McKinsey Digital

Unlocking business acceleration in a hybrid cloud world

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Abstract

Across industries, CEOs share a top priority: harness technology to jump-start growth, accelerate time to market, and foster innovation. Chief information officers (CIOs) recognize that the C-suite depends on them to achieve growth and meet rising expectations for agility. They increasingly view IT modernization—including migrating to the cloud, adopting new application architectures, and building on cloud-native services—as a way to sustain these goals. To date, however, most companies have not captured the anticipated agility benefits because a number of challenges hinder technology leaders as they push ahead with modernization initiatives. While many of these challenges are valid, we also find some are false trade-offs that can be avoided.

New McKinsey research highlights that cloud migration needs to be combined with a comprehensive organizational approach to allow for a much more effective agile transformation. CIOs need to promote the transformation mind-set of focusing on differentiated business value by adopting agile processes, automating policies, and upskilling talent across the entire organization. They need to look beyond technology to change the way their IT organization operates across three foundational elements: people, processes, and policies. Priorities include upskilling existing talent and creating new roles (such as site reliability engineers, full-stack engineers, and data scientists), revamping procedures by adopting agile development processes with security integrated into every step, and enforcing policies through automation. The research delves into the practices of leaders versus that of laggards and distills the key “unlocks” that can help organizations move to higher levels of business agility as they pursue increased cloud adoption.

McKinsey & Company has published this report based on its independent research. McKinsey does not endorse any technology vendor, product, or service.

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Introduction

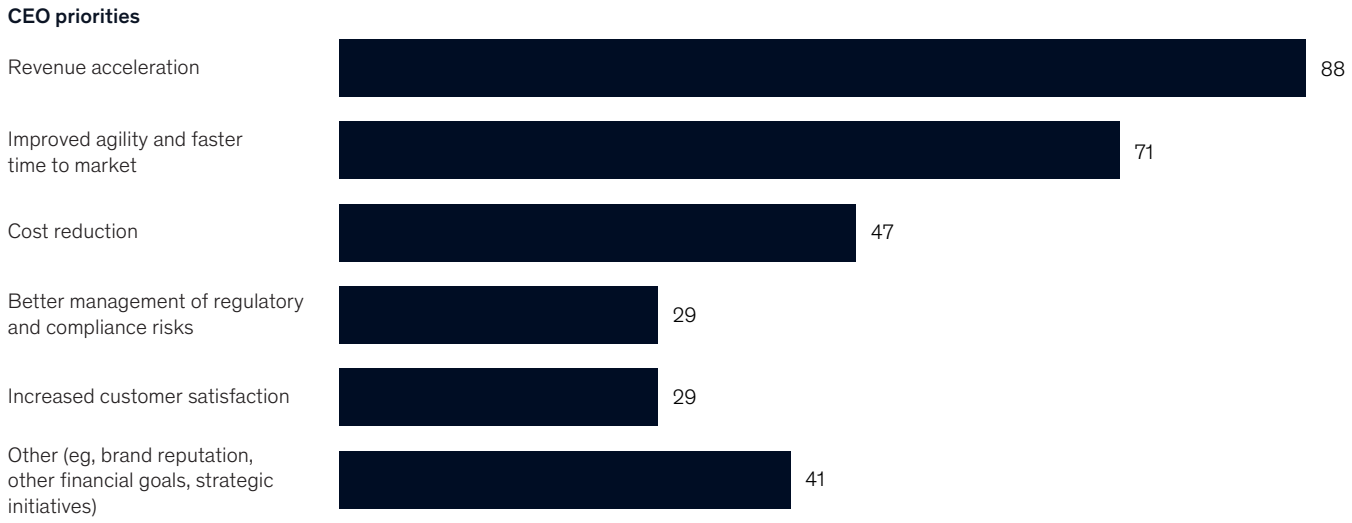
Digital technologies continue to transform every facet of business. Across industries, CEOs have a consistent top priority—harness technology to jump-start growth, speed time to market, and foster innovation. Several factors are ratcheting up pressure: investors are valuing top-line revenue growth; rising customer expectations for simple cross-channel experiences are compelling companies to systematically tear down silos; and an organization's ability to respond to market shifts is becoming a core differentiator. Meanwhile, digital leaders across sectors have changed the competitive landscape by demonstrating that agility and velocity can beat scale.

Senior technology leaders are feeling this pressure. In recent McKinsey research, when chief information officers (CIOs) or equivalent tech leaders were asked about their CEO's top priorities (see sidebar "About the research"), 71 percent pointed to agility in reacting to changing customer needs and faster time to market, while 88 percent of respondents cited revenue acceleration (Exhibit 1).

Exhibit 1

To stay relevant and ahead of the competition, CEOs across industries are prioritizing growth and speed of innovation over cost.

"What would you say are the top 3 priorities for your CEO?"
Chief information officers who mentioned this as a top 3 CEO priority, %



Source: McKinsey expert interviews (*N*=52)

These priorities are playing out across every industry, with huge implications for business models.

— A clothing company, for example, traditionally had several weeks between the introduction of a new product line in stores and when competitors could get their cheaper versions to market. That cushion has dropped significantly thanks to digital channels: the company indicates that it now has just 48 hours to launch a new design and gain buyers through digital, direct-to-consumer routes, and rapid (sometimes same-day) delivery.

— A digital-media company regularly saw spikes in viewership upon releasing new content, so its need to ramp up infrastructure in order to accommodate increases in demand has suddenly become critical to satisfy its subscribers.

— In financial services, a line-of-business leader at a large retail bank cited tremendous pressure to shorten product-development cycles. The industry's average product release time has ranged from nine to 24 months—a glacial pace compared with that of fintech companies, which can deploy code daily and run dozens of A/B tests a month.

The common thread running through these examples is the ongoing, urgent need to gain market advantage through business acceleration.

Sidebar

About the research

To gain a better understanding of the challenges organizations face in modernizing their IT infrastructure, McKinsey conducted in-depth interviews with the tech leaders (chief information and technology officers) at 52 enterprises in the spring of 2019. The sample studied companies from 17 industries with global operations. Of respondents, 78 percent work at organizations with at least 5,000 employees, and 44 percent work at companies with annual revenues in excess of $10 billion.

Role of digital and the ever-increasing reliance on technology leaders

IT strategy has long been part of business strategy, but C-suite executives (CxOs) are increasingly seeking a larger impact from investments in digital technologies. Digital innovation has become central to the full range of business transformation initiatives and is no longer just one category among many.

Since technology is integral to a company's performance and competitiveness, identifying prudent investments in IT modernization becomes even more critical. CEOs recognize the importance of getting it right: good choices establish a favorable course, and the business soars; however, poor choices will siphon away much-needed organizational energy and resources and undermine competitiveness.

The task of translating ambitious tech-driven strategies into accelerated performance falls to CIOs and chief technology officers (CTOs). Approximately 95 percent of the CIOs indicated that at least two of CxOs' top three priorities are dependent on them—and almost 60 percent said all three were dependent on their tech teams (Exhibit 2). This major cross-sector shift brings a new, deeper degree of focus to achieving modernization faster and more broadly across the IT landscape.

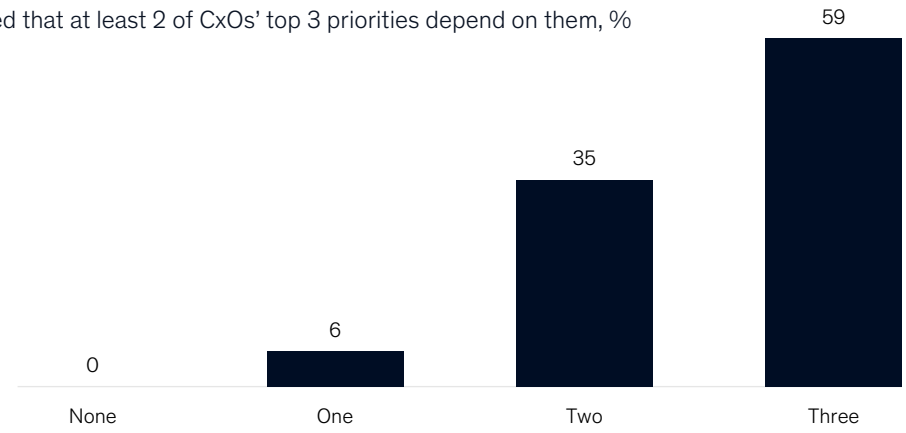
As a CTO at a large US insurance company points out, "I think all CEO priorities depend on the office of the CTO. It is all about bringing products to market faster. We have to innovate on new policies and change our business model rapidly." And the CIO of a retailer indicates that the IT team is mutually accountable with the chief marketing officer (CMO) to achieve the growth objective: "The CIO and CMO will have to work together. We have common metrics to track. If a campaign fails, both of us are on the hook. So to say that the CMO is dependent on me to deliver the objectives is an understatement. It's our joint responsibility."

Exhibit 2

IT leaders clearly realize CxOs' dependence on them to deliver on growth priorities and agility expectations.

"Which of the top 3 CxO priorities depend on you?"

CIOs who indicated that at least 2 of CxOs' top 3 priorities depend on them, %



Source: McKinsey expert interviews (*N*=52)

The IT infrastructure modernization imperative

To meet CxO and board expectations, IT modernization is critical. According to our research, CIOs believe that the organization cannot capture agility benefits by simply shifting applications to cloud platforms. Instead, they recognize the need to reassess the infrastructure stack and the way it works.

Emphasizing agility while managing cost and risk

When asked about the principal benefits of infrastructure modernization, CIOs prioritize increased agility and better quality of service to customers. They are also looking to reduce costs and improve their security posture (Exhibit 3).

CIOs see the cloud as a predominant enabler of IT architecture and its modernization. They are increasingly migrating workloads and redirecting a greater share of their infrastructure spending to the cloud. The companies we surveyed currently have around 50 percent of all workloads running on public and private cloud platforms. By 2022, that share is projected to rise to 75 percent, with roughly two-thirds of that workload housed in shared public platforms within data centers built out by the major cloud-service providers. Based on our sample, in the next three years, approximately 90 percent of organizations will either have more than 35 percent of their workloads running on public- or private-cloud platforms or double their workloads on cloud platforms (Exhibit 4).

While this migration represents a dramatic technology overhaul, astute tech executives also view it as a trigger to reevaluate how the IT function works. One large retail chain's CIO notes, "I need a forcing device

Exhibit 3

CIOs believe that business benefits cannot be achieved by lifting and shifting applications and need to rethink the infrastructure stack.

CIO reasons for pursuing infrastructure modernization

100 points allocated across

Source: McKinsey expert interviews (*N*=52)

to jolt my organization out of its old ways of working. I see cloud as that catalyst. Our current tools enable the old ways, not the new. Until we implement the tools and data, we can't reap the full benefits."

Identifying key challenges

Thus far, modernization efforts have largely failed to generate the expected benefits. Despite migrating a portion of workloads to the cloud, around 80 percent of CIOs report that they have not attained the level of agility and business benefits that they sought through modernization. Further analysis indicates that companies are falling short of their IT agility expectations, regardless of their level of cloud migration (Exhibit 5). Even organizations that have transitioned the majority of workloads to the cloud remain within the same range of IT agility as their slower-moving counterparts.

CIOs who indicated they aren't achieving the required agility to support CEO priorities cited several reasons. Despite cloud migration and infrastructure modernization, the IT operating model hasn't embraced the functionality of modern IT infrastructure. Many organizations focus on monitoring and troubleshooting rather than on activities that add business value, such as developing new applications or analytics capabilities that accelerate business decision making. One reason is that these organizations have accumulated a "tech debt," characterized by legacy architectures that can't be easily unwound and impede the speedy implementation or interoperability of new solutions. In addition, siloed organizations and traditional app-development practices lack the speed and responsiveness to meet heightened expectations. The energy and resources required to address these challenges can sap the organization, causing modernization efforts to falter before they achieve their full potential.

Our research found that CIOs face several entrenched challenges when pursuing IT modernization: survey respondents indicated talent gaps were their top barrier, followed by security and compliance requirements (Exhibit 6).

The CIO of an automaker reflects on the struggle of hiring candidates with the requisite cloud expertise: "Finding someone with skills similar to engineers who are attracted by large cloud providers and software as a service (SaaS) companies is too difficult."

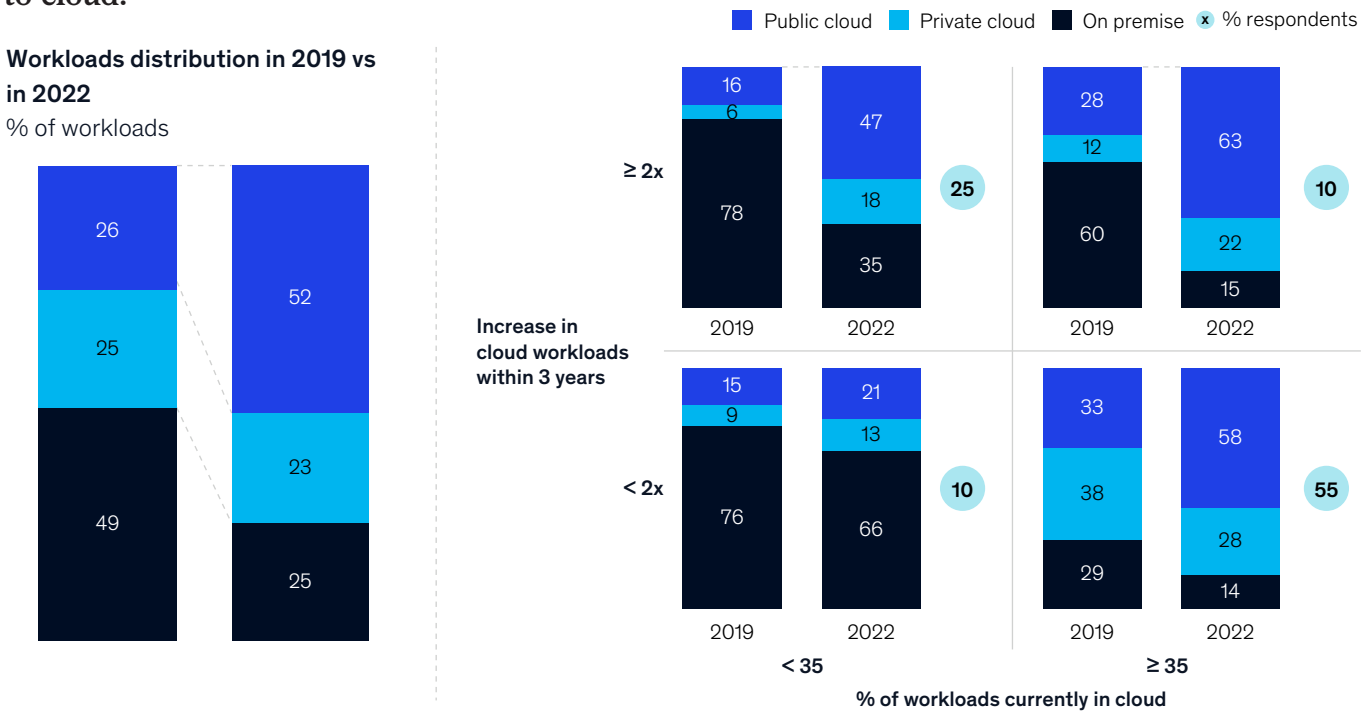
Notably, 28 percent of respondents cited the complexity of their current environment. The technology leader in financial services notes, "We were surprised by the hidden complexity, dependencies and hard-coding of legacy applications, and slow migration speed." Thus, it becomes critical for many applications to refactor for modern architecture. This approach—characterized by microservices and containerization—enables companies to balance the projected cost to run against cost to modernize, focus on the pace of innovation and enhancements, and improve responsiveness to fast-changing needs and dynamic markets. We have seen CEOs seek this guidance from their IT leaders and teams.

Managing trade-offs on the IT modernization journey

The inability of CIOs to achieve greater agility is in part due to valid constraints (such as gaps in skills and training), but our research finds that avoidable compromises also hinder progress. Few organizations have the luxury of starting with a clean-sheet approach to IT infrastructure, and so CIOs are making trade-offs in the name of balancing the ideal with the practical. Our analysis identified five common compromises that IT leaders feel they are frequently forced into and that negatively affect agility (Exhibit 7). Furthermore, some CIOs debate whether such compromises are valid or not. Some say these

Exhibit 4

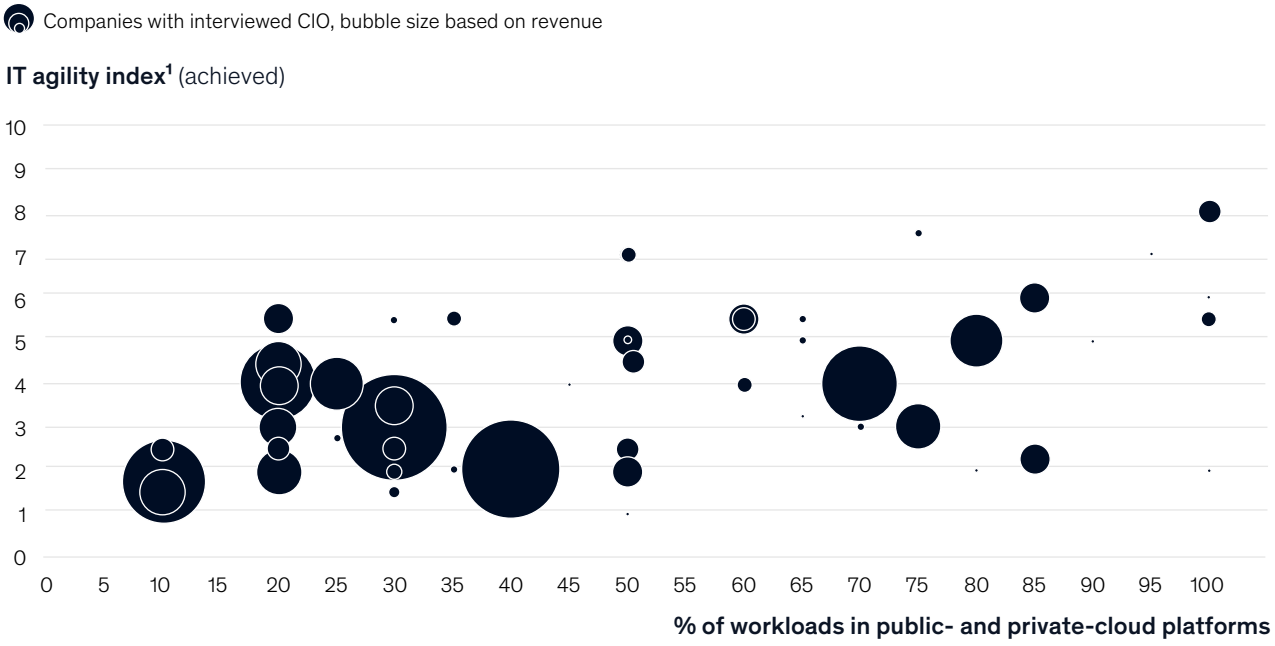
CIOs see cloud as crucial to modernizing technology and are increasingly migrating workloads to cloud.



Source: McKinsey expert interviews (*N*=52)

Exhibit 5

Analysis indicates that companies are falling short of their IT agility expectations, irrespective of migration level to cloud.



[1] Parameters used to calculate IT agility score are the following, self-reported and rated on a scale of 0 to 10: speed of application and feature development, maturity of IT operations automation, and agile application-development capabilities.

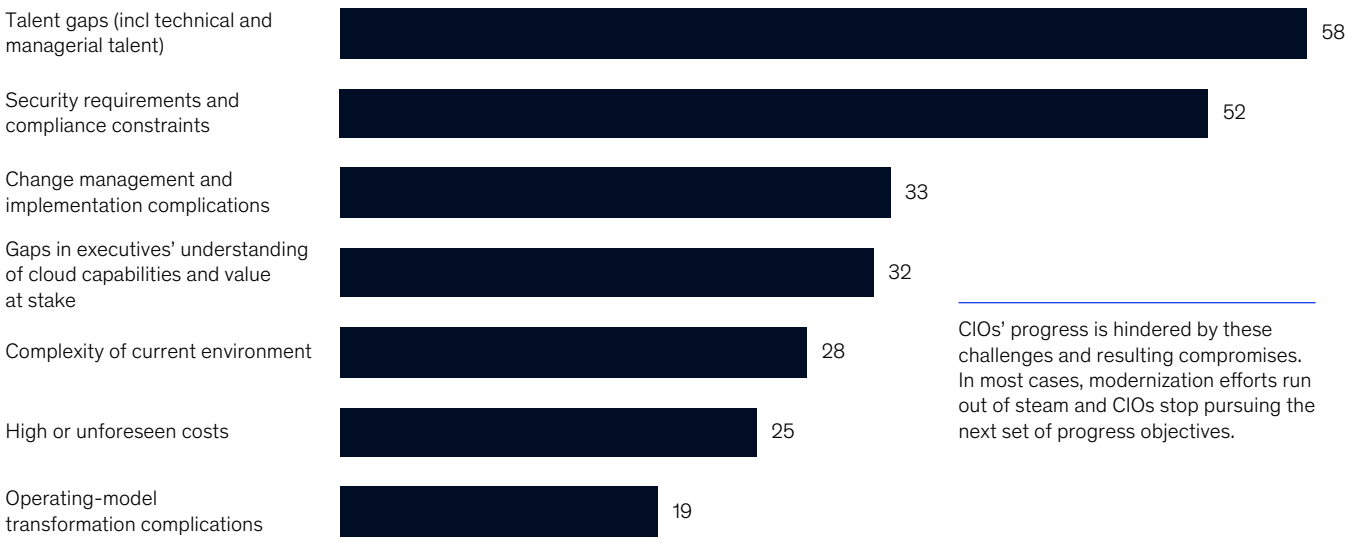
Source: McKinsey expert interviews (*N*=52)

Exhibit 6

CIOs' inability to deliver on agility objectives is due to valid constraints and challenges.

Top challenges CIOs are facing in infrastructure modernization

CIOs who indicated this as a challenge, %



Source: McKinsey expert interviews (*N*=52)

responses reflect real constraints, while others say that adopting new technology and operating-model innovations can easily address these constraints—hence, these are not trade-offs at all.

While a majority of CIOs indicate that they are living with these suboptimal choices, deeper analysis of companies that have successfully navigated these trade-offs highlights best practices to avoid these compromises and, in turn, increase business agility.

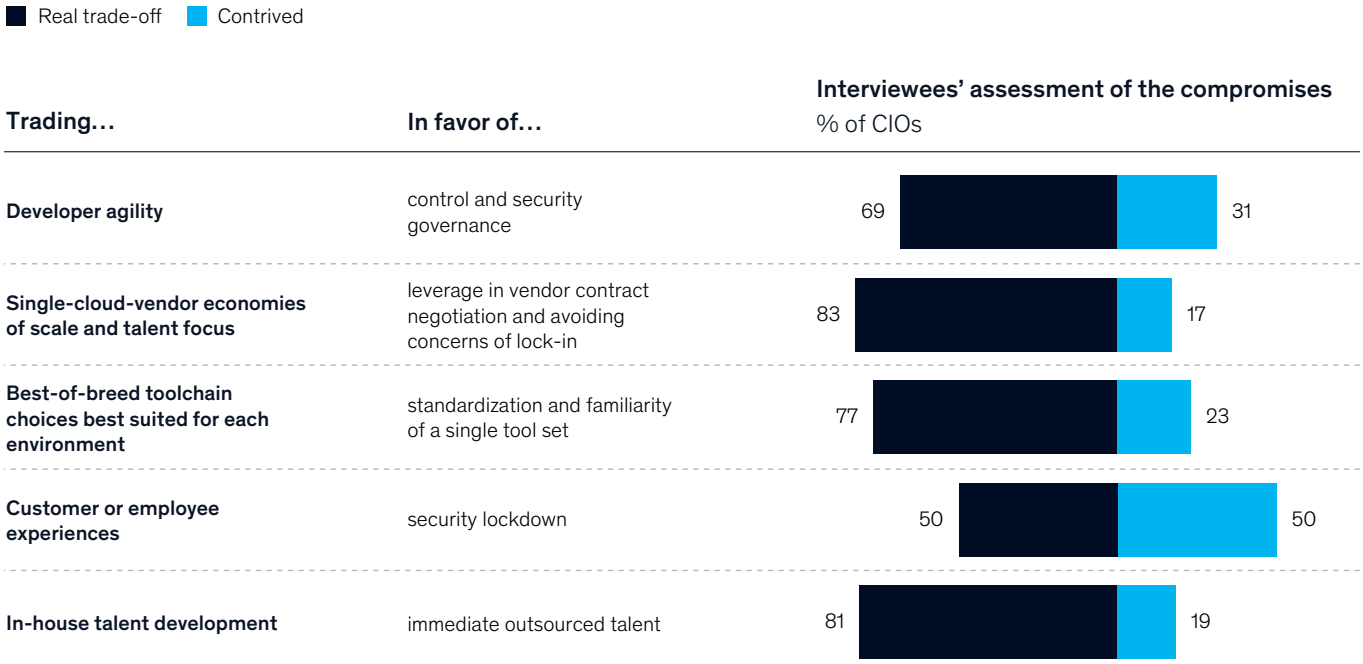
Giving up developer agility for the sake of control and governance. One of the top benefits of transitioning operations from legacy infrastructure to cloud-native solutions is the speed at which developers can work. However, 69 percent of organizations indicate that implementing stringent security guidelines and code review processes can slow developers significantly. According to the chief information security officer of a multinational cloud-based solutions provider, "In the old world, when a developer checks in bad code, I can find it and control the blast radius. But in cloud, it happens too fast—I still have those codes go through manual reviews and sign-offs." Some leaders have found a way to work around this compromise through the following approaches:

— *Acquiring and upgrading talent.* Leading companies hire developers with security architecture expertise and entrust them to design secure architectures from a project's inception.

— *Provisioning process improvements.* DevOps engineers use application programming interfaces (APIs) for environment creation, which include functions that specify secure configuration.

Exhibit 7

Some cases of compromise prove to be avoidable, according to CIOs' assessments.



Source: McKinsey expert interviews (*N*=52)

— *Changing development processes.* By bringing security teams more deeply into agile development and DevOps processes, companies have avoided the added complexity of cross-team coordination and alignment across development and security teams.

— *Investing in toolchain and technology.* CIOs are integrating the right set of DevOps toolchains that can automate security policies.

— *Automating code reviews.* Security-code scanners are used to conduct automated code reviews for common vulnerability.

— *Automating test suites for code elevation.* Development teams are investing in test-driven development, and test suites are foundational to automate the elevation of code from development to test, sandbox, and production environments.

— *Implementing developer self-service.* Standardizing the service catalog for infrastructure, implementing cost guardrails, and enabling self-service can speed infrastructure procurement approval processes for developers.

Forgoing single-vendor benefits in the name of avoiding vendor lock-in. Companies can realize economies of scale and build deeper expertise (especially given the cited talent shortages) if they use fewer vendors or deploy technology to allow them to scale across multiple vendors with common controls. For 83 percent of CIOs, the potential loss of flexibility from vendor lock-in can loom large, forcing them to choose multiple vendors and thereby split their focus, divide their talent to learn and work on different vendor solutions, and reduce their speed of execution. The CIO of a North American retailer notes that when it comes to picking public-cloud providers to migrate applications, "This is a true debate. Without multiple vendors, you run into technical and financial lock-in."

CIOs can also accelerate application development by using native services offered by providers. However, in some cases developers are being discouraged from creating new dependencies on native services because of concerns that it will be harder to move away from the platform if needs evolve in the future. As a CIO for a professional services company explains, "We don't see concerns of vendor lock-in with public-cloud providers by betting on a single vendor. This is not a new concept for us. However, some of our stakeholders take a different view. They hear about outages and want us to source from two or more providers." Help is coming in the form of emerging solutions that work across cloud-service-provider platforms, enabling enterprises to avoid this compromise. In the meantime, leaders are working around vendor lock-in through the following methods:

— *Abstracting infrastructure.* Seasoned architects are choosing technologies such as containerization to abstract infrastructure and to enable portability across disparate environments.

— *Minimizing dependencies on infrastructure or platforms as a service (IaaS or PaaS).* Developers at leading companies build applications that are not tied to platforms by avoiding using proprietary cloud services offered in the PaaS layer. And in cases that necessitate dependencies, developing modular code enables services to be easily swapped out when companies move from one cloud provider to another.

— *Safeguarding contracts.* Companies concerned about future price increases from cloud providers draft and negotiate contracts that both set boundaries and offer downside protection from escalation of costs.

— *Educating executives and the board on vendor strategy.* CIOs and CTOs who prefer using a single cloud provider are making the effort to educate board members and collaborate with them to come up with solutions for vendor lock-in or service disruptions.

Missing out on the benefits of best-of-breed tool kits for the sake of standardization and familiarity. Toolchains optimized for different environments—and those with which developers and operators are most familiar—help boost productivity. In our research, 77 percent of CIOs expressed concern over having to standardize a lowest-common-denominator solution. Consequently, this trade-off means accepting reduced functionality and fit for the work at hand. Modern developers need to be free to choose combinations of languages, libraries, and frameworks that enable accelerated delivery. Leading companies are working around this trade-off in the following ways:

— *Adopting open, vendor-agnostic solutions.* Emerging cross-platform open-architecture and open-source solutions provide coverage for hybrid and multicloud environments.

— *Continuously upskilling talent.* IT organizations are adopting best-of-breed tools and investing in upskilling for developers and operators on multiple solutions.

Trading customer and employee experience for the sake of security. Providing reliable "anytime–anywhere access" of applications to users (developers or agile teams in marketing, for example) allows organizations to rapidly innovate, respond to customer needs, and scale up tests and experiments. It also enables employees to be more productive and complete tasks from anywhere. In our research, we observed leaders pursuing the following strategies to improve customer experience without compromising security:

— *Adopting a DevSecOps approach.* IT organizations are pursuing a DevSecOps style of management for high-velocity code and model-development pipelines. Doing so not only combines the security and DevOps functions—it also blurs lines across formerly distinct roles in "waterfall" software development life cycles, simplifying the end-to-end application development and delivery process.

— *Adding layers of security.* Leaders are implementing multiple layers of security, especially for identity and access management. They are using multifactor authentication and refreshing end-point security for applications that are accessed remotely or use mobile devices.

— *Investing in data security.* IT organizations are investing to not only secure their data, the perimeter, and applications, but also to encrypt at-rest and in-motion data.

— *Remediating applications.* Companies are remediating applications opened up for external access to employees and end users.

— *Assessing security automatically and more frequently.* Leaders have increased the frequency of application scanning and penetration testing (against apps and source code).

— *Ensuring application version compliance.* Automating patch scheduling for external-facing apps ensures compliance with the latest, most secure versions.

Delaying talent development and upskilling and augmenting talent with contractors. A shortfall of tech talent is a recurring challenge for CIOs. Companies often feel they face two options: develop in-house capabilities slowly or rely on external vendors to get initiatives done quickly. Despite the best intentions to build capabilities, IT teams often compromise by outsourcing projects to contractors or partners to patch holes in their talent pipelines. The challenge is that a short-term solution often leads to long-term dependence—without a parallel focus on promoting skills transfer, retraining current staff, and systematically backfilling contractors. Leading companies tackle this issue in several ways:

— *Hiring new talent.* IT functions are investing in the cloud operations talent and developers who bring modern full-stack skills and mind-sets. These workers represent a truly strategic resource, assuring that any cloud modernization effort accounts for skill building—even if organizations need a boost from contractors to get rolling quickly.

— *Building capabilities with external help.* Companies are bringing in external expertise for skill building (such as agile team facilitators, DevOps coaches, and analytics and data science practitioners) to augment in-house talent.

— *Offering employee-education programs.* Companies are providing their employees with tuition and external-training expenses for selected continuing education, such as AI and machine-learning programs, accelerated software engineering reskilling programs, and DevOps training.

— *Partnering with technology vendors.* IT collaborates with vendors such as cloud service providers and other partners to gain expertise and educate in-house talent.

— *Freeing up capacity to invest in new skills.* Automating routine monitoring, reporting, and troubleshooting tasks can create capacity for operators to develop new skills and take on additional responsibilities.

Unlocking the full range of business benefits through an operating-model transformation

Technology leaders can avoid making these trade-offs by harnessing the right combination of IT solutions in their hybrid environment—ranging from on-premise platforms, edge nodes, and cloud services. But no matter how powerful, technology on its own is insufficient to achieve acceleration. So CIOs must transform their operating model to see material benefits, including shorter time to value, improved business agility, and reduced business risk. Business acceleration is best achieved by extending IT modernization efforts to encompass far-reaching changes in the operating model along three dimensions: people, processes, and policies.

People

Many enterprises have IT workforces with specialized skill sets and knowledge developed over years (for example, about custom legacy systems and platform configurations). But this expertise is increasingly outdated—even if the knowledge of a business or functional domain is not. In such cases, organizations must make significant investments to retrain, upskill, or reskill their employees. In addition, the IT function typically covers a range of roles: networking engineers, capacity planners, system administrators and operators, data storage and security specialists, analysts, developers, quality-assurance (QA) engineers, database administrators, data architects, and many more.

We see an opportunity for organizations to radically simplify their IT team structures. Specifically, they can consolidate positions to a smaller set of critical roles that bring together skills formerly divided across jobs. These roles will move from structured tasks (likely to be replaced by increasingly powerful IT-management tools) toward more fulfilling ones (adapted to a world of increasing automation). Instead of supplying more resources or convening cumbersome investigations over a system instability, the best companies will develop the talent to address root problems (for example, going under the hood and changing how code consumes infrastructure resources).

Processes

Many organizations depend on ad hoc manual operations and adopt a reactive stance, building excess capacity to provide reliability. Design decisions are marked by a lack of transparency and coordination across different functions in IT, resulting in more expensive custom solutions that still underperform. And when incidents arise, they are often funneled to technology silos. These functions either are slow to respond or depend on orchestrating numerous internal and vendor resources to manage escalated incidents and resolve problems.

The ideal organization does little to no infrastructure planning and instead uses a DevOps approach and self-service to expedite the development and implementation of solutions. In other words, rather than estimating demand and planning for worst-case scenarios, a company can simply be agile in ramping up resources as needed. The IT function focuses on customer-centric journeys rather than product- or service-centered processes. After setting a course, IT automation delivers the necessary service levels to optimize the user experience despite changing conditions and surprises. For example, self-driving cars hold the potential to automate travel on even chaotic roads; however, no "IT drivers" are ready to take their hands off the wheel just yet. So the tremendous potential of process automation must be designed to complement judgment and the uniquely human capabilities needed to assure reliability, scalability, and security.

Policies

Typical organizations have policies for a wide range of issues—such as security, information access, and data management. These are often manually enforced, increasing the cost of compliance and reducing effectiveness. As such, companies can struggle to maintain consistency across existing environments and extend established policies to new environments. Slow response times to evolving internal rules and external regulations result in increased business risk. Furthermore, many of these policies were developed for older IT paradigms, serving to reinforce legacy ways of working and hindering agility and speed.

Leading organizations are characterized by policies that engage technology for automatic distribution of change as well as for monitoring and enforcement. Standard policies across hybrid environments (for example, on-premise and cloud) lead to better compliance at lower cost. These companies can quickly respond to and mitigate emerging business risks by consistently pushing policy changes out across their hybrid operating environments.

We examined the three dimensions of people, processes, and policies and identified 15 constituent elements that can be used as the foundation for IT leaders to transform the way they operate (Exhibit 8).

Overall, we see tremendous opportunities to accelerate progress on business agility—*if* organizations are ready to take the right steps across all these elements to transform the way they work.

The tremendous potential of process automation must be designed to complement judgment and the uniquely human capabilities needed to assure reliability, scalability, and security.

Exhibit 8

Each archetype has unlocks to reach the frontiers of business agility across people, processes, and policies.

Dimension			Elements	Description
People		1	Structure	Team construction and cross-functional collaboration model that sets up rapid experimentation and execution in an agile manner
		2	Talent or roles	Skill, capabilities, and integrated roles adapted for a world of increasing automation, rather than roles defined based on tasks
		3	Objectives or metrics	Objectives and key results (OKRs) that act as robust indicators of leading and lagging business outcomes to optimize for
Processes	Plan	4	Demand management	Techniques that dramatically reduce time from demand generation to fulfillment based on self-service and automated methods
		5	Investment planning	Infrastructure and operational framework to rapidly market-test initiatives and shape investments in line with rates of adoption
	Build	6	Service presentation	Catalogs and underlying automation that enable stakeholders to request and consume services in a zero-touch manner
		7	Configuration management	Infrastructure-agnostic configuration principles based on open standards and continually audited and enforced
		8	Quality-assurance (QA) strategy	Fully automated testing infrastructure to eliminate manual interventions and accelerate code elevation
		9	Security	API-based security enforcement methodologies integrated into development and operations
	Run	10	Monitoring	Instrumentation and telemetry that provide full visibility across the stack and can be linked to end-user experiences and tracked in real time
		11	Incident response	Troubleshooting and service restoration that eliminate human intervention and use artificial intelligence to end service disruptions
		12	Cost management	Automated resource tracking, reporting, and reclamation to ensure scaling up or down of resources most efficiently
Policies		13	Compliance	Foundational capabilities that enable dynamic setting, tracking, and enforcement of policies rapidly
		14	Spend management	Governance model for optimizing service levels while keeping cost low, with the options to dial up or down without manual interventions
		15	Developer empowerment	Full self-service capabilities for developers to reduce innovation clock speed in a compliant manner

The path forward: Steps to take at each stage of the journey

An IT modernization journey will vary, depending on an organization's starting point and its aspirations for agility. Companies may seek to shift the bulk of their operations into hybrid or public-cloud operating environments, move discrete parts of their application portfolio, or eliminate particular legacy infrastructure platforms. Some prefer building applications based on their skills and competitive context over buying them, while others are highly selective in their build strategies and focus on integrating third-party SaaS solutions. Additional factors include a company's industry, level of maturity, tolerance for risk, and organizational readiness for pursuing agility. (See sidebar "Central questions for IT leaders to consider as they plan their journey.")

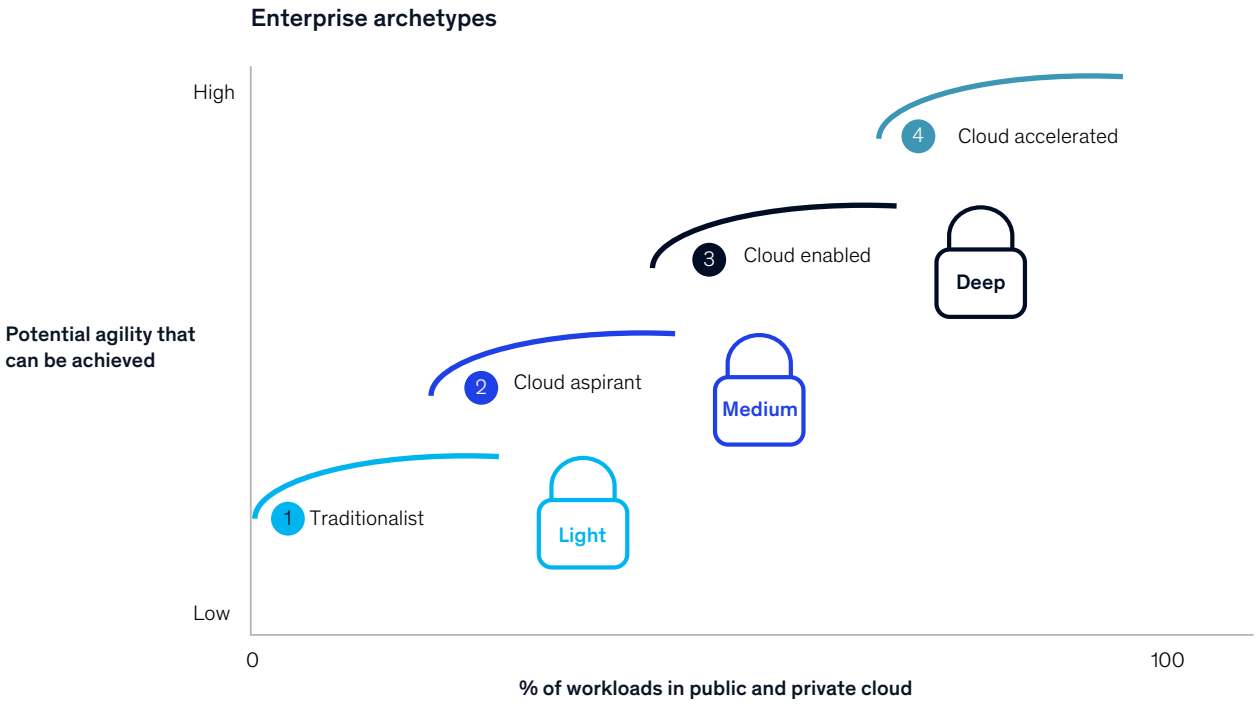
Our research with CxOs identified four archetypes based on share of cloud-delivered workload (public, private, or SaaS), their aspirations, and their potential to achieve business-agility goals (Exhibit 9). We then examined how far each archetype had progressed in modernization and the success of their companies in reaching specific agility levels.[1] These archetypes characterize companies as a spectrum of "traditionalist," "cloud aspirant," "cloud enabled," and "cloud accelerated"—with traditionalists occupying the lowest in share of cloud-delivered workload and cloud accelerated businesses having the highest.

Recognizing that the cloud-operating environment can significantly accelerate change, we expected to see a much stronger correlation between adoption and agility—but we did not. We dug deeper to discover

[1] Parameters used to calculate IT agility score consist of the following self-reported parameters, rated on a scale of 0 to 10: speed of application and feature development, maturity of IT operations automation, and agile application-development capabilities.

Exhibit 9

Achieving high agility through tech modernization takes more than a one-size-fits-all approach and needs different unlocks.



what factors were holding back enterprises from increasing business agility, especially ones that were well along on their cloud journeys. In discussing these patterns with interviewees and other experts, we found that technology platforms are changing much faster than the processes, mind-sets, infrastructure operations, and behaviors of IT leaders and organizations.

In short, technology adoption can outpace the change readiness of the organization and the people, processes, and policies that define its way of working. This pattern is especially true of traditionalists, but we found that companies in all archetypes can get stuck and need to make substantial changes in their ways of working to achieve a breakthrough.

Closer analysis of each of the cohorts yielded two noteworthy insights. First, within each archetype, organizations plateau on agility and must develop the characteristics of the next-biggest archetype's operating model to make progress. Second, some organizations have developed noticeably higher levels of agility than others within the same archetype. We also saw overarching themes emerge in how each cohort's leaders stand out.

Traditionalist: Building the foundations of operating-model changes by aligning with the business. Traditionalist companies have the lowest level of cloud adoption and agility. Leaders aligned their technology operations with business goals and laid the foundations for operating-model changes.

Cloud aspirant: Adopting an agile operating model. Occupying a more intermediate spot in the framework, cloud aspirant leaders made the move to agile operating models to reduce response and innovation cycle times.

Cloud enabled: Achieving automation at scale. Cloud enabled companies that outpaced others invested inordinately in automation. These efforts extended across plan, build, and run processes. To ensure that speed does not come at the cost of security, they integrated security into every step of software development, delivery, and ongoing operations.

Cloud accelerated: Embedding intelligence into operations. Though few, truly cloud accelerated companies have figured out how to make operations self-propelling. These organizations incorporate data-driven insights, machine learning, and artificial intelligence to respond to changing requirements without manual interventions.

Below we share recommendations along the three dimensions (people, processes, and policies) for how organizations in each archetype can unlock the next level of agility benefits through modernization. These recommendations are derived from organizations that have excelled in this area. While not exhaustive, this sample offers insights into changes to the operating model that are likely to be catalysts for business acceleration.

Unlocking potential for traditionalists

This archetype consists of companies that have their workloads predominantly on legacy, on-premise environments and pursue technology modernization conservatively. They typically take a wait-and-see approach to the cloud and have no more than 15 to 20 percent of their workloads in a cloud-operating environment. Traditionalists tend to have a centralized, functionally structured IT organization with a traditional enterprise operating model. The bulk of IT decisions are made by senior management, and non-IT executives tend to view the function as a cost center rather than a value generator. Meanwhile, the IT function is more focused on reliability and cost-effectiveness than innovation, which partly explains why its processes tend to be more manual, ad hoc, and reactive. Traditionalists typically exhibit lower levels of agility and may be just starting to push for greater velocity of business-capability delivery. Nonetheless, most traditionalists have seen agility benefits improve because of their modernization efforts.

Exhibit 10a

Traditionalist IT modernization journeys build the foundations of operating-model changes by aligning with the business.

People	Structure	Transform IT organizations to align with business units, functions, etc, by creating stakeholders that were mapped to business-unit heads. Start running trials of small cross-functional teams, where multiple stakeholders come together to work on common deliverables.
	Talent or roles	Rationalize process or project management roles and upskill them to product managers who can synthesize business requirements and convert them into solutions. Baseline roles dedicated to monitoring, reporting, and troubleshooting that can be freed up (eg, due to automated services offered by public cloud) and reskilled them to work on business value-adding solution development. Hire developers with security expertise and upskill existing engineers in secure-code development practices.
	Objectives and key metrics	Review IT key performance indicators (KPIs), and rationalize and introduce metrics that map to experiences that are expected to improve due to modernization efforts.
Process: Plan	Demand management	Bring transparency into demand by tracking and reporting infrastructure demand at the stakeholder level and constantly validating the resource usage against business KPIs.
	Investment planning	Build in-house capabilities in IT to develop business cases for IT initiatives showing investment plan, time to capture ROI, and improvement in intangibles (eg, customer-satisfaction improvements, time to market flexibility). Train IT program managers to build business cases by working closely with IT colleagues and line-of-business stakeholders.
Process: Build	Service presentation	Conduct retrospective analysis of service catalog to understand consumption patterns of infrastructure choices and rationalize long tail. Institute annual process to audit and refine service catalog.
	Configuration management	Develop and codify standards configuration guidelines for infrastructure. Enforce standardization based on lightweight audits and rationalize nonstandard configurations. Build scripts and APIs to enforce secure configurations as part of deployment process.
	QA strategy	Building on modernization efforts, perform an upfront estimation of high-priority test scenarios (incl those that are likely to be repeat scenarios). Train test engineers on automation and upskill at least the parts of the QA organization slated to be development engineers.
	Security	Institute a recurring security review process (annual or semiannual) to run threat analysis and update security response plan, among other actions, led by the chief officer. Codify best practices and templates (eg, code review standards) coming out of security reviews.
Process: Run	Monitoring	Invest in creating dynamic dashboards of the key metrics (eg, OKRs, feature velocity). Track business-agility KPIs that were the key drivers of modernization efforts.
	Cost management	Set up systems to track time series view of spending at the business stakeholder level and institute processes for periodic reporting of IT costs to businesses.
	Incident response	Establish clear process of request prioritization (eg, across alerting, ticketing, etc) to ensure high-impact requests are addressed in a speedy manner.
Policies	Compliance	Establish policies for security across all stages of the software-development life cycle and automated monitoring process.
	Spend management	Set guardrails on spending for internal customers and change chargebacks based on true consumption instead of estimated allocations.
	Developer empowerment	Introduce self-service portals for standing up development-and-test environments, and eliminate manual request-response workflows that result in increased wait times for developers.

The key unlock for traditionalists is transitioning from technology modernization to operating-model transformations—that is, clearly aligning IT goals to the business metrics that modernization efforts were intended to improve. Traditionalists seeking to get to the frontier of their agility potential and break through to the next level of adoption can take the following actions (Exhibit 10a).

People

The CIO should work with senior leaders to shift the IT function's perspective from technology to business. Achieving this shift will likely include creating product-management roles to interface with business. They must also link IT metrics to business-agility objectives and hold individuals accountable for meeting the business goals.

Processes

Traditionalists can start by defining business goals and aspirations shared across IT and the larger business. IT must make the case for modernization up front by showing how the initiatives will improve on business outcomes—and committing to them.

CIOs can create momentum by streamlining the infrastructure choices in the service catalog and moving toward a self-service model that enables developers to accelerate provisioning of develop-and-test environments. Automating and integrating security into the development process, via templates and policies, is critical to ensuring that agility does not come at the cost of security and compliance.

Companies must meticulously identify automation opportunities in monitoring and incident management and harness the native services offered by modernized infrastructure- and application-management platforms. Conversely, companies that continue manual run processes are likely to undermine the benefits that infrastructure modernization can provide. To achieve the comprehensive effect of modernization efforts, IT organizations should continuously track and be accountable for the improvements to key performance indicators they committed to prior to modernization.

Policies

Traditionalists should prioritize policy-based security, compliance enforcement, and transparency based on resource consumption and structured authorization levels. Developer empowerment (such as the self-provisioning of develop-and-test environments or code elevation) can be better established if security guardrails are embedded in the development process.

"It all starts with keeping focus on why you invest in efforts like rewriting an application, moving to cloud, or making changes to architecture," says one retailer's CTO. "We made big changes to how success was measured. We retired metrics that did not make sense anymore, such as server-to-server admin ratios, instituted metrics related to shopper-experience and customer-abandon rate on our digital storefront, and held product managers accountable for them."

Unlocking potential for cloud aspirants

Cloud aspirant institutions desire to both become more agile and cut IT costs, and they are committed to going beyond infrastructure modernization and changing the way they work. An average of 35 percent of their workloads is in hybrid or public-cloud operating environments. While cloud aspirants are usually focused on the newest, easiest ways to shift parts of the application portfolios, to date they have achieved only a low to medium level of IT agility. Common obstacles include talent gaps, lack of executive buy-in, and difficulties with change management as well as architectural coupling between their traditional and cloud-managed IT assets. So although the cloud aspirants may have implemented self-service IT governance processes and adopted some elements and principles of an agile operating model, they have yet to achieve a full transformation.

Case study

Global pharma company moved to agile development process to accelerate innovation clock speed

"The key is not to bite off too much at once. Incrementally work on bigger and more impactful things. That's how we did it. You learn by doing, and this way you can deliver more later," says the chief information officer of a pharma company that committed to moving from waterfall to an agile app development process.

The chief information officer's app development team took a methodical approach to evaluate application domains and build a clear view of which ones would benefit from agile development methodologies and more frequent releases. They organized development teams into small groups that work on distinct pieces of work in one- to two-week sprints. However, instead of moving all the applications to agile delivery model, they earmarked a subset that had the highest potential value.

Within a year, the organization moved a third of its applications to agile methodology and is doing weekly releases. "The rest are on waterfall and slow release cycles. But that is aligned with the business needs."

He acknowledges that talent gaps are a challenge and highlights that retaining external expertise to lead the agile transformation made the difference in his case.

Cloud aspirant leaders commit to agile operating models by incorporating small teams, just-in-time resource allocations, and modified mind-sets and execution styles. They can then work in small chunks, experiment, market test, and scale—or ramp down fast if tests are not successful (Exhibit 10b).

People

To get more out of the IT function, cloud aspirants should set up agile organizations and operating models that cannot be slowed down by legacy dependencies. They should ensure that IT leaders are held accountable for the metrics related to business outcomes in the same way that business leaders are. Organizations should also be prepared to hire more cloud architects, security engineers, and full-stack engineers to sustain the shift to the cloud.

Processes

Companies should seek to adopt just-in-time demand fulfillment for infrastructure requests using real-time procurement and automated provisioning. Investment decisions should be shaped by business cases that can instantly ramp initiatives up or down based on performance. Standardization is crucial to shortening response times to changing market conditions—for example, through a well-defined service catalog with templates. Organizations should strive to fully automate QA testing at this stage and invest in automating their operational processes.

Policies

Cloud aspirants should seek to expand their policy monitoring to encompass both data and security. Developer empowerment becomes a high priority for cloud aspirants, and the IT function should build the ability for developers to set up and configure the deployment pipeline.

Exhibit 10b

Cloud aspirants' IT modernization journeys adopt agile operating models.

People	Structure	Set up the agile organization (eg, cloud operations, net new agile app dev units) as operating cells or guilds, with clear boundaries. Ensure they are not being slowed down by legacy dependencies or workflows (eg, modernized app developers not having to make traditional dev environment setup requests or batched code review or QA process).
	Talent or roles	Be prepared to hire more cloud architects, security engineers, and full-stack engineers to support the shift to the cloud.
	Objectives and key metrics	Make IT leaders accountable for gains in business agility metrics expected from infrastructure and application modernization efforts. Cascade the KPIs for the IT leader and business leaders to agile teams. Emerging trends create joint accountability for business results across general managers, functional leaders, and IT leaders (eg, head of analytics in IT, chief digital officer, CMO performance rewards tied to online lead conversation rates on digital channels).
Process: Plan	Demand management	Involve product managers and cloud architects to collaborate on proactive demand estimation. Set up procurement process to enable just-in-time demand fulfillment when infrastructure resources are requested by developers. Eliminate manual approval wait times if requests are within guardrails.
	Investment planning	Institute quarterly reviews of initiatives to track progress on business case and ramp up or ramp down investments based on performance. agile mind-set is critical to encourage failing fast and redirecting resources if business case is not being realized.
Process: Build	Service presentation	Integrate more standardization into infrastructure service catalog. Establish templates that implement guardrails to minimize custom requests. Mirror configurations across hybrid environments wherever possible to ensure consistency in policy enforcements.
	Configuration management	Set up standard configuration templates that are enforced during provisioning and deployment.
	QA strategy	Invest in almost-full automation of build verification testing, unit testing, and integration testing to set the foundation of automated code elevation from development to release. Budget for developer time into building automated test suites.
	Security	Invest in clean-sheet security controls along with security audits and enforcements for hybrid and multicloud environments. Extending legacy security controls to modernized infrastructure environments (eg, extending on-premise controls to public cloud) should not proceed if it results in suboptimal security posture either for the sake of ease of implementation or costs.
Process: Run	Monitoring	Invest in automated operational assessment at both the infrastructure and application levels (eg, automated log and application performance analysis) and feedback loop to inform business impact. Choose multicloud or infrastructure-agnostic monitoring solutions or build integrations across disparate monitoring solutions to provide a unified view.
	Cost management	Set up real-time resource utilization tracking and optimization systems to provide transparency on whether investments are paying off and how IT is tracking on ROI of modernization initiatives.
	Incident response	Build service request prioritization, tiering, and automated routing logic (eg, expert-based routing) to manage incidents.
Policies	Compliance	Institute role-based policies for data protection, access, and usage beyond securing the perimeter, applications, and end points.
	Spend management	In addition to consumption dashboards, build logic to estimate spending and automate alerting logic when there is likelihood of exceeding expected levels.
	Developer empowerment	Empower developers with ability to rapidly set up and configure deployment pipeline in addition to standing up development-and-test environments.

Unlocking potential for cloud enabled enterprises

Cloud enabled leaders push the boundaries on automation. This archetype consists of companies that have made significant progress in modernizing their technology infrastructure, with an average of 65 percent of their workloads on the cloud. However, they may not have fully adopted a cloud operating model to unlock the full potential of their already modernized infrastructure. As a result, cloud enabled enterprises often have low levels of agility and struggle to match the pace of their fully digital counterparts. Executives recognize that being competitive and staying relevant means significantly increasing their business agility (Exhibit 10c).

People

Companies should transform their entire organizational structure by taking advantage of small team formats such as agile pods, which can be scaled by using standardized processes (such as in app development) across a hybrid environment. Cloud enabled enterprises should also seek to develop or attract and hire DevOps talent and site reliability engineers (SREs).

Processes

Organizations should undertake several actions to maximize automation. First, they should implement a self-service model, reinforced by automated provisioning and stand-up. The next step is adopting infrastructure as code, followed by automating standardized configurations for deployment and moving to full-test automation and test-driven development. Last, the organization must implement the policy-based enforcement of security practices.

Cloud enabled organizations embrace data-driven decision making, powered by heavily instrumented code to reduce feedback loops and provide real-time tracking and results on business performance and impact.

Policies

Automated policy enforcement should extend to data, security, risk, and business-continuity planning. Furthermore, cloud enabled companies should seek to automate spending enforcement based on outcomes.

Unlocking potential for cloud accelerated businesses

These pioneers, which have aggressively pushed for the heavy adoption of cloud environments, tend to build all apps on the cloud stack and require easily scalable solutions to promote their business. With a cloud-first mind-set, cloud accelerated enterprises often exhibit high levels of business agility. This is usually in the form of extremely rapid development cycles and the capacity for quick responses to spikes in customer demand. Cloud accelerated companies typically employ a highly skilled workforce, mostly in-house. Their IT functions are characterized by agile organizational structures, more decentralized decision making within architectural guidelines that shape enterprise-wide behavior, and established data strategies.

Cloud accelerated leaders are moving to embed intelligence into the operations, ranging from rule-based automation to augmented decision making truly based on AI and machine learning. These trends are still in conceptual phases with the CIOs we interviewed. However, theories are emerging on how to achieve business acceleration via better integration of data science and intelligence into IT operations (Exhibit 10d).

People

To promote collaboration and integrate IT with business priorities, cloud accelerated companies should not only move into truly agile operating teams but also add more data scientists. These teams consist of cross-functional pods working on common deliverables that include specialists in AI and machine learning. CIOs need to maximize time spent on product development—that is, designing and deploying

Exhibit 10c

Cloud enabled IT modernization journeys achieve automation at scale.

People	Structure	Transform end-to-end org structure to harness small-team constructs such as agile pods. Scale small-team structure with standardized processes (eg, app development) across hybrid environments and projects.
	Talent or roles	Acquire DevOps or SRE talent (either in-house or via external expertise).
	Objectives and key metrics	Drive business-related OKRs across all roles of IT. OKRs must iteratively cascade from top levels of IT to agile teams and subsequently to individuals in order to be effective and aligned to the overarching modernization goals. It will be critical to include both leading and lagging indicators as part of results tracking.
Process: Plan	Demand management	Eliminate wait times in fulfilling demand by fully automating the procurement process and enabling self-service. Integrate processes for infrastructure requests and provisioning with vendors to ensure developers can get their requests fulfilled without complex manual intervention or approval processes.
	Investment planning	Institute governance process for dynamic investment based on outcomes and progress and validated by rapid market testing of initiatives. Key enabler is not to tie resources to projects and build flexibility for infrastructure or people to move across initiatives as needed.
Process: Build	Service presentation	Enable infrastructure-as-code model for provisioning, configuration, and scaling. Establishing self-service model for infrastructure stand-up and configuration is foundational to reduce wait times for both developers and business leaders.
	Configuration management	Automate configuration as part of deployment, based on predefined standards and guidelines. Create APIs and scripts to replicate configurations across environments.
	QA strategy	Incorporate test-driven development approach. Educate developers and product managers to build instrumentation and telemetry to enable automated troubleshooting and error correction based on application exhaust data.
	Security	Establish DevSecOps model for code development, deployment, and operations. Policy-based enforcement of security practices across the software development life cycle is a core requirement to ensure secure code development and deployment.
Process: Run	Monitoring	Deploy heavily instrumented code to reduce feedback loops and real-time tracking that goes beyond just monitoring application behavior and performance.
	Cost management	Augment cost tracking with proactive trade-off recommendations (eg, where to give up service-level agreements for cost benefits and vice versa). Invest in A/B testing environments and data analytics to inform optimal SLA choices.
	Incident response	Bring online self-service or automated support process. Use off-the-shelf solutions, including bots, robotic process automation, and self-service, to intelligently address incidents and reduce time to resolution.
Policies	Compliance	Establish automated policy enforcement for data, security, and risk or business-continuity planning.
	Spend management	Establish automated consumption/cost tracking by service with rules configured to control consumption when hitting thresholds.
	Developer empowerment	Enable developers to stand up production and automated testing in continuous-integration-and-deployment pipelines with one click. Abstract infrastructure details and build templates based on application types that developers can use to spin up environments across disparate cloud environments.

Case study

Food-services company uses people transformation to accelerate business objectives

By some measures, a North American–based food-services company had achieved impressive benefits with its modernization efforts. For example, in 2019 it had 90 percent of its workloads in the cloud. However, when the CEO laid out his goals for the organization—increased customer satisfaction, innovation, and operational excellence—the CIO recognized that the IT function didn't have the capabilities to support business strategy, despite adopting an agile execution model and investing heavily on automation.

To address these issues, the CIO quickly realized that though he had transformed the process and policies, he needed to focus his attention on people. So he chose to emphasize two areas. First, he prioritized training efforts to integrate the business perspective into IT decisions. He says, "A lot of engineering and IT personnel have become smarter about how tech affects the business and increasingly think through what impact IT decisions will have on the bottom line. The CIO or CTO used to do this for the longest time, but now every member is getting used to doing it." Second, he changed the performance metrics for individuals from activity-based results to achieving results faster for their business partners. "We started becoming more data driven and hired data analytics experts, but we still have years to go before building intelligent self-healing systems," he adds.

He admits the organization has come a long way from there. But by just changing the metrics and making it a priority to reward people on building automation that replaces their manual tasks, the CIO managed to transform the IT organization's focus and speed on supporting business acceleration.

standout products, features, and services—compared with time spent keeping the lights on. Shifting this ratio is best achieved when systems and applications are self-healing and autocorrecting by building more artificial intelligence into operations.

Processes

A nimble investment methodology—characterized by agile sprints of prototyping, testing, and refining—can enable business stakeholders to market-test solutions, get instant feedback, and redirect budgets dynamically to high-impact areas.

To capitalize on the modernized infrastructure capabilities (such as those offered by public cloud), these companies should implement a self-service model based on use-case templates, with a zero-touch ramp-up bolstered by best practices. Approaches that have proven effective include AI operations, featuring preemptive and self-healing run environments based on telemetry and failure data, as well as automated resource optimization and reclamation. The creation of self-correcting systems is critical to business acceleration—and is best achieved by drawing insights from enormous amounts of data, which require machine learning and are unlikely to be analyzed by humans alone.

Exhibit 10d

Cloud accelerated IT modernization journeys embed intelligence into operations.

People	Structure	Create cross-functional pods (eg, across business and IT) working on common deliverables. Such agile teams, which are loosely structured with participants coming into the team and leaving based on the changing activities, work in sprints to produce small deliverables on a weekly cadence.
	Talent or roles	Add more data scientists and specialists in AI and machine learning to use data-driven insights as the key catalyst for business acceleration.
	Objectives and key metrics	Track and maximize percentage of time spent on designing, developing, and deploying market-differentiating products, features, and services. Militantly automate activities that are focused on keeping the lights on.
Process: Plan	Demand management	Use resource utilization and result attainment data to build environments that are autoscaling, based on demand prediction techniques.
	Investment planning	Accelerate agile deployment based on rapid prototyping, testing, and refining, enabling business stakeholders to test in market and provide instant feedback to shape investment decisions.
Process: Build	Service presentation	Move to full self-service model for infrastructure based on use-case templates, with zero-touch ramp-up. Bake best-practice recommendations into predefined templates that can be used for instantaneous ramp-up so that developers and operators don't have to spend inordinate amounts of time planning the optimal configurations for application performance.
	Configuration management	Move toward infrastructure-agnostic approaches (eg, serverless) as a base for application development and delivery.
	QA strategy	Evolve the continuous-integration-and-deployment pipeline for automated code elevation across software development life cycle environments, based on QA stage gates (including performance and security testing, which goes beyond integration testing).
	Security	Integrate fully evolved DevSecOps model and API-based security enforcements into the build process and extend this approach to the run process.
Process: Run	Monitoring	Invest in the emerging AI ops services—preemptive, self-healing run environments (based on telemetry and failure data). Develop solutions for behavioral tracking and prediction of application performance to maximize business outcomes.
	Cost management	Enable automated resource optimization and reclamation to ensure unused infrastructure resources are recovered and revectored for initiatives that have supply gaps.
	Incident response	Build self-healing and self-correction methodologies in applications and infrastructure orchestration tools.
Policies	Compliance	Create automation workflows to enable dynamic definition, deployment, and enforcement of new policies for security, compliance, data usage, and application access.
	Spend management	Dynamic spending management to maximize service levels while managing costs with minimal human intervention.
	Developer empowerment	Enable full developer self-service run-time environment autoconfigured to assure all "-abilties" (scalability, reliability, etc) based on service profile.

Central questions for IT leaders to consider as they plan their journey

Chief information officers can overcome the perceived trade-offs in modernization efforts and maximize the business acceleration from these investments. No matter where they start, a few primary issues must be addressed. To set the best path forward, IT leaders should consider five central questions:

1. **Do we have the right talent to support the technology transformation and needed operating-model shifts?**
   Exemplary organizations view IT as a business-acceleration partner that proactively identifies opportunities—such as those from digital, data-driven decision making, and AI—to encourage growth. These IT functions have shifted skill profiles: from project managers to product managers, from operations engineers to automation engineers. They have upskilled developers with security expertise and recruited cloud architects, security engineers, and full-stack engineers. More advanced organizations have in-house DevOps or site reliability engineer (SRE) talent. Organizations are beginning to add data scientists and AI or machine-learning specialists to integrate more data-driven intelligence into IT operations.
2. **Have we implemented the right metrics tied to business strategy so that IT can prioritize business building over just keeping the lights on?**
   IT organizations with an effective talent engine have successfully created performance metrics and commitments aligned with business targets rather than technical objectives. Objectives and key results methodology has proven effective in conjunction with agile teams, and these metrics need to be leading indicators that link to the key objectives of modernization. Organizations are increasingly using metrics such as APIs published, test scripts created, and configuration scripts automated as metrics to improve automation. They are also implementing metrics to track how much time is spent by individuals in building new features as opposed to routine monitoring and troubleshooting tasks.
3. **Are we automating IT to the fullest?**
   Leaders that have achieved agility differ dramatically from laggards in their rate of automation. The most successful companies are increasingly adopting DevOps or SREs as part of their operations approach. As a foundation, companies are implementing test-driven development and aiming to achieve full automation of unit and integration tests. They are also baking in standardized configurations as part of deployment automation. They are then providing the setup of develop-and-test environments to developers through self-service mechanisms, eliminating wait times and enabling “one-click” deployments. Application performance tracking and troubleshooting are supported by heavily instrumented code and telemetry. Furthermore, these organizations are incorporating automation into service-request management and incidence response. They are also beginning to use machine learning and data to inform and accelerate decision making, ultimately leading with policy-based operations and control.
4. **How are we building security by design?**
   Leading IT organizations have integrated security into every aspect of planning, building, and operating. They have managed to incorporate secure thinking and design earlier in the process and automated security enforcement based on policy. DevSecOps and API-based security are core enablers in such organizations. This effort starts with hiring developers with knowledge of security architecture. In the implementation phase, developers create modular security components that can be easily reused, thereby eliminating the need for separate design and implementation. During the review phase, automatic code scanners are used for code reviews to detect vulnerabilities. In the testing

phase, security tests are automated and integrated into the functional testing process. Last, during the deployment phase, APIs for environment creation include functions to enforce secure configurations. By taking this approach, leading organizations have accelerated—rather than slowed—developer agility and innovation. In parallel, they have also created delightful customer and employee experiences.

5. **What architectural approaches are we implementing to dramatically accelerate time-to-release features?**

Approaches that increase flexibility, abstract the infrastructure, and let organizations focus on applications in line with business use cases are the hallmarks of leading IT organizations. They have adopted containerized and serverless architectures and built applications dependent on open standards. When using proprietary platforms, decisions are based on the clear time-to-market advantage and technical superiority. Fast-moving IT organizations have heavily invested in API-based approaches and meticulously plan for code reuse. They also have a clear migration path in mind should a superior platform emerge.

Policies

Cloud accelerated enterprises should focus their resources on achieving several milestones:

— Define, deploy, and enforce new policies.

— Implement dynamic spending management that maximizes returns based on rapid market tests.

— Attain full developer self-service and an autoconfigured run-time environment, assuring all "-abilties" (such as scalability and reliability) are based on the service profile.

We see exciting innovations coming faster and faster from technology providers. These innovations hold the potential to overcome the compromises and constraints that have held back enterprise IT. The pace by which organizations can accelerate business change through these cloud platform capabilities will be set by the pace at which they can change the way they work.

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