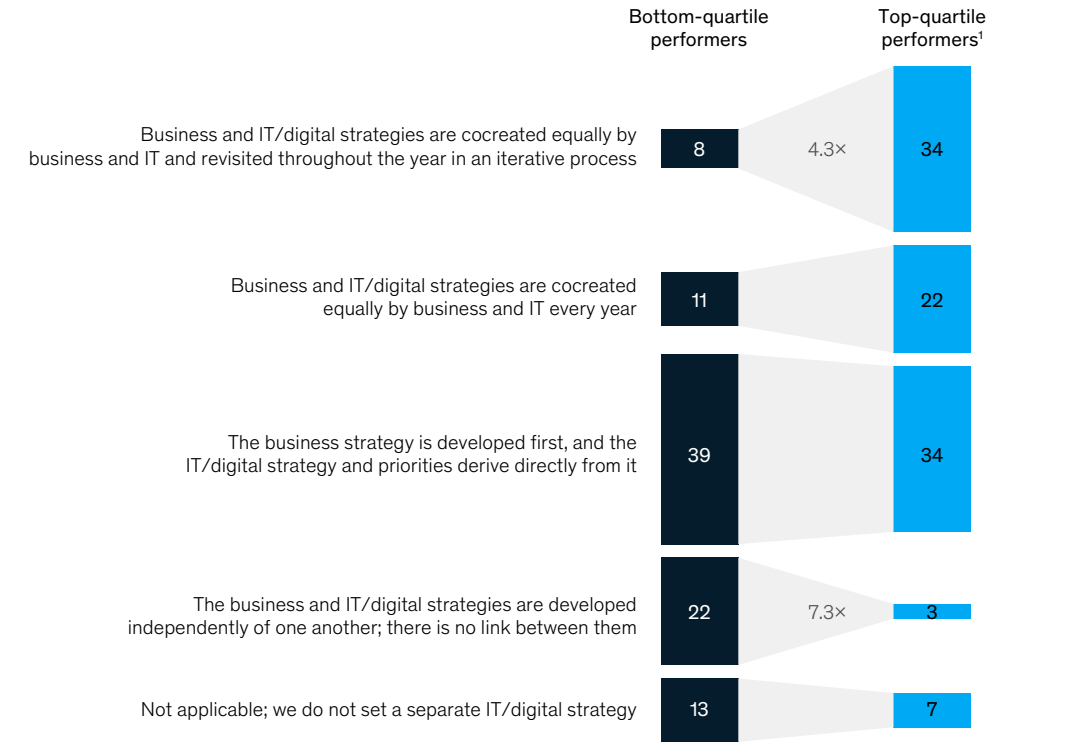
Exhibit 5

## Top performers bridge the business and technology gap at significantly higher rates than others.

**% of respondents who say their most senior technology leaders are very involved in shaping enterprise-wide business strategy and agenda**




**Companies' process for setting IT/digital strategy,** % of respondents[2]




[1]Respondents who reported an average effectiveness score in top 25% of the sample, based on ratings of 15 key IT activities that were tested in the survey.
[2]Respondents who answered "don't know" or "not applicable; we do not share the IT/digital strategy with the rest of the organization" are not shown. For top-quartile respondents, n = 125; for bottom-quartile respondents, n = 120.

At these organizations, IT and business teams also are much more likely to work together to both develop strategy and deliver technology. Top-quartile respondents are nearly three times as likely as their bottom-quartile peers to say that business and IT cocreate corporate and technology strategies. And they are more than four times likelier than their bottom-quartile peers to have a digitally integrated or fully digital operating model, in which digital and business-oriented teams—or cross-functional teams—all deliver technology across the organization (Exhibit 6).[9]

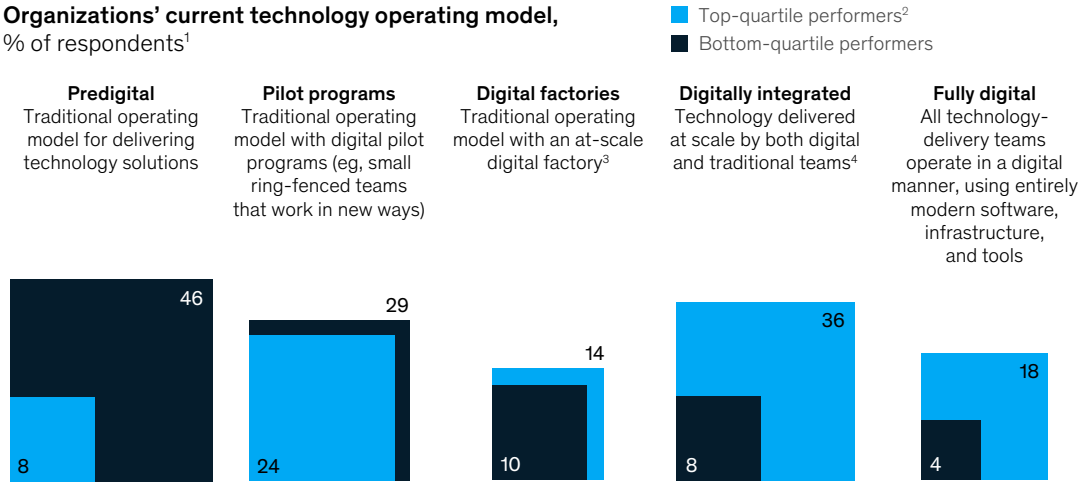
Finally, the top performers are much more focused than others on measurement, even for metrics that aren't technology-specific. According to respondents, top-quartile companies are more likely to track their technology organizations' performance as well as team performance across the company, using more business-oriented metrics such as user satisfaction, time to market, and financial impact.

[9] For more on technology operating models, see Naufal Khan, Gautam Lunawat, and Amit Rahul, "Toward an integrated technology operating model," October 2, 2017, McKinsey.com.

Exhibit 6

## Top performers are more likely than others to involve both digital and business-oriented teams in technology delivery.

**Organizations' current technology operating model,**
% of respondents[1]




[1]Respondents who answered "don't know" are not shown. For top-quartile respondents, n = 125; for bottom-quartile respondents, n = 120.
[2]Respondents who reported an average effectiveness score in top 25% of the sample, based on ratings of 15 key IT activities that were tested in the survey.
[3]A group of delivery teams that is dedicated to building digital products and is largely separate from the traditional technology organization.
[4]Teams are not siloed or incubated and are governed by a single operating model.

The contributors to the development and analysis of this survey include the following members from McKinsey's Chicago office: **Anusha Dhasarathy,** a partner; **Ross Frazier,** an associate partner; **Naufal Khan,** a senior partner; and **Kristen Steagall,** a consultant.

# 2. Reimagining the role of technology

# The CIO challenge: Modern business needs a new kind of tech leader

As technology becomes increasingly important, an organization's success depends on whether the CIO can move from being a functional to a strategic business leader.

*by Anusha Dhasarathy, Isha Gill, and Naufal Khan*

**"There's no worse time than now** to be an average CIO." These words, uttered by an executive at a recent conference, neatly capture the intense pressure on CIOs. For years, executives have stressed the need for CIOs to move beyond simply managing IT to leveraging technology to create value for the business. This priority is now a requirement. New technologies have been at the center of trends—from mobile-first consumer shopping preferences to the promise of artificial intelligence in critical decision making—that have reshaped the competitive landscape and disrupted business models. For this reason, companies need to be tech forward: technology needs to drive the business.

Despite this pressing need, of the organizations that have pursued digitization, 79 percent of them are still in the early stages of their technology transformation, according to McKinsey's 2018 IT strategy survey.[1] Legitimate factors are delaying progress, from the scale of the change to the mind-boggling complexity of legacy systems. We believe, however, that one of the biggest issues is that many CIOs have not accepted the degree to which their role needs to expand beyond cost and performance responsibilities in order to transform IT into a core driver of business value.

## Three vectors of a holistic transformation

Before understanding the responsibilities of the new CIO, it's important to understand the nature of tech transformations themselves. In most cases we've observed, tech transformations are implemented as a set of disjointed initiatives across IT. That leads promising developments to stall out or underdeliver. We have found that a tech transformation must be holistic to deliver full business value. Creating powerful customer experiences, for example, requires a data architecture to track and make sense of customer behavior. Architecting modular platforms needs revamped approaches to hiring in order to get top-flight engineers.

This reality requires a CIO to first come to terms with the scope of the transformation itself. In our experience, it's been helpful to think about it along three vectors:

1. *Reimagine the role of technology in the organization.* This vector includes establishing the role of technology as a business and innovation partner to design a tech-forward business strategy (for example, tech-enabled products and business models), integrate tech management across organizational silos, and deliver excellent user experiences.

2. *Reinvent technology delivery.* IT needs to change how it functions by embracing agile; improving IT services with next-generation capabilities such as end-to-end automation, platform as a service, and cloud; building small teams around top engineers; and developing flexible tech partnerships.

3. *Future-proof the foundation.* To keep pace with rapid technological advancements, organizations need to implement a flexible architecture supported by modular platforms, enable data ubiquity, and protect systems through advanced cybersecurity.

## Five traits of a transformative CIO

For IT to become a driver of value, the transformative CIO also needs a new set of skills and capabilities that embody a more expansive role. In working on tech transformations with hundreds of CIOs, we have identified five CIO traits that we believe are markers for success.

### 1. Business leader

To help technology generate business value, the transformative CIO has to understand business strategy. Findings from our 2018 IT strategy survey reveal that companies with top IT organizations are much more likely than others to have the CIO very involved with shaping

[1] "Can IT rise to the digital challenge?" October 2018, McKinsey.com.

Sidebar

## Questions for the CIO

- Can I clearly articulate the business's goals?
- Are the most important technology initiatives delivering quantifiable business value to the company?
- What percentage of technology resources is focused on work that drives business goals versus maintenance?

the business strategy and agenda, and strong performance on core IT tasks enables faster progress against a company's digital goals.[2] CIOs who can make this leap tend to take the following actions.

*Learn the business inside and out*

The scope of an IT transformation means that CIOs must be prepared to interact with the business in different ways. We have found, for example, that the best CIOs go far beyond meeting with the C-suite or attending strategy meetings. They invest time with functional and business-unit leaders and managers to gain an in-depth understanding of business realities on the ground and go out of their way to develop a nuanced and detailed understanding of customer issues. CIOs do this by continually reviewing customer-satisfaction reports, regularly monitoring customer-care calls, and participating in user forums to hear direct feedback.

As one large financial institution set out to build its digital products, the business and technology teams jointly led user listening and feedback panels early and often throughout the development process. Both technology and business leaders made it a priority to attend these panel discussions so that they could effectively guide their teams on developing products that would best address the needs of end customers. The CIO of a B2B technology-services company, meanwhile, meets customers on a regular basis to get firsthand feedback on both products and the customer's experience of doing business with the company. He uses these perspectives to inform his technology decisions.

*Take responsibility for initiatives that generate revenue*

CIOs can further develop business acumen by taking responsibility for initiatives that generate business impact, such as building an e-commerce business, or by working with a business-unit leader to launch a digital product and then measure success by business-impact key performance indicators (KPIs), not technology KPIs. Such efforts allow CIOs to build a deep understanding of the business implications of technology, such as customer abandonment because of slow download times on a site or other poor user experiences.

As part of a digital transformation, for instance, the CIO at a large financial institution committed to developing digital products to help the business scale its presence in a new market. While the CIO already understood how to build systems to support financial products, he and his team had limited experience in creating new digital products to sell directly to consumers. So the team created a program built on rapid test-and-learn cycles to identify what mattered to customers and meet those needs. Subordinating tech decisions to customer needs was crucial in allowing the CIO and his team to develop a digital

[2] "Can IT rise to the digital challenge?" October 2018, McKinsey.com.

offering that succeeded where it mattered: with consumers.

*Get on boards*

Developing a deeper well of business knowledge often requires CIOs to extend their networks beyond the organization. One of the best ways to do that is by joining the board of another company. A third of the boards of companies within the Fortune 500 today include a former CIO or CTO, and that number continues to increase.[3]

**2. Change agent**

A full technology transformation is not about moving to the cloud or embracing new IT solutions. It also involves infusing technology into every strategy discussion and process throughout the organization. Driving a transformation around the three vectors we laid out earlier (reimagining the role of technology, reinventing technology delivery, and future-proofing the foundation) starts with a CIO mind-set that both acknowledges the need for transformative change and commits to a multiyear journey.

*Partner with business leaders*

Generating support for a transformation among business leaders across the organization requires creating true partnering relationships with them based on common goals, mutual responsibility, and accountability. According to a McKinsey survey on business technology, in fact, the companies in which IT plays a partner role in digital initiatives are further along in both implementation and achieving business impact.[4]

To kick-start the transformation journey, the CIO of a transportation-and-logistics company made it her first priority to meet with every single business leader to understand their goals and issues and to set expectations on how they could best work together, by clarifying, for example, what the business side could expect to get from IT in a consultant role versus IT as a service provider or partner. This effort to understand what mattered to each leader established trust, and from each of these discussions it became clear that the business wanted a true partnership with technology and understood what it meant. The CIO further built on the relationship with the business by prioritizing initiatives in the tech transformation that addressed business needs and working closely with business leaders to drive progress. This active collaboration ensured that the products and services IT developed were adopted.

[3] "The digital CIO has arrived," MIT Sloan CIO Symposium, 2016.
[4] "Partnering to shape the future—IT's new imperative," May 2016, McKinsey.com.

Sidebar

## Questions for the CIO

- Do leaders in the C-suite have a clear understanding of why a tech transformation is important?
- Do you have partner-level relationships with people in the C-suite in developing the vision and plan for both business and IT?
- Is your tech transformation actively incorporating each of the three vectors of change?
- Do you have a "war room" to manage the transformation that can solve problems as well as track progress?

Sidebar

## The CEO's role in making the CIO successful

The stage is set for CIOs both to lead a successful technology transformation and to influence business strategy. They can't do it alone, however. The CEO must create an environment where the CIO can thrive. Here are a few things CEOs can do:

- establish a strategic role for the technology function
- elevate the CIO to report directly to the CEO
- rebalance technology investments and track their business value
- prioritize the development of a world-class tech workforce

For more on this topic, read "The CEO's new technology agenda," on McKinsey.com.

*Articulate the 'why'*

Gaining support for a transformation requires that stakeholders understand that true change will come only from tackling all three transformation vectors in a strategic, interlinked manner. That means not just explaining how this three-pronged approach is better for IT but also clarifying how it drives business goals and how it can be implemented. When considering a shift to cloud, for example, executives tend to understand it first as a cost-saving opportunity. But in helping executives understand the full range of cloud benefits—improved speed to market, better developer productivity, and improved resiliency and disaster recovery—CIOs can help them see how the cloud can unlock new revenue models and services tied to business priorities.

*Have an integrated plan that highlights risks and dependencies beyond IT*

Large IT initiatives have always required detailed planning, but business-oriented CIOs ensure that transformation plans account for dependencies outside of IT, such as marketing campaigns or legal implications. They approach planning as a dynamic process rather than something static, which allows transformation teams to better remove roadblocks and to allocate people and spend when and where they are needed. To actively manage this process, such CIOs also put in place a "war room," a dedicated team that ensures transformation initiatives are delivering value by actively tracking progress and helping to break through root-cause issues.

This was the approach taken in a large global retailer's digital and technology transformation. The CIO set up a transformation war-room team that worked jointly from the beginning with leaders outside the IT function, including marketing, operations, sales, and e-commerce. Together, they created detailed work plans. This detailed early planning revealed which systems needed to be upgraded and when. The war-room team actively tracked progress and quickly escalated issues for speedy resolution. The results were clear: a fivefold jump in digital sales, and project delivery four times faster than projects of similar scope had previously taken.

Sidebar

## Questions for the CIO

- Are the top people in IT really stars in their field?
- Do you rely exclusively on HR to find your talent?
- Do you have a clear view of the talent you need in the next three years—and a plan to develop it?
- What percentage of the best people you hire are still with you two years later?

**3. Talent scout**

Nearly half of respondents to McKinsey's 2018 IT strategy survey cite skill gaps on traditional teams as the top obstacle to a successful digital transformation.[5] So CIOs need to focus not just on recruiting top people but also on retaining them. Two solutions have proven effective.

*Reimagine how to attract tech stars*

Companies can reap tremendous benefits from outsourcing. In the oil and gas industry, for example, the outsourcing of application development grew 50 percent between 2014 and 2018.[6] But that needs to change, especially around the most crucial capabilities. CIOs who want to reinvent tech's role need tech stars, particularly the best engineers. By hiring the best tech people, we've seen companies reduce their technology costs by as much as 30 percent while maintaining or improving their productivity.[7] CIOs need to move quickly. In just 18 months, one CIO at a transportation-and-logistics company radically reshaped its talent profile. All the direct reports and approximately 50 percent of tech employees were new, and 80 percent had transitioned to different roles.

The head of technology and analytics at a large retail organization set up a talent war room to hire data scientists and engineers. As part of this effort, the war-room team revamped recruitment and onboarding processes by using different talent sources, such as HackerRank and General Assembly, and by updating candidate screenings and interviews with appropriate assessments of technical and other skills, such as coding and collaboration. In addition, they led weekly check-ins to track the talent funnel and adjust the process as needed.

*Build up internal talent*

Getting good people doesn't matter if you can't keep them. Top CIOs, therefore, develop diverse career paths so that top talent can advance in their own areas of strength—for example, by letting a top-notch software engineer advance while continuing to code design software rather than forcing her to manage others in order to succeed.

Retraining the existing tech workforce also needs to be an important element of this platform. The CIO of a large consumer company made

[5] "Can IT rise to the digital challenge?" October 2018, McKinsey.com.
[6] Dhingra, Sverre Fjeldstad, Natalya Katsap, and Richard Ward, "A new mandate for the oil and gas chief information officer," November 2019, McKinsey.com.
[7] Klemens Hjartar, Peter Jacobs, Eric Lamarre, and Lars Vinter, "It's time to reset the IT talent model," March 5, 2020, *Sloan Management Review,* sloanreview.mit.edu.

Sidebar

## Questions for the CIO

- Do you meet or speak with IT employees who are on the front lines at least once a week?
- Do you have a way to accurately measure and track people's attitudes across the IT department?
- Are your top engineers happy with their work?
- How often do you publicly celebrate success and support noble failures?

digital and analytics upskilling one of the company's key strategic priorities, launching an enterprise-wide program, in tandem with HR's learning team. The program invested in an online learning portal to create personalized online learning experiences based on an employee's goals and learning needs. These were supplemented by other programs, including in-person training, top management immersion sessions, and the cultivation of an in-house expert network that people could tap on specific topics.

**4. Culture revolutionary**
An effective talent strategy requires a culture that supports talent.

*Build a true engineering community*
Pay matters, of course, but top people want to go where they're valued. One way to create that kind of environment is to provide engineers with more autonomy by reducing the number of managers and often-bureaucratic processes, such as time-consuming reports and multiple rounds of approval.

Creating ways for cohorts of similar skill sets to get together can be a powerful way to share best practices and foster a sense of community. The CIO of a software company established various community-building and knowledge-sharing efforts—hackathons, "dev days," tech spotlights, brown-bag lunches—where product managers, developers, data engineers, and architects could meet on a weekly basis to share details about their projects and bring up ideas or issues for discussion. The CIO attended and actively participated.

*Model and support true collaboration*
Promoting collaboration across technology teams and between the business and technology is one of the most crucial prerequisites for a successful transformation. Top-quartile IT organizations are more likely to have an integrated or fully digital operating model, according to McKinsey's 2018 IT strategy survey.[8]

In practice, CIOs can enable collaboration if they're willing to relinquish some control. One CIO at a financial-services firm realized that for his people to increase their impact, they had to be more closely tied to business teams. So he embedded them into cross-functional teams aligned around specific products, relying on informal networks of guilds and chapters to provide guidance and light oversight. The most effective

[8] "Can IT rise to the digital challenge?" October 2018, McKinsey.com.

Sidebar

## Questions for the CIO

- Do the questions about technology that leaders in the C-suite ask reflect a true understanding of the impact of tech decisions?
- When you explain the ramifications of tech decisions, do leaders really understand you?
- How often do company leaders reach out to you for substantive guidance about how tech can improve their business?

CIOs ensure this level of collaboration is the norm within IT itself as well. This is particularly important around cybersecurity. IT can radically reduce cycle times and maintain effective security by incorporating security early into development and working closely with the cybersecurity team on an ongoing basis.

**5. Tech translator**

In the past, IT transformations have often proven expensive, time consuming, and short on value, and this has made some companies leery of undertaking them again. To address this issue and build trust, the best CIOs play an active role in educating leaders about technologies and their applications for the business.

*Make the business implications of tech decisions clear*

Many tech decisions don't get sufficient business scrutiny beyond cost and high-level strategy discussions. Transformative CIOs don't settle for that kind of interaction, articulating instead how a proposed solution solves the underlying business problem, what alternative approaches exist, and the pros and cons of each. The CEO of a B2B technology-services company found this level of insight so important that he asked the CIO to present periodically to the board on technology-led business models.

This role was particularly important when a retail giant was looking to acquire an analytics company. The CIO and his leadership team were involved from the very beginning in determining the data and analytics capabilities needed to fulfill the company's business strategy. They performed deep-dive technical assessments, system and data-platform compatibility reviews, and tests of vendor capabilities. The CIO ran a pilot with a business unit and operations team for three months to determine whether the final vendor could deliver on its capabilities. At the end of the process, the business was able to make an informed decision.

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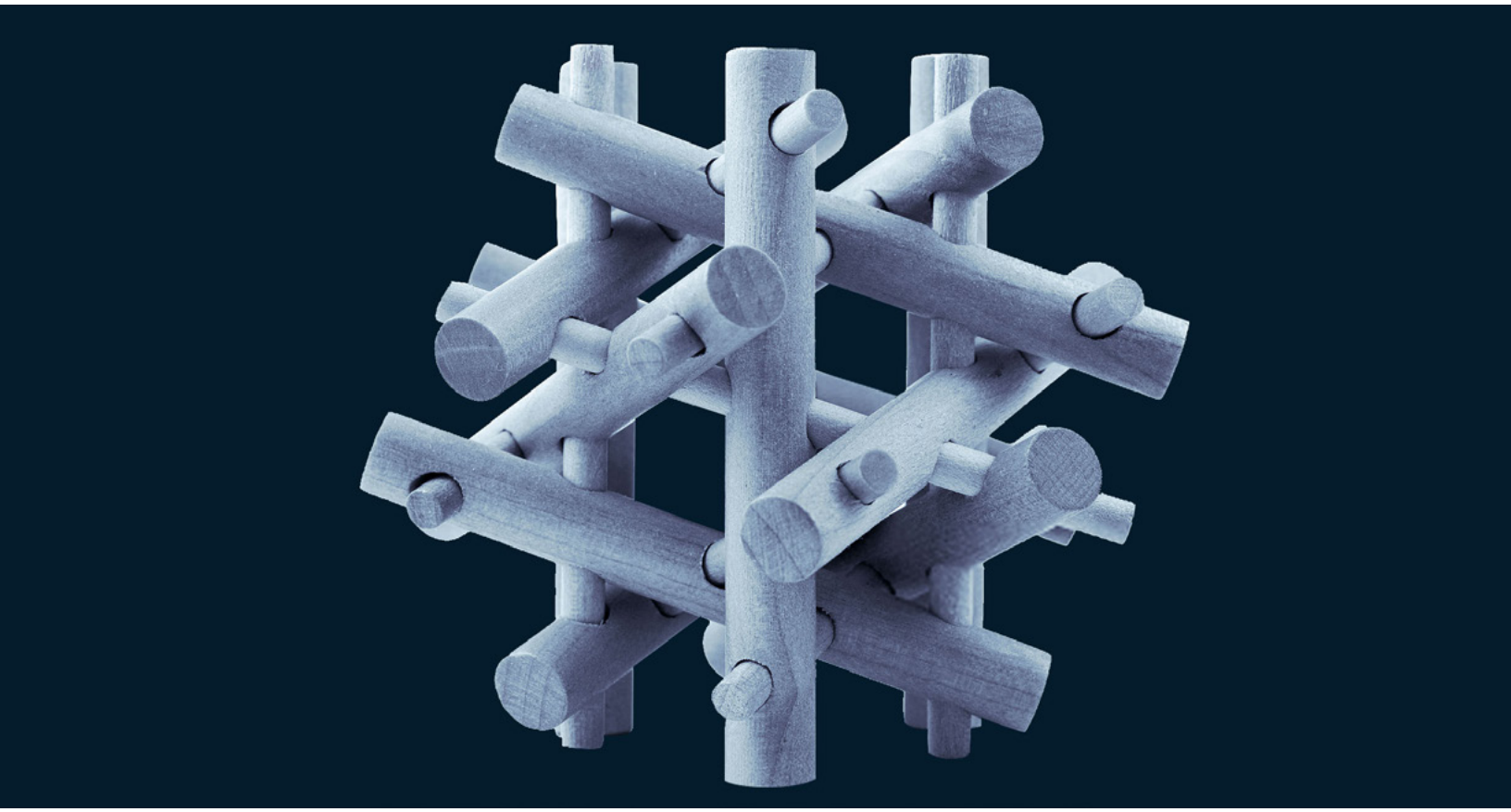
These skills are the tools that enable a CIO's ability to transform IT. And in an increasingly tech-driven business landscape, they position CIOs as legitimate contenders to lead businesses as well.

**Anusha Dhasarathy** is a partner in McKinsey's Chicago office, where **Isha Gill** is an associate partner and **Naufal Khan** is a senior partner.

# Products and platforms: Is your technology operating model ready?

Forming an integrated technology model creates value but can be hard to do. The right approach centers teams on tech products and platforms, focuses them on business goals, and helps them prioritize technology work.

*by Ross Frazier, Naufal Khan, Gautam Lunawat, and Amit Rahul*



**More and more companies** are choosing to remove the divide between their digital programs and their traditional IT delivery by bringing them into a single technology operating model. Two years ago, just 18 percent of respondents to McKinsey's global survey of technology leaders said their companies had either converted their digital and IT teams to a single operating model or developed a fully digital model.[1] In our most recent survey, that percentage nearly doubled: one-third of respondents say their technology organizations are integrated or fully digital. Sixty-seven percent say their companies aspire to make the shift to an integrated or fully digital technology organization.[2]

Combining digital operations (in which cross-functional teams apply new technologies and ways of working, such as agile, to improve user experiences) and traditional IT delivery (in which technical specialists develop and maintain core business systems according to traditional methods) has evident benefits. According to survey respondents, companies with an integrated or fully digital technology model are 30 percent less likely than other companies to face digital-transformation challenges and less than half as likely to face issues in integrating new digital efforts with their core architecture. Notably, respondents at companies with integrated digital and IT operations are 60 percent more likely than respondents at other companies to say their companies' investments in technology create business value.[3]

Combining digital programs and IT operations is also more practical than other changes that business leaders might consider as part of a digital transformation. Executives sometimes assume that once their digital activities are running well, the next step in their digital evolution should be a far-reaching, potentially disruptive effort to reorganize the entire company and operate it in the manner of a digital native. This needn't be the case. To achieve the technical agility of a digital native, it is often enough to form integrated, cross-functional technology teams, which define forward-thinking technology organizations.[4]

Moving to an integrated technology operating model does require significant change. Companies can ease the transition by taking three actions: organizing technology teams around user-facing products and the underlying platforms that enable them, creating a governance structure to keep the technology organization focused on the business's strategic priorities, and establishing a rigorous system for prioritizing and delivering technology work. In this article, we offer a closer look at what these actions involve and how to get them right.

## Reorganizing technology teams

To begin integrating digital and IT operations, technology and business leaders should map their companies' technology activities and assets with respect to two categories: products and platforms (Exhibit 1). Products are the technology-enabled offerings used by customers and employees. Their immediate and primary purpose is to enable users to perform activities that create value, in line with a business's objectives. For example, a retailer's search product contributes business value by making it easy for customers to find items on a website or mobile app. Its effectiveness might be measured with conversion-to-sale metrics and enhanced by improvements to search algorithms. An industrial-equipment maker might equip its salespeople with a configuration product

[1] In a digitally converted technology organization, digital and traditional IT teams are not siloed or incubated and are governed by a single operating model. In a fully digital technology organization, all technology teams operate in a digital manner, using modern software, infrastructure, and tools. For more, see "Can IT rise to the digital challenge?," October 2018, McKinsey.com.
[2] "Managing the fallout from technology transformations," February 2020, McKinsey.com.
[3] Ibid.
[4] Klemens Hjartar, Krish Krishnakanthan, Pablo Prieto-Munoz, Gayatri Shenai, and Steve Van Kuiken, "The CEO's new technology agenda," November 2019, McKinsey.com.

Exhibit 1

## An integrated technology model centers on products and platforms, which differ in important ways.

| | Products | Platforms |
|---|---|---|
| Purpose | Create business value by enhancing end users' experiences | Provide capabilities to products and the enterprise |
| Primary users | Customers and employees | Digital-product developers, along with functional employees who use platforms directly |
| Responsible personnel | Business-minded teams of tech specialists, designers, product managers, and functional employees | Technology-minded teams of digital and IT specialists |
| Pace of innovation | Rapid: upgrades happen as quickly as possible to keep up with users' needs | Variable: changes to support products and modernize underlying systems are made as priorities dictate |
| Examples | B2C: website/online search<br>B2B: order configuration | B2C: inventory management<br>B2B: pricing |

that lets them assemble and price orders during customer meetings.

Platforms are the back-end technology capabilities, whether provided by individual systems or by assemblies of multiple systems, that power products, as well as the enterprise more broadly. The retail search product previously described, for example, might rely on an inventory platform that includes databases and integrations with suppliers. Typical platforms found at large companies include those for enterprise resource planning, customer relationship management, inventory management, and field operations.

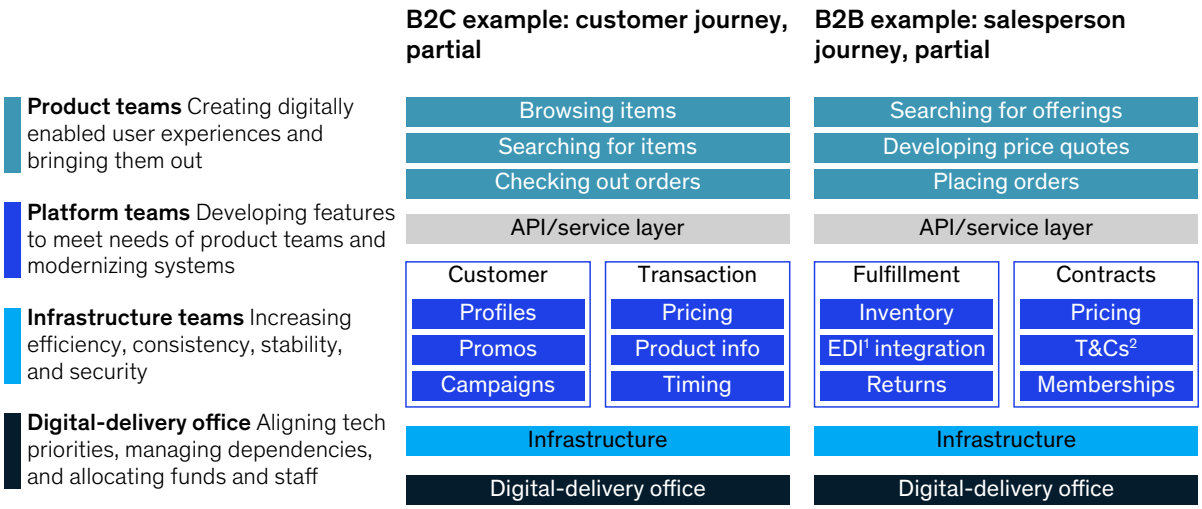
Many companies launch their digital efforts with a focus on creating and improving products through a stand-alone organization that is separate or siloed from company IT. These separately funded digital units deliver user-experience innovations quickly by employing a mix of design and engineering talent, using cloud technologies, following agile delivery practices, and, often, fostering a different working culture and norms—an approach unlike that of a traditional IT function.

However, it is important that these digital units and IT departments are closely integrated, with thoughtful coordination and planning between the organizations to prevent any bottlenecks. For instance, as digital efforts expand to cover more customer and employee experiences and incorporate new technologies, integration between digital and traditional technology solutions requires more extensive collaboration. Differences in culture and ways of working can make it harder for digital and IT groups to integrate new digital offerings with core systems. Teams from other business functions can also get confused about which technology groups to work with—and how.

An integrated operating model helps resolve these differences by bringing IT and digital organizations into a single model for planning, delivering, and managing technology, reinforced by a shared culture and talent-management approach. In this model, digital and IT specialists work together on unified teams, each centered on an individual product or platform (Exhibit 2).

Exhibit 2

## Integrated technology organizations comprise teams that support products, platforms, and infrastructure, plus a digital-delivery office.




[1]Electronic data interchange.
[2]Terms and conditions.

*Product teams* focus on serving the needs of end users in ways that generate revenue, lift productivity, or otherwise directly create value for a company. They operate like minibusinesses, responsible for go-to-market planning, user experience, and adoption in addition to technology delivery. To carry out this approach, product teams include not only engineers but also designers, analysts, and experts from other business functions, such as operations, marketing, and compliance. Typically, they use agile methods to develop products, iterating rapidly to make improvements. Most product teams will have a leader who is more business oriented than technology oriented.

*Platform teams* focus on making an organization's core systems accessible, reusable, and modern so that they better enable products. This collaborative approach sometimes calls for platform experts to join product teams temporarily. For example, if the team working on the search product described earlier decides that users should be able to filter their searches on available inventory, then the inventory-platform team might build an API that allows product teams to query inventory data for in-stock items. A platform team will normally adjust its ways of working to match the state of the underlying systems and the needs of product teams and external partners. On most platform teams, the leader will have a technology background, and staff will mainly consist of technology specialists.

An integrated technology organization has two additional components. One is a centralized *infrastructure-services team*, responsible for provisioning and managing the underlying technology infrastructure in ways that make it efficient, easy to use, reliable, and consistent. By automating activities and promoting standard development, operations, and engineering practices across product and platform teams, the infrastructure-services team continuously streamlines its own work and that of the wider technology organization.

The other is a *digital-delivery office*, which performs coordinating functions that we describe later in the article.

Of course, the differences between digital programs and IT operations don't necessarily resolve themselves when specialists from each group combine to form product and platform teams. Indeed, our research suggests that when companies integrate digital and IT specialists, they often find that cultural differences and talent gaps get in the way of effective teamwork.[5] In our experience, establishing new operating norms for the integrated IT organization can help align digital and IT employees who have diverging ideas about how their teams should work. For example, technology leaders should lay out a common set of engineering practices as well as standardized ways of working based on agile principles and design thinking.

To address talent gaps, companies often find it necessary to reskill existing employees or hire additional talent. Product teams, for example, handle all aspects of product development, from design to user adoption, so their leaders must be able to understand users, translate their needs into technical requirements, manage product road maps, guide engineering teams, and oversee releases. Few organizations employ enough technology specialists with experience across these disciplines, so they must either train the people they have or bring in new people who have experience as product managers or product owners.[6]

At one omnichannel retailer, the executive team planned the shift to an integrated technology operating model by first identifying potential product teams based on the organization's digital priorities. The team determined that select personnel from across the company should join these product teams to make them cross-functional. It also set out performance indicators to hold the teams accountable.

Next, executives grouped most of the company's technology capabilities into platforms. They asked each platform team to prepare a road map for making improvements that would support products while also modernizing the platform's technology. (Not all platform teams immediately began working in this new way. At first, the retailer focused on those platform teams that provided the most essential functions to high-priority products.) Finally, executives reorganized the leadership of the technology organization to reflect its new structure, in a move we will explore further in the next section. As a result of these changes, the company increased its capacity for delivering the technologies that its strategic priorities called for, and it gained the ability to reallocate people quickly to urgent tasks.

## Creating a governance model

Each team in an integrated technology organization ordinarily has its own leader. Companies might also appoint a head of products, a head of platforms, and a head of infrastructure services. In addition, integrated technology organizations need a central team, or digital-delivery office, to balance the priorities and resource requirements of product and platform teams and to coordinate any overlapping or related activities, particularly when it comes to prioritizing changes to platforms.[7] Here are some actions that digital-delivery offices can take to govern integrated technology organizations well:

— *Define value-focused performance metrics.* Defining a few performance metrics for each team, in partnership with business leaders, will help a digital-delivery office tell whether teams are on track. Such metrics should measure both value creation ("Is the team contributing to the business?") and the delivery of work ("Is the team meeting its commitments?"). For example, the team managing the search product previously described might be assigned a target for increasing the proportion of online

[5] "Managing the fallout from technology transformations," February 2020, McKinsey.com.
[6] Chandra Gnanasambandam, Martin Harrysson, Shivam Srivastava, and Yun Wu, "Product managers for the digital world," May 2017, McKinsey.com.
[7] Oliver Bossert and Driek Desmet, "The platform play: How to operate like a tech company," February 2019, McKinsey.com.

searches that convert to sales, in support of a broader strategic goal to lift e-commerce sales.

— *Create processes for tracking and reporting.* Digital-delivery offices should have consistent workflows for collecting performance updates from product and platform teams (with particular interest in whether business-value and other targets are being met and whether any interdependencies are causing delays) and synthesizing those into reports that can inform a leadership team's strategic decisions.

— *Establish a mechanism for quickly removing bottlenecks and resolving conflicts.* Since unexpected difficulties (for example, a dispute between product teams that want to bring in the same platform personnel) can slow down work on technology projects, some organizations empower their digital-delivery offices to come up with quick solutions that minimize delays. Others choose to have their digital-delivery offices surface conflicts to leadership, which resolves them.

— *Gradually adopt an agile funding model.* It is common for technology organizations to allocate funds for products and platforms on an annual—or even less frequent—basis. By contrast, an agile funding model ties new releases of funding to the achievement of development or performance objectives. This approach keeps teams focused on delivering value and prevents companies from backing struggling initiatives merely because funds were already allocated to them.[8] With respect to the search product mentioned before, the team might receive initial funding to create and test a new function but only receive full funding to develop and launch the function if user tests show that the new function increases the likelihood of sales conversions.

One global consumer company set up a digital-delivery office to facilitate the development of new digital products for customers after noticing that too many products had fallen behind schedule. At the outset, the company's executive team set goals that defined what the success of these products would look like, including specific changes to customer experience, geographic coverage, and value-creation metrics. The digital-delivery office tracked the technology organization's progress against these goals and held monthly reviews with executive leaders. It also tracked leading indicators and surfaced early signs of problems in areas such as software quality and reliability. To resolve those problems, the office established a weekly leadership forum and series of meetings to escalate issues spotted by engineering teams. As a result of these efforts, the company accelerated the development of several products that had been delayed and launched them sooner than it had planned.

## Establishing a system to prioritize and deliver technology work

Even though technology teams and roles might be well defined, coordinating their many activities can be difficult. Leaders should therefore create a system for maintaining order in how product and platform teams respond to the business's demand for technology services.

One feature of this system should be processes by which a technology organization aligns product and platform road maps with the business's priorities. The head of each business function should have a single contact within the tech organization, likely a product manager or user-journey lead, who is responsible for understanding the function's priorities and translating them into a set of desired technology features, recorded on product backlogs. Product managers then work with their platform-team counterparts on updating the platforms' development road maps to incorporate the features that products

[8]Santiago Comella-Dorda, Khushpreet Kaur, and Ahmad Zaidi, "Planning in an agile organization," February 2019, McKinsey.com.

require. (Functional leaders should also assign their personnel to product teams when necessary to speed development.) The digital-delivery office then helps sort out project, staffing, and other priorities across multiple teams, consulting with the organization's leadership when conflicts have strategic implications (Exhibit 3).

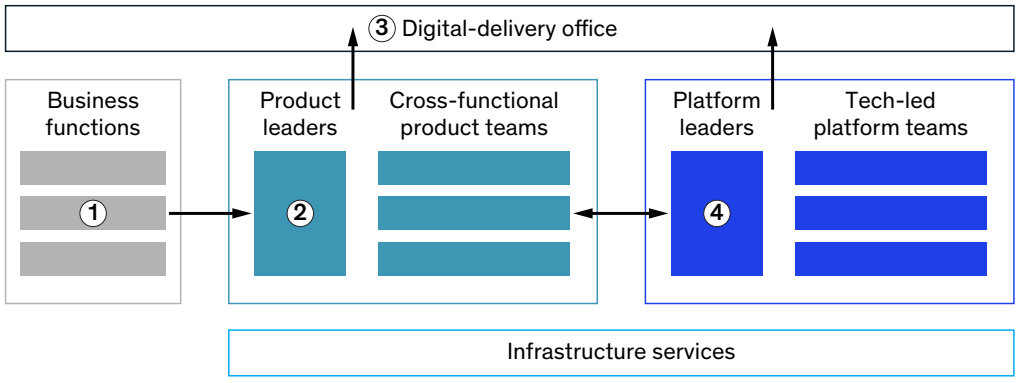
The digital-delivery office also helps manage the dependencies among teams, particularly product teams' dependencies on platform teams. Product and platform teams can do some of this on their own. Earlier in the article, we noted that a retailer's online search product might depend on an underlying inventory platform. In such a case, the search-product team and inventory-platform team would ideally work together to ensure that changes to the inventory platform are in sync with the release plan for the search product. But because each platform supports multiple products, and each product depends on multiple platforms, coordinating development efforts across teams can get complicated. To minimize conflicts and surprises, every dependency should be addressed on at least one team's release plan.

The digital-delivery office should also make sure that product teams depend on platform teams but that platform teams never depend on product teams. The idea is to prevent any one product team from restricting the work of a platform team because that can interfere with what other product teams want to do. The one-way nature of dependencies between products and platforms might require product teams to postpone the release of certain features while platforms are being updated and to fast-track other features in the meantime.

The digital-delivery office helps manage dependencies by reviewing each team's road map to identify the impacts of any planned

Exhibit 3

**Product and platform teams and the digital-delivery office handle and prioritize technology requests from business functions.**




1 Leaders generate technology demand from business functions and units or from the company's strategy

2 Product leaders capture demand in their road maps, own the execution, and liaise with platform teams; a business leader should have one product leader as a main tech contact

3 The digital-delivery office prioritizes work, allocates resources, tracks activity and value creation, and provides a unified view of what is being delivered and when

4 Platform teams build modular, reusable technology capabilities that support end-user demand

changes. It also holds regular meetings with product and platform leaders to go over the value and feasibility of the features they want to add, identify new dependencies, and negotiate teams' competing interests (such as product teams' needs to borrow the same personnel from platform teams and product teams' simultaneous requests for additional platform features). Some digital-delivery offices establish a common release cadence so that they can more easily coordinate assignments of resources. Other practices, such as feature flagging, can prevent dependencies from delaying releases.

Last, integrated technology organizations should look for and seize opportunities to modernize IT products and platforms as they are working on requests from the business for new features and solutions. For platform teams, especially, modernizing core systems in the course of their normal work ensures that the platforms remain capable of meeting increasingly sophisticated technical requirements from product teams. Platform teams should also reserve capacity to ensure that any changes are exposed in as-a-service offerings for all product teams to use (through an API endpoint, for example). This approach not only ensures that changes to platforms support multiple products without adding duplication or complexity but also allows product teams to build new capabilities without always engaging platform teams.

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Increasingly, companies are choosing an IT operating model that integrates customer- and employee-facing digital efforts with the activities of conventional IT departments and promotes uniform approaches to technology work. By forming integrated teams to support products and platforms, instituting consistent governance processes, and establishing a common system for prioritizing work, a technology organization can increase the value it creates for a business.

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# 3. Reinventing technology delivery

# How companies can win in the seven tech-talent battlegrounds

Companies have to hire the best, but that won't be enough. They'll also need to rethink how they reskill and upskill their people.

*by Matthias Daub, Ranja Reda Kouba, Kate Smaje, and Anna Wiesinger*

**With the acceleration in digital,** the demands on technology—for speed, flexibility, reliability, security, and value—have radically increased. For CIOs surveying how to transform their organizations, one tricky question is emerging: Where do I find the people to do all the work?

Few executives would debate the importance of talent or the difficulty that many have in attracting and keeping top people. But companies nevertheless aren't treating tech talent with the urgency it demands. Respondents to a recent McKinsey survey report more significant impact from talent transformations than from any other technology-based play. Yet talent transformations are relatively rare. Only 27 percent say their companies have pursued one in the past two years, and just 15 percent believe they will do so in the next two years.[1]

Amidst this reality, the increasing complexity of IT systems and the emergence of a broad range of new technologies, from cloud to artificial intelligence (AI) to machine learning, have increased the challenges. One European CEO and football fan explained it this way: if you gave him a big enough budget, he'd be confident he could put together a winning team. But a cricket team? He wouldn't know where to start, since he doesn't know anything about the game. He used the analogy to point out how hard it can be for leaders to know what talent they actually need.

A few companies, however, have started to crack the code. Companies winning in this arena have identified at a granular level the tech skills they need to build value for the business, have developed a clear view of their present and future talent needs, and are intentional about finding both top talent and adaptable learners. Crucially, these leaders understand that it's impossible to hire everyone you need; training and reskilling the existing workforce has to be a core part of the strategy to win the talent battle. Some 82 percent of global executives expect that reskilling and upskilling will be at least half of the solution to their persistent skill gaps.[2]

## Seven emerging tech-talent battlegrounds

To better understand what tech talent will matter most in the next three to five years, we spoke with hundreds of global CIOs, analyzed talent developments over two years across three global markets, and reviewed more than 30 cross-cutting tech trends. We then mapped relevant skills and roles to the most significant emerging tech trends and business needs. For example, given the increasing importance of using data to make better and faster decisions, the ability to rapidly build infrastructure and architecture for data (data-engineer skills) is likely to become more of a bottleneck than the ability to generate insights (data-scientist skills).

Through this analysis, we identified about 4,000 tech skills, which we broke down into seven battlegrounds, or clusters of need (see chart on the next page). (Note: while cultural and change-management aspects, including social and emotional skills, are also important, our research honed in on tech skills only).

Significant skills gaps in these seven areas already exist, and we expect them to become more severe over time. Executives expect skills mismatches in functions that have already started adopting automation and AI technologies, according to McKinsey Global Institute analysis.[3] The largest percentage of survey respondents (more than 30 percent) ranked data analytics, IT, mobile, and web design as the skills with the highest expectation of a mismatch over the next three years.

In Germany, 700,000 additional tech specialists are needed by 2023 to meet the economy's demand for them.[4] For agile skills, demand will be four times greater than supply, and for big data talent, 50 to 60 percent greater.[5] Globally, 3.5

[1] McKinsey Global Survey on IT and the Business, August 2020.
[2] For more, see "Retraining and reskilling workers in the age of automation," McKinsey Global Institute, January 2018, on McKinsey.com.
[3] For the full McKinsey Global Institute report, see "Skill shift: Automation and the future of the workforce," May 2018, on McKinsey.com.
[4] Julian Kirchherr, Julia Klier, Cornels Lehmann-Brauns, and Mathias Winde, "Future skills: Which skills are lacking in Germany," Stifterverband and McKinsey & Company, September 2018, stifterverband.com.
[5] Satty Bhens, Ling Lau, and Hugo Sarrazin, "The new tech talent you need to succeed in digital," September 2016, McKinsey.com.

| Battleground | Rationale | Tech skills (sample set) |
|---|---|---|
| DevOps | Faster and continuous delivery of features, more stable environments, and reduced operations time. (For more, read "Agile, reliable, secure, compliant IT: Fulfilling the promise of DevSecOps," on McKinsey.com.) | • Agile product-life-cycle management<br>• DevSecOps<br>• Continuous integration and delivery (CI/CD)<br>• Microservices architecture |
| Customer experience | Significant shifts in customer behavior as a result of COVID-19 and rising customer expectations; need to deliver top experiences across a wide array of channels; prioritization of personalized over generic design (while maintaining privacy); continuous test-and-learn cycles. (For more, read "Elevating customer experience excellence in the next normal," on McKinsey.com.) | • Predictive/nudge analytics<br>• Design thinking<br>• Test-and-learn at scale<br>• Automated testing<br>• Prototyping |
| Cloud | Infrastructure increasingly provided through next-gen cloud architecture, the time to market of services is vastly improved, solutions are more easily scalable; acceleration of transformation and increased source of competitive value. (For more, read "Capturing value in the cloud," on McKinsey.com.) | • Kubernetes<br>• Docker<br>• Multicloud and hybrid-cloud architecture<br>• Security<br>• Smart distribution/metering<br>• Edge computing |
| Automation | Significant number of tasks automatable: about 22 percent of workforce activities across the European Union could be automated by 2030,[6] for example, through end-to-end automation across development, testing, and deployment processes—accelerating development and reducing errors. (For more, read "The imperatives for automation success," on McKinsey.com.) | • Cognitive AI<br>• RPA technologies<br>• Automation anywhere<br>• Machine learning<br>• AI-enabled analytics<br>• Quantum computing |
| Platforms and products | Platform-as-a-service (PaaS) operating model provides foundation for development with reusable code; "building-block" product approach to development speeds up releases and makes process more flexible. (For more, read "The platform play: How to operate like a tech company," on McKinsey.com.) | • Life-cycle management across platform layers<br>• Industrial Internet of Things (IIoT)<br>• Vertical software as a service (SaaS) |
| Data management | Need for real-time data-driven insights, data democratization (nonexpert users making advanced data queries), acceleration of both data quantity and variability. (For more, read "How to build a data architecture to drive innovation—today and tomorrow," on McKinsey.com.) | • Use-case life-cycle management<br>• Synthetic data<br>• Data governance<br>• Automated machine learning |
| Cybersecurity and privacy | Data breaches are increasing while data-privacy concerns are resulting in varied regulatory changes, forcing companies to rethink security and compliance protocols. (For more, read "A dual cybersecurity mindset for the next normal," on McKinsey.com.) | • Shift-left security<br>• Automated testing<br>• Zero-trust security<br>• Data-protection law and practices |

[6] For more, see "The future of work in Europe," McKinsey Global Institute, June 2020, on McKinsey.com.

million cybersecurity positions are projected to be unfilled in 2021.[7]

In addition to meeting the challenges of filling future roles, technology modernization requires knowledge of how to transition from existing systems, which are often written in outdated programming languages, such as LISP, ALGOL 58, or COBOL, and are understood mostly by an aging workforce.[8]

## Closing the talent gap

To succeed in the seven tech-talent battlegrounds, companies will need to use a set of well-considered strategies: hiring, reskilling (training employees for new roles), upskilling (training within an existing role), reallocating, and sourcing. Which strategies to pursue depend on a company's starting point and specific needs (see sidebar "Four archetypes for addressing talent gaps"). For this article, we focus on hiring, reskilling, and upskilling.

The first step in closing the skills gap is rigorous discipline in identifying specific talent needs. In a McKinsey survey, nearly twice as many respondents who report successful transformations say their companies set hiring goals based on specific skills needs, compared with respondents whose organizations don't set those same kind of goals.[9] They do so by evaluating relevant trends, identifying the corresponding skills needed over the next three to five years. Importantly, they identify skills at a level of precision necessary so they can target the right hires and build out relevant training programs.

### Hiring practices that work

We have found the following hiring practices to be most effective:

— *Favoring quality over quantity.* Given the scale of the need, organizations tend to focus on quantity. However, they should favor quality even more. A single expert or highly skilled engineer is as productive as eight novices. The most effective IT organizations are built around small cadres of high-performance people working in highly self-motivated, self-managing, and agile teams.

Finding these anchor hires and being prepared to pay more for them is more cost-effective in the long run—and greatly helps in recruiting additional people who want to work with the best. Spotting quality talent is notoriously difficult, however, because companies are often unclear about how to evaluate their talent effectively. Top companies, however, identify top performance through a hierarchy of observable behaviors.

— *Finding adaptable learners.* Tech talent has always been accustomed to lifelong learning as their fields change and new ones emerge. Technology skills evolve so quickly that focusing solely on credentials and specific skills when hiring is not enough. In addition to specialized talent, the best companies look for "strong talent," which has the ability to learn and adapt. As one executive said, "We're not looking for people with skills; we're looking for people who can learn skills."

The flip side of this coin is nurturing an environment for learning. In a survey of IT experts, the majority of respondents said they regard employee training as a crucial driver of career success, even more important than IT certifications.[10] But beyond formal training, the best companies explicitly provide their people with time to learn, budgets to fund experimentation, and access to new technologies, as well as flexible career paths that provide additional learning opportunities.

— *"Techies for techies" recruiting.* To hire good tech talent, you need to involve your top talent in the recruiting process. The reality is that techies want to talk to techies rather

[7] Steve Morgan,"Cybersecurity talent crunch to create 3.5 million unfilled jobs globally by 2021," Cybersecurity Ventures, October 24, 2019, cybersecurityventures.com.
[8] Patrick McGeehan, "He needs jobless benefits. He was told to find a fax machine," *New York Times*, April 4, 2020, nytimes.com.
[9] "Unlocking success in digital transformations," October 2018, McKinsey.com.
[10] "What IT pros think about IT training," LinkedIn, January 2017, learning.linkedin.com.

## Four archetypes for addressing talent gaps

Four organizational archetypes determine how companies address their tech-talent challenges (exhibit).

**The traditionalist: Upskilling**
Extensive skills gaps paired with an inability to attract top talent predisposes this archetype to focus on upskilling and reskilling existing employees. Digital learning platforms can help to make training scalable, applicable across locations, and also feasible during COVID-19 restrictions.

**The digitizing incumbent: Skilling–hiring mix**
This archetype in general still has a large tech-skills gap, especially in quantity of skills, with a slightly smaller gap in quality of skills. In addition to reskilling employees, the focus is on hiring new tech talent, though that can prove to be a challenge.

**The emerging digitalist: Redeploying and hiring**
The emerging digitalist is prone to focusing on hiring to address a moderate—though widening (due to business growth)—skills gap. In this case, redeploying talent to the most value-generating needs can be particularly effective. Our research reveals that, on average, leading companies reallocate digital talent more than five times faster than their peers.

**The digital native: Continuous reskilling and hiring**
Leadership at digital-native companies is typically aware of technology's critical role and the need to stay abreast of the competition. If a skills gap arises at all, it is likely to happen because a tech firm undergoes yet another IT paradigm shift, from mobile-first to AI-first, for example. They are then aggressive both in hiring the necessary talent and in reskilling relevant people.

Exhibit

### IT organizations typically fall into one of four archetypes, each with varying approaches to closing skills gaps.

| | ① The traditionalist | ② The digitizing incumbent | ③ The emerging digitalist | ④ The digital native |
|---|---|---|---|---|
| Characteristics of the IT organization | IT assumes a **support function;** outdated working model and tech stack, tenured staff, and lack of belief in the power of technology impede reorientation | IT assumes an **enabling function** and is understood to be important for reaping efficiency gains or discovering new frontiers in an incumbent's core business | IT assumes a **central function** in the setup of a new digital business within an existing incumbent and is expected to unlock new value pools in addition to those in the core | IT assumes a **strategic function**, and an IT-first mindset permeates all teams; state-of-the-art tech stack, adaptable top talent, and tech-forward IT operations model act as enablers |
| Sample organization | Public-sector institution aims to digitize processes | Large bank decides to digitally transform its core business from the ground up | Automotive incumbent builds digital attacker (new digital business in addition to core business) | Leading tech firm undergoes yet another IT paradigm shift (eg, from mobile-first to AI-first) |
| Strategies to close the gap | Extensive qual and quant gaps paired with limited ability to revamp employee base leads to upskilling focus | Large quant gap paired with openness to revamp employee base leads to skilling and hiring focus | Medium quant gap paired with overall business growth leads to redeploying and hiring focus | Modest qual gap paired with overall business growth leads to continuous reskilling and hiring top talent |
| Upskilling |  |  |  |  |
| Reskilling |  |  |  |  |
| Hiring |  |  |  |  |

than to HR people with limited tech knowledge. Acquiring top talent also requires the use of a broad set of recruiting channels, such as developer conferences and hackathons; an open mind about educational qualifications and an awareness that 85 percent of developers are at least partially self-taught; aspirational goals that inspire; and a demonstrated commitment to building a diverse and inclusive workforce.[11]

— *Moving quickly.* Job seekers in the tech world are impatient. Applicants often have various offers and are used to rapid recruiting processes: 57 percent of job seekers are unhappy with the waiting time after an interview, while 23 percent are willing to wait only one week to hear back.[12]

## Practical guide for reskilling and upskilling

According to the World Economic Forum, around 54 percent of all employees will need reskilling and upskilling by 2022. Of these, 35 percent will require up to six months of training, 9 percent will need six to 12 months, and 10 percent more than a year.[13] The best programs will focus on the following practices.

### Use budget strategically

Reskilling is cheaper than hiring. While reskilling an internal employee may cost $20,000 or less, the cost of hiring often costs $30,000 for recruitment alone, in addition to onboarding training. And new hires are two to three times more likely to then leave.[14] Large tech players understand this and often opt to invest more significantly in reskilling their workforce.

Effective reskilling and upskilling, however, don't require large outlays. By using existing training budgets more strategically, companies can move away from broad learning programs to targeted learning journeys that focus on top-priority areas for the business. In addition, the courses can be short. Tech-learning providers offer introductory courses that take only a few hours or degree programs that can be completed within three to six months, with less than 15 hours of learning effort per week.[15]

### Build learning journeys

A learning journey is a set of connected learning experiences that drive sustained performance improvements (exhibit). Learning journeys have been highly effective in closing skills gaps, as they blend a variety of different training formats, such as digital, cohort-based, or on-the job learning.

COVID-19 has accelerated the full digitization of all learning-journey components. These dynamics not only make it possible to scale learning efforts more cost effectively but also offer greater personalization for learners.[16]

For example, a leading US insurer identified 15 to 20 critical talent pools among its more than 17,000-strong workforce, to determine the potential of displaced individuals to be reskilled and redeployed. The insurer designed learning journeys to upskill and reskill current roles to the roles of the future, such as the business translator. This learning-journey approach made it possible to reskill or redeploy 40 percent of the overall workforce.

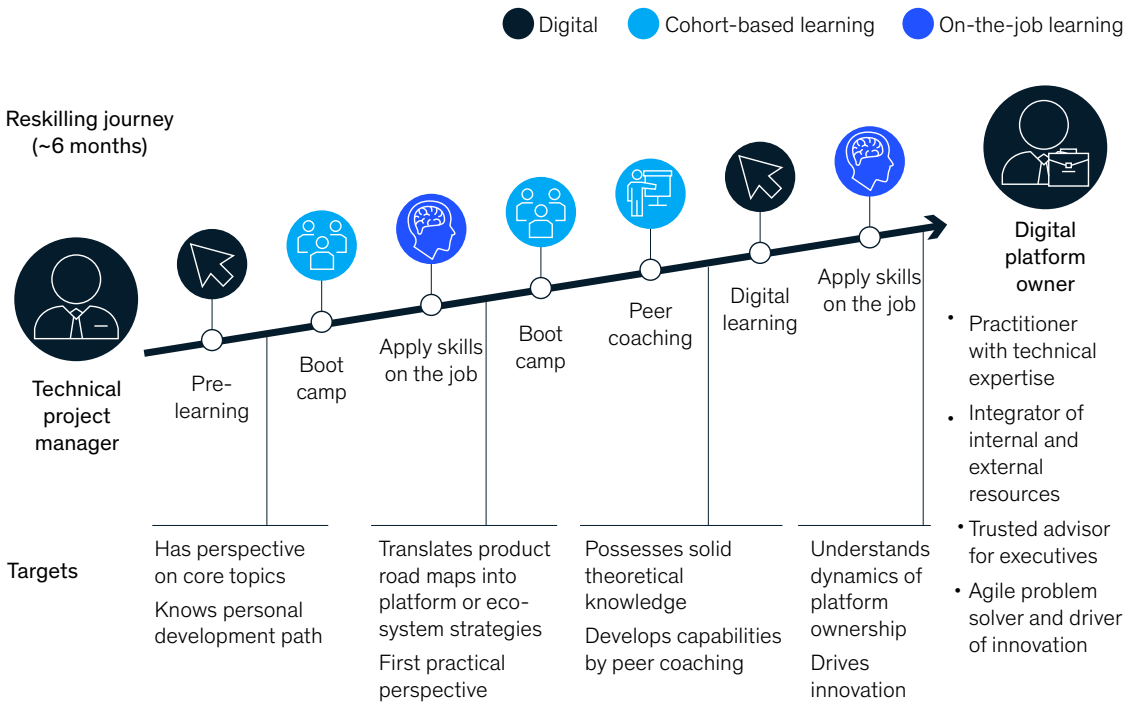
In another example, a European regional bank linked its learning journeys to concrete new career paths. In addition to learning-journey-based reskilling, almost all of the more than 30,000 employees used mobile-app digital learning courses to build skills identified as important for the company's future.

[11] Tomas Chamorro-Premuzic and Jonathan Kirschner, "How the best managers identify and develop talent," *Harvard Business Review*, January 9, 2020, hbr.org.
[12] "Are you taking too long to hire?," Robert Half, 2016, roberthalf.com.
[13] *The future of jobs report 2018*, World Economic Forum, September 2018, weforum.org.
[14] Josh Bersin, *Rethinking the build vs. buy approach to talent*, General Assembly and Whiteboard Advisors, October 2019, joshbersin.com.
[15] Course overview of online learning providers Udacity and Coursera, 2020.
[16] Sapana Agrawal, Aaron De Smet, Sébastien Lacroix, and Angelika Reich, "To emerge stronger from the COVID-19 crisis, companies should start reskilling their workforces now," May 2020, McKinsey.com.

Exhibit

## Individual learning journeys are tailored to specific skills needs over a range of formats.

**Tech company example**




**Learning needs to be a top management priority**

The CHRO and CIO need to take joint ownership of a business's tech-training program. The most effective partnerships make sure that their training investments align with the company's overall strategy, establish a governance model with shared ownership among business leaders, continuously assess skills gaps, design targeted learning journeys, and integrate them into HR processes.[17]

**Don't forget your nontech employees**

Nontech people need tech skills, too. With the continued importance of technology in driving business value, technology can no longer be relegated to being an "IT thing." While people on the business side don't need to know how to code, they do need to learn how to better use technology. The continued democratization of data can also allow for "laypeople" to use data to make better and faster decisions without relying on complex IT processes.

Furthermore, CIOs often assume that only IT people can be reskilled and typically underestimate the possibility of reskilling employees from nontech departments. But increasing evidence shows that reskilling nontech people for tech roles can be effective (see sidebar "Even people without 'adjacent' skills can be successfully reskilled").[18]

[17] Jacqueline Brassey, Lisa Christensen, and Nick van Dam, "The essential components of a successful L&D strategy," February 2019, McKinsey.com.
[18] *Coursera blog*, "Learned code and switched careers as a developer," February 24, 2017, blog.coursera.org.

## Even people without 'adjacent' skills can be successfully reskilled

Skills adjacency is defined as the proximity between the skills required for two different jobs. Among students at Udacity,[1] a for-profit educational organization offering online technology courses, 67 percent showed high skills adjacency between their previous job and the one they found after completing their courses. Interestingly, however, a significant 33 percent found a new job with only medium or low skills adjacency, indicating that reskilling someone from a nontech role to a tech role can succeed (exhibit).[2]

Exhibit

### Reskilling can be successful even when skills adjacency is low.


[1] McKinsey has a nonexclusive partnership with Udacity.
[2] Udacity data analysis, nonenterprise, private customers, n = 463, August 2020.

Given the rapidly changing nature of business and technology, companies will always be facing technology-skills gaps. But organizations that are willing to dedicate the energy, focus, and resources to continually closing—or, in some cases, even leapfrogging—those gaps can win in the most important talent battlegrounds.

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# CIOs are redefining what a successful relationship with their IT providers looks like

As CIOs lead their IT organizations through transformations, long-established relationships with IT providers are set to change.

*by Abhi Bhatnagar, Anuj Kadyan, Wasim Lala, and Abdallah Salami*

*Note that these findings are based on a survey done before the current coronavirus crisis, and depending on its impact, any sourcing strategy going forward could look different.*

**In the digital world,** technology is no longer an enabler but a strategic asset and a competitive advantage. CIOs are at the helm of this digital transformation journey and are under increasing pressure to deliver the technology capabilities to enable businesses to generate value.

In this context, significant questions are surfacing about the role of IT providers, which have been a mainstay of the technology landscape for the past two decades. Are IT providers hindering an organization's ability to innovate? Do they deliver on promised cost savings, and if they do, are the savings worth the effort? Are they driving strategic outcomes, or are they serving legacy goals? These questions are increasingly pertinent, as CIOs must both ensure that their organizations can keep up with innovation while maintaining established systems.

To address this challenge, many CIOs are choosing to build up internal capabilities in an effort to increase speed, flexibility, and control over critical technology, often in the context of tech-enabled transformations. At the same time, this challenge is leading CIOs to redefine how they engage with, and what they expect from, their IT providers. As one CIO put it: "Given the shortage of capable talent internally, our resources are focused on working with IT providers to define the problem and then partnering with them to execute."

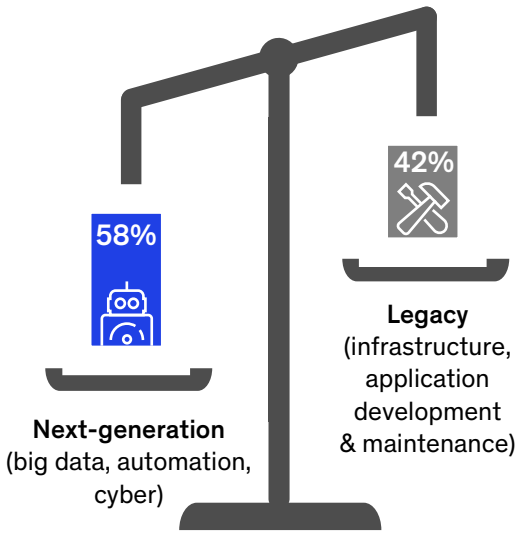
This evolving relationship with IT providers comes through in our survey of 250 global CIOs and similar technology decision makers.[1] More than half of IT leaders believe that "there is no other way" to achieve their digital-transformation goals without a close relationship with their IT providers. Our survey and interviews point to an active role for IT providers along the digital transformation journey of many companies. However, the focus, expectations, and players shaping this role will differ significantly from those of the past.

## Looking for help disentangling from legacy systems

CIOs are eager to accelerate their businesses' digital transformations. After years of allocating external IT spend to legacy systems, the leaders we surveyed signaled an ambitious desire to allocate more than half of their external IT budget to next-generation services within three to five years (Exhibit 1). However, CIOs seeking rapid progress are often thwarted by their organization's entanglement in the complexities of legacy IT. In fact, 87 percent of leaders cited the "complexity of existing infrastructure" as a key impediment to implementing next-generation services. As a result, CIOs are looking for their IT providers' help in simplifying and streamlining the legacy environment. This will enable digital transformation by freeing up resources and funding that are currently engaged in keeping the lights on.

Exhibit 1

### How will you allocate your external IT budget in three to five years?




[1] The survey was conducted in the summer of 2019 and covered 250 CIOs and similar decision makers in companies with IT budgets greater than $250 million across more than ten industries globally.

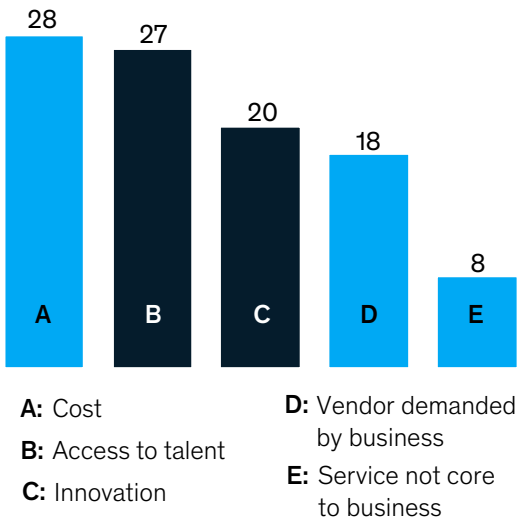
## Talent and innovation are a must

While cost is a major reason why most enterprises were and are still working with IT providers, other factors are now gaining importance (Exhibit 2). Leaders cite access to talent and innovation as crucial drivers influencing their decision to engage and continue with IT providers.

Exhibit 2

### What is driving your need to leverage external IT providers?

**% of respondents**




**A:** Cost
**B:** Access to talent
**C:** Innovation
**D:** Vendor demanded by business
**E:** Service not core to business

This is also reflected in how CIOs define "good" IT providers. Previously, IT providers were deemed to be good if they fulfilled service requirements within targeted cost targets. Today, while CIOs are generally satisfied with external providers' delivery on cost savings (score 4.0 on a 5.0 satisfaction scale), they are less satisfied with and demanding more from providers in terms of innovation (score 3.9 out of 5.0), delivering business outcomes (3.8), and bringing the right talent (3.8) (Exhibit 3).

In addition, there is a pronounced desire among CIOs to sustain their ability to innovate, especially in business-critical and customer-facing areas. As a result, CIOs—particularly those with IT budgets greater than $500 million—are increasingly

Exhibit 3

### Do your external providers meet your expectations?

**IT services providers report card**

| | |
|---|---|
| Executing digital transformation | **4.2/5.0** |
| Designing digital transformation | **4.1/5.0** |
| Delivering cost savings | **4.0/5.0** |
| Driving innovation | **3.9/5.0** |
| Driving business outcomes | **3.8/5.0** |
| Bringing right talent | **3.8/5.0** |

seeking to engage with IT providers that strengthen their internal talent's ability to innovate and drive the business's digital strategy. According to one CIO, "We are no longer impressed with a 'hand the keys over and let them drive' model."

## Providers, like CIOs, have to serve the entire business

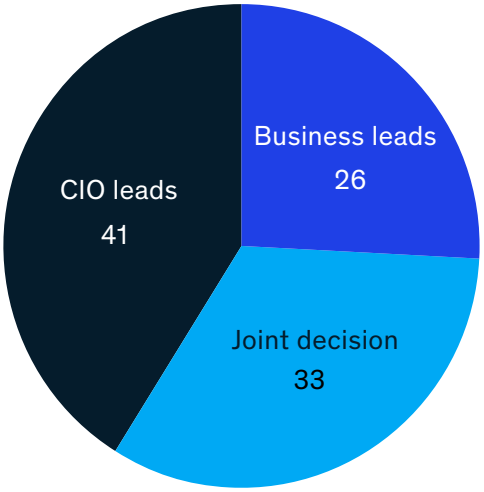
When it comes to selecting IT providers, roughly 60 percent of the CIOs surveyed believe that business-unit leaders will be either the sole decision makers or joint decision makers with the CIO (Exhibit 4).

For this reason, CIOs are shifting their role to become true working partners to the business and focusing increasingly on how technology can drive business outcomes. While doing so, they expect IT providers—who have traditionally primarily interfaced with the CIO—to do the same. It is not surprising, then, to find that some 60 percent of CIOs consider the "ability to engage with the business" to be a key criterion influencing the selection of IT providers.

Exhibit 4

## Who leads decision making on selection of IT providers?

**% of respondents**



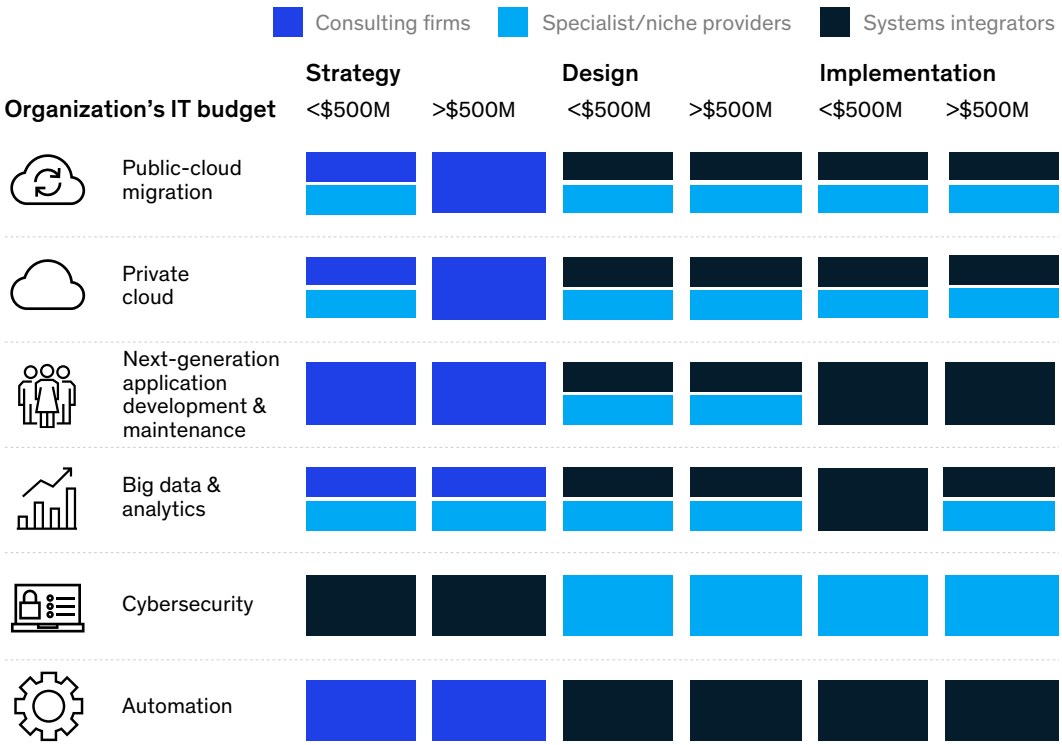

IT providers have a good starting point. When we asked CIOs about where IT providers deliver value, designing and executing digital transformations came out on top (above 4.0 on a 5.0 satisfaction scale). To succeed going forward, IT providers need to ensure these transformations align with and deliver business outcomes.

### With greater choice, organizations are rethinking their provider portfolio

Traditional players, such as large systems integrators (SIs), have enjoyed market dominance over other IT providers for a while. However, as CIOs look for more specialized talent and capabilities, niche providers, in particular, have the potential to plug gaps in talent and innovation where traditional large-scale providers fall short (Exhibit 5). Said one of the surveyed CIOs: "For analytics, traditional SIs play the role of flex capacity; if we need data scientists, we go to specialists."

Exhibit 5

## Who is your preferred provider?



Specialist/niche providers are making significant inroads and establishing themselves as serious contenders. While working with niche providers requires more trial and error than working with traditional SIs, CIOs said the outcomes often justify it. CIOs would do well, therefore, to seriously consider the new players on the chessboard as they redesign their partnerships portfolio for the long game.

The relationship between IT organizations and service providers is profoundly changing. Leaders are looking to IT providers to bring to the table talent and innovation while continuing to deliver on cost. More than ever, leaders have at their disposal a diverse bench of partners, including niche and specialist providers, that are hungry to distinguish themselves from their peers.

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# Unlocking value: Four lessons in cloud sourcing and consumption

Companies that are successful in sourcing and managing the consumption of cloud adopt a more dynamic, analytical, and demand-driven mindset.

*by Abhi Bhatnagar, Will Forrest, Naufal Khan, and Abdallah Salami*

**Cloud adoption** is no longer a question of "if" but of "how fast" and "to what extent." Between 2015 and 2020, the revenue of the big-three public cloud providers (AWS, Microsoft Azure, and Google Cloud Platform) has quintupled, and they have more than tripled their capital-expenditures investment to meet increasing demand. And enterprises are ever more open to cloud platforms: more than 90 percent of enterprises reported using cloud technology in some way.[1]

These trends reflect a world where enterprises increasingly "consume" infrastructure rather than own it. The benefits of this model are plentiful. Cloud adopters are attracted by the promise of flexible infrastructure capacity, rapid capacity deployment, and faster time to market for digital products. The COVID-19 crisis has accentuated the need for speed and agility, making these benefits even more important. From an infrastructure-economics perspective, perhaps the most attractive innovation of cloud is the ability to tailor the consumption of infrastructure to the needs of the organization. This promises greater economic flexibility by transforming underutilized capital expenditures into optimally allocated operations expenditures.

While this concept is attractive in theory, many enterprises are facing challenges in capturing the value in reality. Enterprises estimate that around 30 percent of their cloud spend is wasted. Furthermore, around 80 percent of enterprises consider managing cloud spend a challenge. Thus, even though more than 70 percent of enterprises cite optimizing cloud spend as a major goal, realizing value remains elusive.[2]

In our experience, a major driver of value capture is transforming the approach to sourcing and consuming cloud. Enterprises that approach this task with a traditional sourcing and infrastructure-consumption mindset are likely to be surprised by the bill. The flexibility to consume cloud as needed and cost effectively places responsibility on enterprises to maintain a real-time view of their needs and continuously make deliberate decisions on how best to adjust consumption.

Here are four ways enterprises can derive value from cloud by transforming their sourcing and consumption approaches.

**Lesson 1: Sourcing and managing consumption of cloud is a dynamic exercise**

Over the years, enterprises developed a robust model for sourcing IT infrastructure assets. It is episodic in nature based on asset refresh cycles and follows a structured sequence: requirements to request for proposal (RFP) to negotiations to award. Success in this model requires solid negotiation and contracting skills and the ability to engage the business at the right touchpoints in the process. The RFP juncture came to constitute the major point at which value was captured. Once the contract was signed, the organizational focus normally shifted to other areas until the next negotiation cycle.

Cloud economics mandates a fundamentally different approach. While cloud service provider (CSP) selection and negotiation are critical components of the cloud journey—determining, for example, the price of services and discount levels—many of the decisions impacting value

[1] *2020 Flexera state of the cloud report*, Flexera, April 2020, flexera.com.
[2] Ibid.

## Capturing value in the cloud

This article is part of a featured series of articles on "Capturing value in the cloud" at cloud.mckinsey.com, in which we explore how cloud is revolutionizing the way businesses can create and capture value.

capture come afterwards. The very flexibility that cloud provides means that enterprises must continuously make dynamic consumption decisions about which services and specifications are needed when and for how long. Each of these decisions can have significant cost implications if not deliberately managed. One manufacturing company we know was able to leverage its traditional procurement muscle to negotiate competitive discounts from its CSPs, only to be surprised by the high cloud-consumption projections—up to twice its spend commitment—a year into cloud adoption. This prompted the company to consider renegotiations with its CSPs and to accelerate the shift in its internal approach to cloud to a more demand-focused model.

The need to continuously manage cloud consumption is accentuated by the rapidly evolving vendor marketplace and its continuous introduction of new offerings, features, pricing mechanisms, and regions. For instance, AWS has changed prices—mostly dropping them—more than 60 times since its launch in 2006. It introduced more than 20 new top-level services last year alone. Sourcing and managing the consumption of cloud in this world requires a deep understanding of the cloud ecosystem and continuous engagement with the business as partners.

**Lesson 2: Cloud economics is a demand rather than a supply game**

With server and storage assets essentially being commodities, enterprises purchasing traditional infrastructure optimized around two variables: price and quantity. The latter is less flexible, as it is mandated by the number of assets that need to be refreshed and by fluctuations in peak and average demand. This has encouraged enterprises to focus on supply-side solutions, such as consolidating volume, standardizing SKUs, and structuring favorable contract terms.

In a cloud world, enterprises have to solve for more numerous, interconnected, and demand-focused variables. Take compute as an example: Which instance types, of the dozens offered, deliver the right balance between performance and cost? Should the enterprise preselect instance types to be used by teams or leave the decision to the teams based on the use case? Which instance regions should be selected? For example, does the cost-benefit ratio justify provisioning instances closer to the customer in order to minimize latency? How long is the capacity needed, and if the duration is predictable, should the organization purchase reserved capacity rather than on-demand, since reserved instances can be up to 60 percent cheaper? And finally, how should the enterprise dynamically adjust these choices as it rolls out new products and features or expands into new markets and geographies?

Given these variables, a deep understanding of an enterprise's demand is critical across the cloud journey. During the CSP selection and negotiation phases, enterprises equipped with a proper understanding of the level and variability of their future demand will be able to better negotiate discounts and make calculated decisions on spend commitments, if any. Following that, on a continuous basis, enterprises that capture value are ones that take a "consumption approach" to cloud, continuously matching their demand to the best-fitting cloud services and pricing arrangements. One technology company we know launched a continuous consumption analysis focused on application-level assessment and analytical projection of demand. It was able to harmonize the number of instance configurations for related workloads from more than 20 down to three and then, leveraging the analytical projection, utilized reserved-instance pricing arrangements for the relatively predictable portion of demand.

**Lesson 3: Granular visibility and forecasting are needed to optimize consumption of cloud**

While visibility into and forecasting of spend are critical to any procurement category, they are particularly important to cloud given it is a continuously sourced ("consumed") service. Capturing value from cloud requires a clear understanding of actual usage costs in order to stem any value leakage from excessive or miscalibrated consumption. However, enterprises often find themselves mired in an intractable sprawl

of cloud services with inadequate visibility into the corresponding spend. The large and growing range of cloud offerings and pricing arrangements in the marketplace—as well as often obsolete managerial processes—do not make this problem easier.

To gain greater control of their cloud spend, top-performing enterprises focus on developing three capabilities (see sidebar, "Visibility, forecasting, and optimization go hand in hand"):

— understanding the business and technical drivers of consumption, then establishing granular visibility to monitor and track cloud spend, often assisted by internal analytics or third-party tools

— deriving the unit-cost economics according to the hierarchy of business and technical drivers, based on detailed historical analysis of consumption patterns, then developing the analytical model and governance to accurately forecast consumption

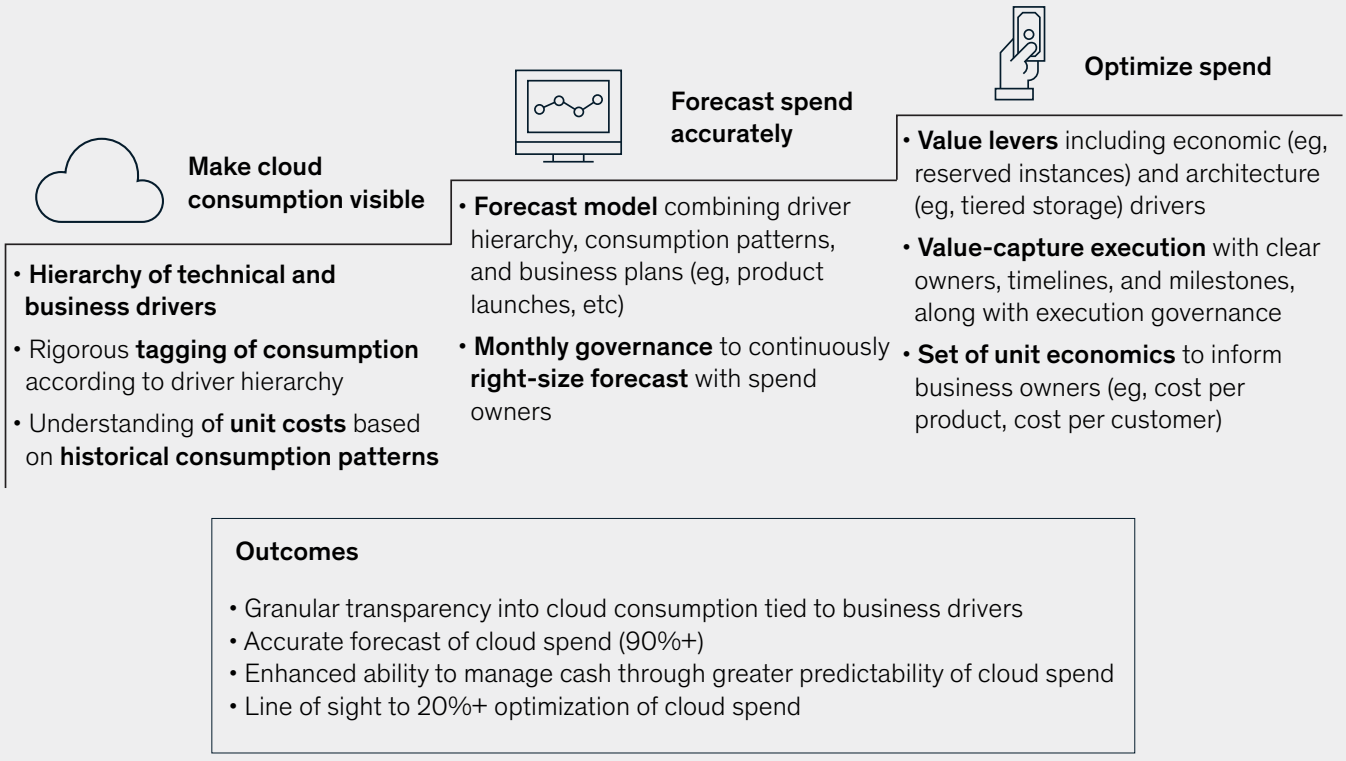
— optimizing consumption (through economic drivers such as reserved instances, or architecture drivers such as spot fleet) to inform business decisions (for example,

## Visibility, forecasting, and optimization go hand in hand

One technology company we know established control of its consumption through developing an integrated approach for visibility, forecasting, and optimization (exhibit). In this way, the company was able to achieve more than 90 percent forecasting accuracy and identify approximately 20 percent in savings.

Exhibit

**Companies can take a three-step journey to gain control of their cloud consumption.**



through deriving cloud cost per subscriber or product)

**Lesson 4: Cross-functional FinOps is essential to manage cloud sourcing and consumption**

Given the complexity and differentiated nature of cloud economics, existing capabilities and organizational constructs cannot fully capture the value at stake. For many companies, sourcing organizations can bring financial and process discipline, but they often lack the technical depth and ability to stratify business demand in sufficient detail. This often leads to rigid sourcing standards that delay and constrain flexible capacity deployment. On the other hand, entrusting product or technology teams with the task can maximize agility and grant developers the freedom to flexibly and rapidly stand up capacity; however, many organizations have observed that this approach leads to fragmented decision making, poor spend visibility, and insufficient financial discipline.

Top-performing enterprises instead are deliberate about bringing together technical, financial, and sourcing talent into a cross-functional cloud financial-operations (FinOps) team to manage cloud sourcing and consumption (exhibit). In some cases, companies can be successful by supplementing their existing sourcing or technology functions with relevant talent. This team is then empowered to orchestrate across stakeholders, translate the business's consumption needs into optimal cloud offerings and pricing arrangements, oversee and make rapid decisions around resource allocations and cloud usage, and track enterprise-wide cloud spend to ensure financial discipline. Importantly, this cloud-management team is provided with the right analytics, tooling, and automation, such as automated dashboards to better track cloud consumption in real time and advanced analytics to help project demand.

Exhibit

## Cloud FinOps teams should follow five guiding principles.

**Context**

Traditional sourcing organization focused on contracting and tendering

Fragmented stakeholders across sourcing, finance, engineering, and product teams

Fragmented cloud consumption across the enterprise, with no coordinated decision making or planning

Deep understanding and appreciation of consumption **technical and business requirements**, trade-offs, time horizons, and ability to speak language of product teams

Advanced **analytical capabilities** (to continually dissect demand) powered by automation and monitoring tools to maximize value

Solid understanding of **market dynamics**, vendor offerings, and pricing trends

Ability to stand up collaborative **cross-functional joint decision making** with stakeholders (product teams, finance, etc) with clear roles and responsibilities

**Balanced set of KPIs** to performance management and tracking of actual vs plan with root-cause problem-solving discipline

As enterprises progress along their cloud journey, transforming the way enterprises source and consume cloud will make the difference between value capture and value leakage. Success will require a mindset shift toward a dynamic model that appreciates the nuances and complexities of cloud economics, the importance of deeply understanding demand, and the benefits of a revamped organizational approach to sourcing and optimizing the consumption of cloud.

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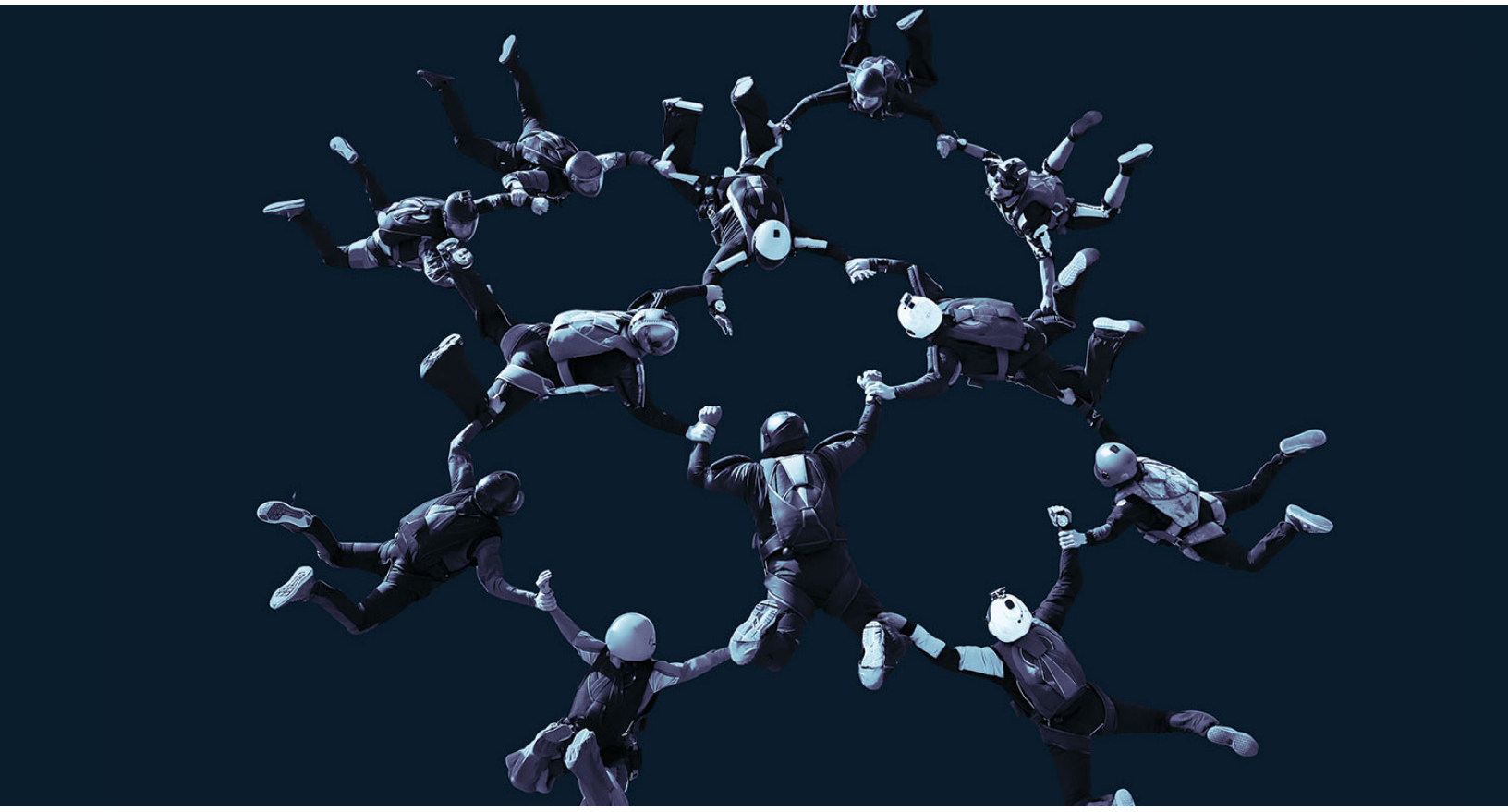
# Three actions CEOs can take to get value from cloud computing

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 Kapla, 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.

[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 "Products and platforms: Is your technology operating model ready?," on p. 30 of this compendium.
[3] Nagendra Bommadevara, James Kaplan, and Irina Starikova, "Leaders and laggards in enterprise cloud infrastructure adoption," October 2016, McKinsey.com.
[4] Technical debt is the implied cost of rework caused by implementing a quick but brittle or otherwise architecturally suboptimal solution.

Each new bit of tactical business functionality built without best-practice cloud 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.

**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.

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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.

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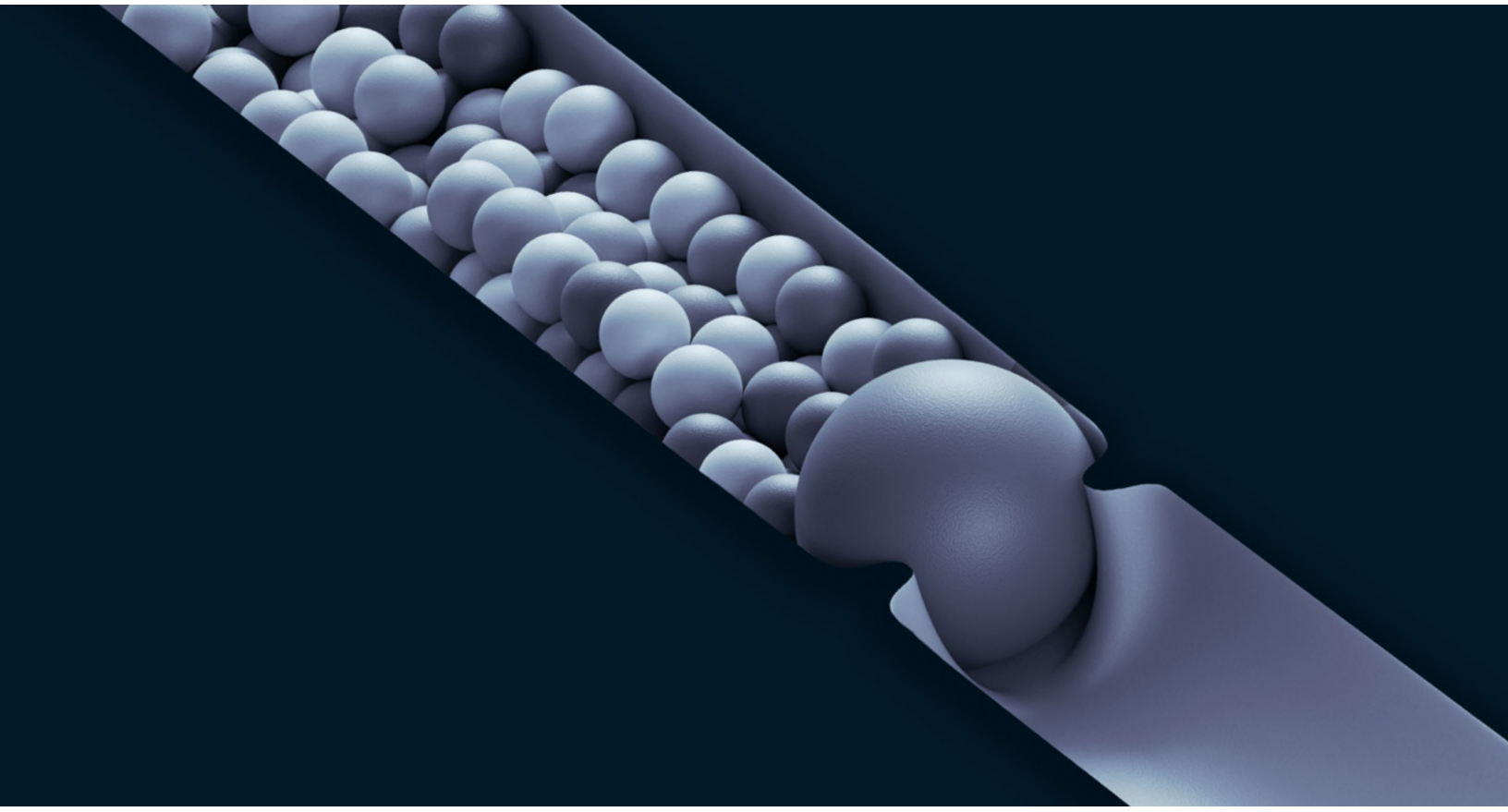
# Breaking through data-architecture gridlock to scale AI

Large-scale data modernization and rapidly evolving data technologies can tie up AI transformations. Five steps give organizations a way to break through the gridlock.

*by Sven Blumberg, Jorge Machado, Henning Soller, and Asin Tavakoli*



**For today's data and technology leaders,** the pressure is mounting to create a modern data architecture that fully fuels their company's digital and artificial intelligence (AI) transformations. In just two months, digital adoption vaulted five years forward amid the COVID-19 crisis. Leading AI adopters (those that attribute 20 percent or more of their organizations' earnings before interest and taxes to AI) are investing even more in AI in response to the pandemic and the ensuing acceleration of digital.

Despite the urgent call for modernization, we have seen few companies successfully making the foundational shifts necessary to drive innovation. For example, in banking, while 70 percent of financial institutions we surveyed have had a modern data-architecture road map for 18 to 24 months, almost half still have disparate data models. The majority have integrated less than 25 percent of their critical data in the target architecture. All of this can create data-quality issues, which add complexity and cost to AI development processes, and suppress the delivery of new capabilities.

Certainly, technology changes are not easy. But often, we find the culprit is not technical complexity; it's process complexity. Traditional architecture design and evaluation approaches may paralyze progress as organizations overplan and overinvest in developing road-map designs and spend months on technology assessments and vendor comparisons that often go off the rails as stakeholders debate the right path in this rapidly evolving landscape. Once organizations have a plan and are ready to implement, their efforts are often stymied as teams struggle to bring these behemoth blueprints to life and put changes into production. Amid it all, business leaders wonder what value they're getting from these efforts.

The good news is that data and technology leaders can break this gridlock by rethinking how they approach modernization efforts. This article shares five practices that leading organizations use to accelerate their modernization efforts and deliver value faster. Their work offers a proven formula for those still struggling to get their efforts on track and give their company a competitive edge.

## 1. Take advantage of a road-tested blueprint

Data and technology leaders no longer need to start from scratch when designing a data architecture. The past few years have seen the emergence of a reference data architecture that provides the agility to meet today's need for speed, flexibility, and innovation (Exhibit 1). It has been road-tested in hundreds of IT and data transformations across industries, and we have observed its ability to reduce costs for traditional AI use cases and enable faster time to market and better reusability of new AI initiatives.

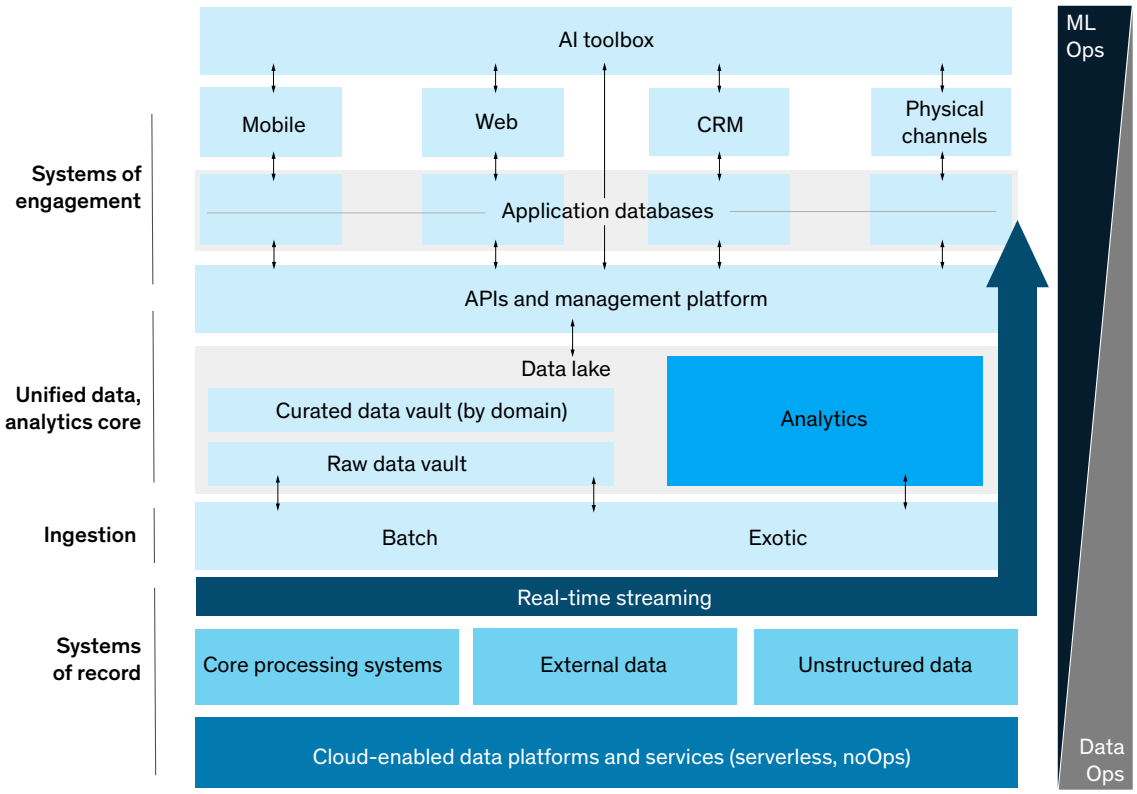
With the reference data architecture, data and technology leaders are freed from spending cycles on architecture design. Instead, leveraging this blueprint, they can iteratively build their data architecture.

Take the case of a large German bank. By using this reference data architecture as its base, the organization reduced the time required to define its data-architecture blueprint and align it with each stakeholder's needs from more than three months to only four weeks. Before adoption of the reference data architecture, business executives would become disillusioned as the CIO, CFO, risk leaders, and business executives debated architectural choices and conducted lengthy technology evaluations, even when product differences had no material impact on the bank's goals. To shift tactics, the company's CIO identified the minimal deviations required from the reference architecture and presented to all the stakeholders examples of companies across industries that had succeeded with the same approach. Executives agreed they had the setup, market positioning, and talent pool to achieve similar results, and the CIO's team quickly began building the new architecture and ingesting data.

Importantly, this isn't a one-and-done exercise. Each quarter, technology leaders should review progress, impact, funding, and alignment with strategic business plans to ensure long-term alignment and a sustainable technology build-out. One global bank implemented a new supply-based funding process that required business

Exhibit 1

**A reference data architecture for AI innovation streamlines the design process.**




units to reprioritize their budgets quarterly against immediate business priorities and the company's target technology road map before applying for additional funds. This new process helped the bank overcome underfunding of $250 million in the first year while gaining immediate business impact from refocused efforts.

## 2. Build a minimum viable product, and then scale

Organizations commonly view data-architecture transformations as "waterfall" projects. They map out every distinct phase—from building a data lake and data pipelines up to implementing data-consumption tools—and then tackle each only after completing the previous ones. In fact, in our latest global survey on data transformation, we found that nearly three-quarters of global banks are knee-deep in such an approach.[1]

However, organizations can realize results faster by taking a use-case approach. Here, leaders build and deploy a minimum viable product that delivers the specific data components required for each desired use case (Exhibit 2). They then make adjustments as needed based on user feedback.

One leading European fashion retailer, for instance, decreased time to market of new models and reduced development costs when it focused first on the architectural components necessary for its

[1]The McKinsey Global Data Survey garnered responses from more than 50 banks, representing various regions and company sizes. To ensure comparability of results and identification of key trends, several questions on key industry trends and demographics were extracted.

Exhibit 2

## Each common business use case is associated with components of the data architecture.

Illustrative

**Most common use cases, by component**

AI tools

- Chatbots
- Marketing technology (eg, customer data platform or campaign management)
- Relationship-based pricing
- Intelligent dashboards showing spending patterns

Application programming interfaces (APIs)

- Data monetization
- Data ecosystems
- Virtual assistants
- ID proofing
- Master-data management

| Data warehouse | Data lake | Data streaming |
|---|---|---|
| • Financial reporting (profit and loss, balance sheet)<br>• Credit-risk reporting<br>• Loan-application scoring | • Campaign and performance reporting<br>• Predictive marketing<br>• 360-degree customer view<br>• Compliance (drawing on historical stores of multiple data types)<br>• New use-case and model testing | • Personalization<br>• Anti-money-laundering (AML) fraud and transaction monitoring<br>• Real-time data ingestion |

Shared ingestion layer

- Fast access and test-and-learn research and development via AI sandboxes

priority use cases. At the outset, leaders recognized that for data-science teams to personalize offerings effectively across multiple online and mobile channels, including social channels, they would need fast access to data. Previously, data scientists had to request data extracts from IT, and data were often outdated when received.

The retailer's focus on the architecture its use cases required enabled development of a highly automated, cloud-based sandbox environment that provides fast access to data extracted from a shared, company-wide ingestion layer; an efficient manner to spin up analytics and AI sandboxes as needed; and a process to shut them down when they aren't needed. Whereas physical and virtual environments could once run up IT bills for months and years, such environments can now be accessed on the cloud for less than 30 minutes—the average amount of time that they're actually needed—generating substantial cost savings.

Once organizations finish building the components for each use case, they can then scale and expand capabilities horizontally to support other use cases across the entire domain. In the case of the retailer, as

new personalized offerings become ready for deployment, the organization moves the selected data features into curated, high-quality data environments for production access.

## 3. Prepare your business for change

Legitimate business concerns over the impact any changes might have on traditional workloads can slow modernization efforts to a crawl. Companies often spend significant time comparing the risks, trade-offs, and business outputs of new and legacy technologies to prove out the new technology.

However, we find that legacy solutions cannot match the business performance, cost savings, or reduced risks of modern technology, such as data lakes. Additionally, legacy solutions won't enable businesses to achieve their full potential, such as the 70 percent cost reduction and greater flexibility in data use that numerous banks have achieved from adopting a data-lake infrastructure for their ingestion layer.

As a result, rather than engaging in detailed evaluations against legacy solutions, data and technology leaders better serve their organization by educating business leaders on the need to let go of legacy technologies. One telecom provider, for example, set up mandatory technology courses for its top 300 business managers to increase their data and technology literacy and facilitate decision making. As part of the training, the data leadership team (including engineers, scientists, and practitioners) shared the organization's new data operating model, recent technology advances, and target data architecture to help provide context for the work.

In addition to educating business leaders, organizations should refocus efforts from their legacy stack to building new capabilities, particularly in the infrastructure-as-a-service space. A chemical company in Eastern Europe, for instance, created a data-as-a-service environment, offloading large parts of its existing enterprise resource planning and data-warehouse setup to a new cloud-based data lake and provisioning the underlying data through standardized application programming interfaces (APIs). This approach reduced time to market and made it easier to use fast-paced analytical modeling, enabling new customer-360 and master-data-management use cases, while reducing the complexity of the overall environment.

## 4. Build an agile data-engineering organization

In our experience, successful modernization efforts have an integrated team and an engineering culture centered around data to accelerate implementation of new architectural components. Achieving this requires the right structural and cultural elements.

From an organizational perspective, we see a push toward reorienting the data organization toward a product and platform model, with two types of teams:

— Data platform teams, consisting of data engineers, data architects, data stewards, and data modelers, build and operate the architecture. They focus on ingesting and modeling data, automating pipelines, and building standard APIs for consumption, while ensuring high availability of data, such as customer data.

— Data product teams, consisting mostly of data scientists, translators, and business analysts, focus on the use of data in business-driven AI use cases such as campaign management. (To see how this structure enables efficiency across even the larger, more complex organizations, see sidebar, "Sharing data across subsidiaries.")

The cultural elements are aimed at improving talent recruiting and management to ensure engineers are learning and growing. A Western European bank is cultivating a learning culture through a wide range of efforts:

— *Providing engineers with clearly documented career paths.* This includes establishing formal job levels for engineers based on their productivity, with promotion rounds based on qualitative feedback, their contributions to open-source communities, their management skills, and their knowledge, all assessed against

## Sharing data across subsidiaries

Across industries, regulators and companies' risk, compliance, supply chain, and finance departments are increasingly asking for granular data access covering the headquarters and subsidiaries. On the regulatory side, for example, companies exporting products that can be used for both civilian and military applications must provide regulators full transparency across the value chain. On the operational side, such transparency can help provide more advanced insight into global supply chains and operations and improve productivity, reducing the resources needed to build and manage an end-to-end data architecture in every country.

In response, organizations are moving toward defining data-architecture strategies that can transfer learnings from headquarters to subsidiaries or vice versa. Companies that do this well, such as Amazon, Google, and Microsoft, harmonize their business and technology delivery models. This entails setting up a global team with a clear product owner, who owns the global data model, and dedicated data architects and engineers, who create a shared data vault containing the granular transaction data of the subsidiaries. Local engineers within the subsidiaries then make any customizations they need while remaining aligned with global teams.

By taking this approach, a French bank drastically improved the quality of its anti-money-laundering and know-your-customer reporting while lowering the cost of the data architecture for subsidiaries by 30 percent. These positive results have laid the foundation for groupwide scaling of another data lake to support other use cases, such as calculating risk.

a structured maturity grid. The bank also revised its compensation structure to ensure that engineers at the highest job levels receive compensation comparable to that of senior managers in IT, data, and the business.

— *Adopting a pragmatic approach to assessing expertise levels.* Research indicates that expert engineers are eight times more productive than novices, so the success of modernization efforts depends on effective recruitment, management, and organization of talent. To provide a consistent measurement for recruiting, upskilling, and advancement, the bank used the well-known Dreyfus model for skill acquisition to identify five aptitude levels from novice to master, rate observable behavior through key indicators, and develop individual training plans based on the feedback.

— *Establishing a culture of continuous technology learning*. Continuous learning requires the sharing of expertise through formal and informal forums, peer reviews, and freedom to pursue online training courses, certifications, and virtual conferences. To support this, bank leaders have instituted an agile performance-management model that emphasizes both knowledge and expertise. At other organizations, the performance measurement of top executives and team members includes their industry contributions; their success metrics might include, for example, the number of keynote presentations they deliver throughout the year.

— *Emphasizing engineering skills and achievements.* To emphasize technical skills, the bank encourages everyone in IT, including managers, to write code. This creates a spirit of craftmanship around data and engineering and generates excitement about innovation.

## 5. Automate deployment using DataOps

Changing the data architecture and associated data models and pipelines is a cumbersome activity. A big chunk of engineering time is spent on reconstructing extract, transform, and load

(ETL) processes after architectural changes have been made or reconfiguring AI models to meet new data structures. A method that aims to change this is DataOps, which applies a DevOps approach to data, just as MLOps applies a DevOps approach to AI. Like DevOps, DataOps is structured into continuous integration and deployment phases with a focus on eliminating "low-value" and automatable activities from engineers' to-do lists and spanning the delivery life cycle across development, testing, deployment, and monitoring stages. Instead of assessing code quality or managing test data or data quality, engineers should focus their time on code building. A structured and automated pipeline, leveraging synthetic data and machine learning for data quality, can bring code and accompanying ETL and data-model changes into production much faster.

One large pharmaceutical company is working to bring biometric insights to its front line more quickly using DataOps. It has defined automated ways to test new biometric analytics models against standards and developed a code library to optimize code reuse. It is currently defining an easier way to deploy models in production to reduce time lags between model development and use. Once completed, this will reduce the typical time required to deploy models and apply results, such as identifying the right mixtures, from weeks to hours.

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Today, most data technologies are readily available in the cloud, making adoption a commodity. As a result, the difference between leaders and laggards in the data space will depend on their ability to evolve their data architecture at a brisk pace to harness the wealth of data collected over decades and new data streaming in. Organizations that can't move as quickly risk derailing their digital and AI transformations. The five practices we have outlined, along with a positive vision and a compelling story for change, can enable organizations to move at the necessary speed, building momentum and value along the way.

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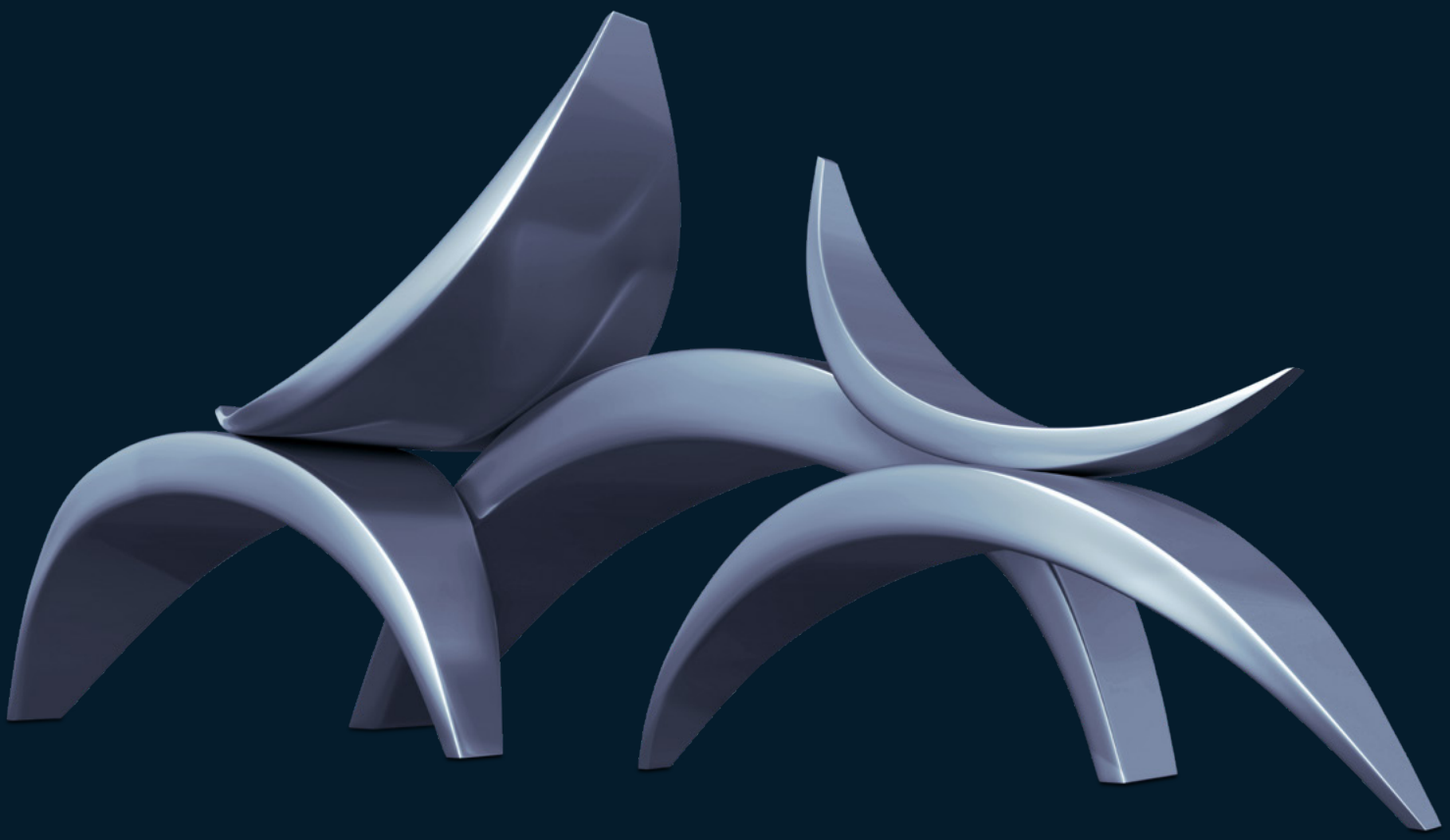
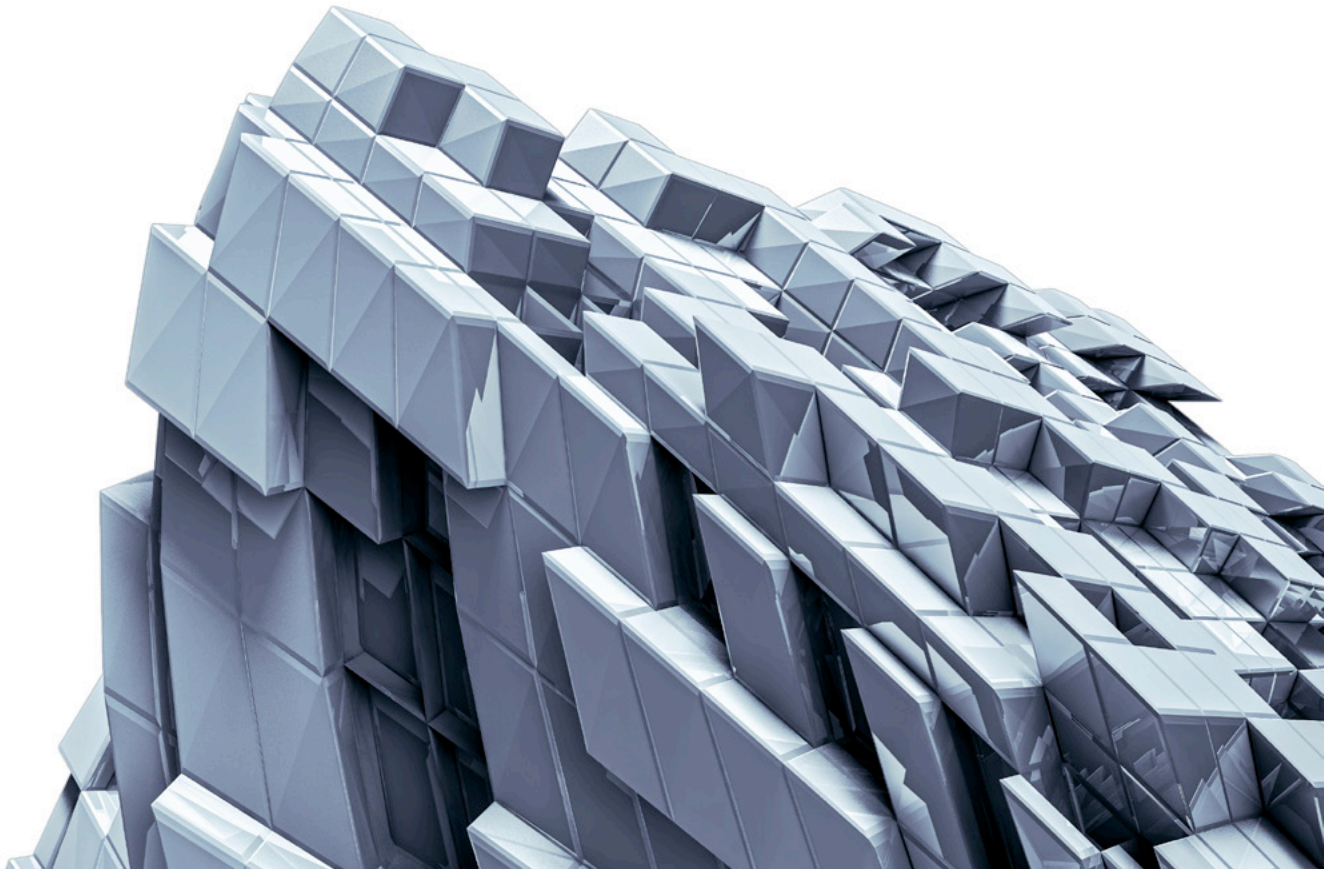
# 4. Future-proofing the foundation



# Managing large technology programs in the digital era

To successfully implement large technology systems, first accept the complexity, and then take these six actions.

*by Katya Defossez, Mark McMillan, and Hrishika Vuppala*



**Every IT executive** wrestles with implementing large technology programs.[1] In fact, two out of three large programs regularly exceed initial budgets, miss schedule estimates, and underdeliver against business objectives and benefits, often by significant margins.[2]

Our past research has found that 25 to 40 percent of programs exceed their budget or schedules by more than 50 percent. This failure rate is especially debilitating for the business because large programs are typically of critical importance—for example, for consolidating multiple financial systems to enable better operational insights or for implementing health-insurance enrollment systems.

That failure rate does not have to be the norm. A number of new digital practices and technologies that have emerged in the past few years can drastically improve large program implementations. When combined with disciplined managerial and talent practices to effectively deal with the vast complexity of large technology programs, success rates can be as high as 90 percent or more.

## What drives failure rates?

So what drives success (or failure)? If you ask 100 technology leaders, you are likely to get almost as many different answers, from unclear objectives to ineffective change management, poor team capabilities, or vendor deficiencies. Others would say excessive customization, the wrong platform decision, or ineffective decision making. In many ways, they are all right, and this reflects an overriding reality of large technology-implementation programs: they are extremely complex. While that shouldn't come as a big surprise, technology leaders continually underestimate the extent and depth of that complexity. For this reason, there is a natural tendency among IT leaders to think (wishfully, perhaps) that by employing a handful of simple fixes or by finding the right systems integrator, the vast majority of their large-program problems can be solved.

Unfortunately, success can occur only when tech leaders sufficiently acknowledge the complexity. In practice, that means driving superior execution across ten domains (Exhibit 1). Each of these domains is a significant topic unto itself, requiring cross-functional skills and capabilities for effective execution.

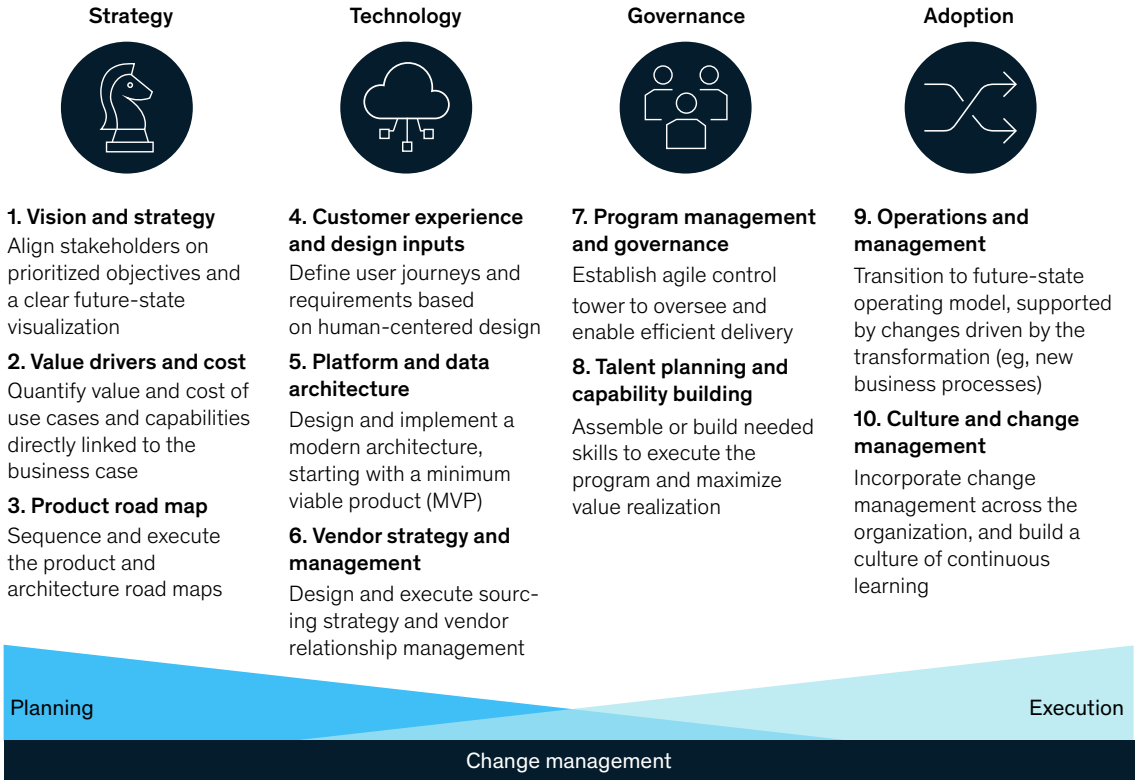
But the main consideration is how to balance the tremendous complexity of the program against the practical need to make progress. In our experience, hitting that balance successfully requires organizations to prioritize five to ten success factors for each of the ten domains and to develop large-program management capabilities accordingly. Traditional project management is simply not up to the complexities of managing a large number of interdependent workstreams, the need for technical mastery across many domains, and the importance of adjusting many dependent variables during the inevitable setbacks and challenges of a program at this scale.

For example, traditional project-manager training teaches managers to develop a sequential and precise timeline of actions from project start to finish and then to manage rigorously against those actions. For large, complex programs, this quickly becomes an impossible task, and the amount of work and rework needed to create this level of detail is not worth the effort. While big programs still need integrated schedules, they should not pretend to have it all worked out up front. Because of the interplay and dependence across domains (the architecture, for example, depends on the sourcing strategy, and the sourcing strategy depends on the architecture), the complexity can be effectively managed only by working through the domains iteratively and in parallel, not by laying out every possible step in advance.

[1] While there is no standard definition of a large technology program, more than $25 million in one-time investment can serve as a useful threshold.
[2] Michael Bloch, Sven Blumberg, and Jürgen Laartz, "Delivering large-scale IT projects on time, on budget, and on value," October 2012, McKinsey.com.

Exhibit 1

**Effective implementation of large programs requires superior capabilities across ten domains.**




## Six actions that make a big difference

In our experience working on more than 500 large technology-implementation programs, the chances for successfully executing against these ten domains significantly increase when tech leaders take six specific actions. Four of them take advantage of new digital capabilities, while two others are proven, long-standing approaches but are often neglected.

### Digital approaches

1. *Use select agile methods.* Even enterprises committed to agile development often are resistant to using agile for large programs. There have been, however, significant successes in programs that have embraced select agile methods: clear product ownership, prioritized product backlog and road map, small cross-functional teams, iterative releases with time-boxed sprints, modular architecture, objectives and key results (OKRs)[3] to manage value capture, and a commitment to a minimal viable product (MVP) and iterative releases. Agile mindsets can also be powerful in supporting a willingness to respond to change, test and learn, and collaborate.

One large organization, for example, started a claims-system modernization program by using the standard waterfall method. After spending the entire $200 million budget, the program was only a quarter of the way through development—and

[3] An approach to defining and tracking desired outcomes (versus activities).

what had been developed was a frustrating user experience and full of defects. The organization made the difficult decision to start over using an agile approach focused on small cross-functional teams working in sprints through active test-and-learn cycles with a stable of smaller vendor partners. The results represented a stunning turnaround for the program, improving delivery velocity and productivity more than threefold, with a massively improved user experience and a first release in months rather than years.

2. *Ground the work in design thinking.* Many large programs may meet requirements but not user needs. Successful large programs use design thinking—a method of problem solving anchored in end users' needs—to address this issue. The practice helps deliver products and services that users want and need and are therefore more likely to use. Another benefit is savings, since teams develop only those features that are needed.

For large programs, design thinking starts with uncovering user needs at the outset, typically through a blend of survey-based quantitative and field-based qualitative research. These efforts derive a clear picture of how people use the service or product, signature moments, and unmet needs. Regular and immersive user engagement throughout the program delivery—for example, in prototyping and user testing—then ensures the program maintains alignment with user needs over time.

One leading automotive company decided to modernize its product life-cycle management (PLM) systems. Instead of the traditional process of collecting requirements from R&D, production, sales, and after-sales, it applied design-thinking principles in cross-functional workshops and interviews to collect current pain points and requirements. Using the "digital twin" approach, it essentially created a digital simulation of a PLM system for the modernization team to work with. This enabled the team to identify clear issues, such as complex collaboration processes. Based on this effort, the company created a "data exchange" for suppliers, providers, and developers (among others) to drive better collaboration around product design specs and order management. This approach significantly improved collaboration among teams and accelerated the release of features.

3. *Use cloud-based services.* Most enterprise leaders still tend to reduce the benefits of cloud to efficiencies around infrastructure management. The capabilities, components, and services that many cloud service providers (CSPs) offer, however, allow companies managing large-program implementations to innovate much more quickly and get to market faster through rapid environment provisioning and simpler ways of prototyping or exploring novel solutions.

By migrating to the cloud while also rapidly scaling cloud-native features for analytics, database management, and content management, for instance, a state-government agency was able to consolidate and modernize three disparate legacy systems across millions of residents and become 30 percent more efficient in terms of operating costs. Running reports, which had been resource intensive and slow, happened much more quickly on the cloud. The agency also took advantage of the CSP's call-center-management application, which greatly

**So what drives success (or failure)? If you ask 100 technology leaders, you are likely to get almost as many different answers.**

simplified a system that had previously relied on multiple providers.

For large programs, leaders need to systematically evaluate how best to take advantage of the cloud. Selecting a software-as-a-service (SaaS) solution, for example, can avoid the effort of a custom build and can result in a best-in-class solution that is easier to maintain. Or leveraging a platform-as-a-service (PaaS) solution can enable greater developer productivity and access to an ecosystem of thousands of innovative services.

4. *Use modular architecture to increase flexibility and vendor competition.* Many organizations are moving to more modular, flexible architectures, such as microservices. This move not only creates longer-lasting, more "future-proof" applications but also allows companies to use a multi-vendor sourcing strategy and thus solve one of the longest-standing challenges with large-program delivery: keeping vendor incentives aligned with your own. With single-vendor solutions, it's nearly impossible to apply steady cost pressure, as often a significant risk premium is worked into a fixed-price contract and change orders are common. Alternatively, time-and-materials contracts create incentives for vendors to extend and expand programs and thus grow their revenue stream.

Instead, modular architectures allow companies to work with multiple vendors who can be replaced as needed, leading to significantly better outcomes. For example, one public-sector organization awarded a development master-services contract to four development vendors. For each phase of the program, the vendors either competed or were directly awarded small packets of work, such as front-end design services or development and testing services for each component. Over time, the strongest-performing vendors—those bringing their A team at reasonable cost—won more of the work, leading to superior outcomes.

**Proven approaches**

5. *Get people with large-program (ideally comparable) experience.* Given the complexity of large program implementations, it is crucial to have people who have already done them, or something comparable. There is just no substitute for that kind of experience and "pattern recognition." Without it, failure is far more likely. As might be expected, these people are hard to find, especially since these sorts of large programs happen infrequently for most organizations.

IT leaders naturally try to address this issue by bringing together a team of the best people they can find. But ensuring this team addresses their talent gaps requires an honest assessment of the team's existing talent and a willingness to bring in the right people, either by hiring them or contracting with vendor partners. This can be time consuming, but it is necessary. Hiring a systems integrator to fill the holes often won't work, since it has different incentives—scope creep or delays increase its revenue—and is focused on delivering against the contract rather than ensuring you are doing everything needed to manage the program effectively.

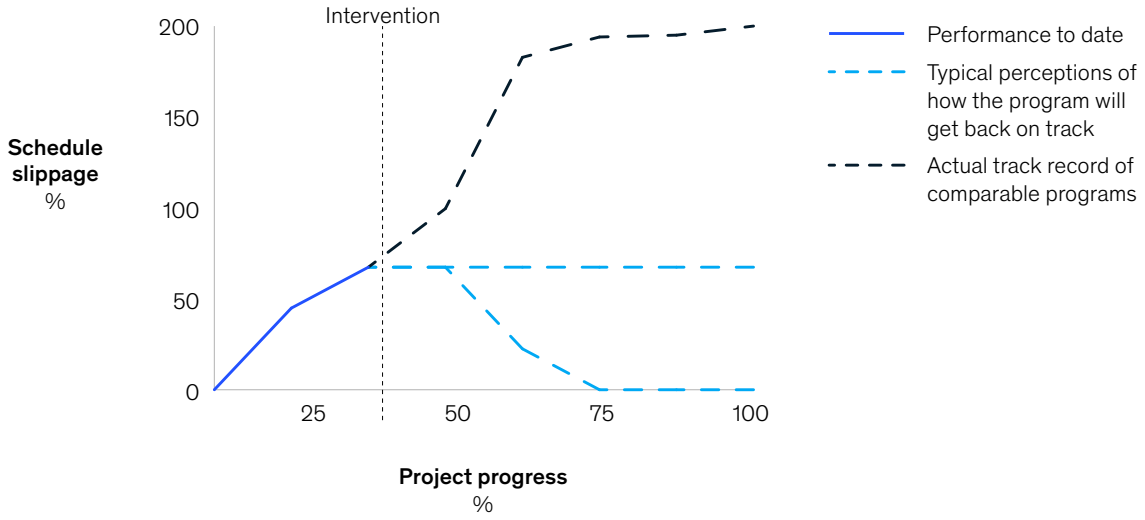
6. *Be aggressive about necessary course corrections.* Any program of this scale is going to run up against issues. When that occurs, CIOs and the leadership team analyze the problem and recommend a correction. But these interventions are often not aggressive enough to get to the root cause of the problem. That's understandable, since these programs are so complex. Their multiple interdependent systems can make it difficult both to pinpoint the source of the issues and to muster the often significant effort needed to course correct.

However, an unwillingness to admit—or the inability to realize—that the issues are more complex and require more work than anticipated means that problems continue and often get worse. The research is quite clear on this point. Early cost and schedule overruns end up, on average, much worse in most programs, often costing twice as much as anticipated—and that's despite the interventions of program leaders (see Exhibit 2 for an example analysis).

Fortunately, there are many examples of successful interventions. One public-sector organization, having invested $60 million of its $200 million budget for a tax-processing

Exhibit 2

**Despite interventions, issues typically get worse over a project's life cycle.**




modernization program that was way behind schedule, decided to forfeit the initial investment and start over by making some aggressive changes. It first hired a new systems integrator and software vendor. It then developed a new business case as a "north star" to guide the relaunched program. The results: a successful project for less than $125 million—less than its original budget, even accounting for the initial sunk investment.

These and other examples show that organizations can be successful with their most important technology investments—if they master a broad array of success factors, take advantage of new digital techniques to de-risk delivery, and ensure they have the right capabilities from the start.

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