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Why you need a CTO—and how to make her successful

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Feeling unprepared for technical disruption? A well-structured role for a chief technology officer is a first line of defense.

The dizzily increasing speed of technological change makes it critical for companies to stay ahead of technology trends and be able to anticipate disruptions. For technology and technological change—which, as Exhibit 1 shows, can involve either pure information technology or technology in the sense of materials and processes—are changing the ground rules for everything from products and services to business models and processes.

Exhibit 1

A vast array of technologies are disrupting today's businesses.

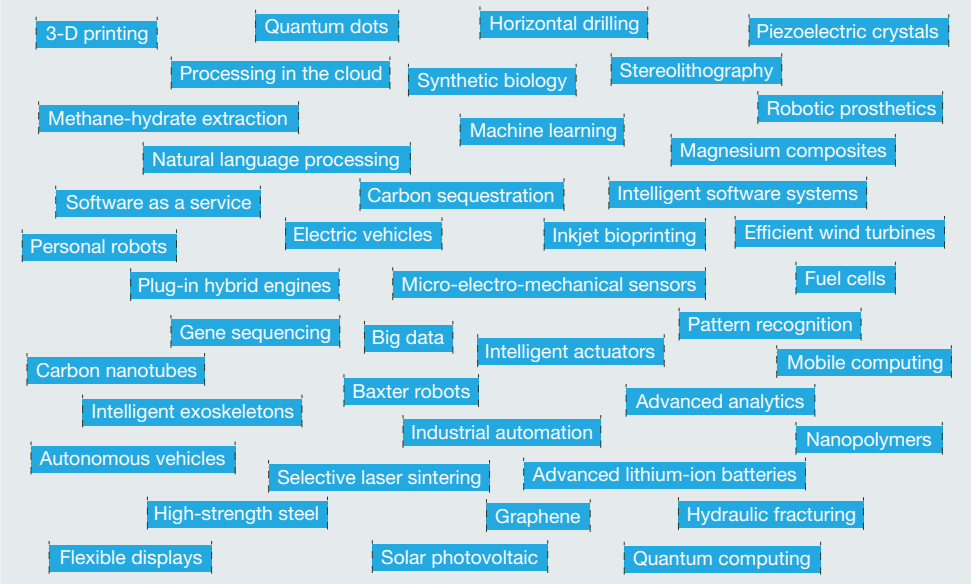

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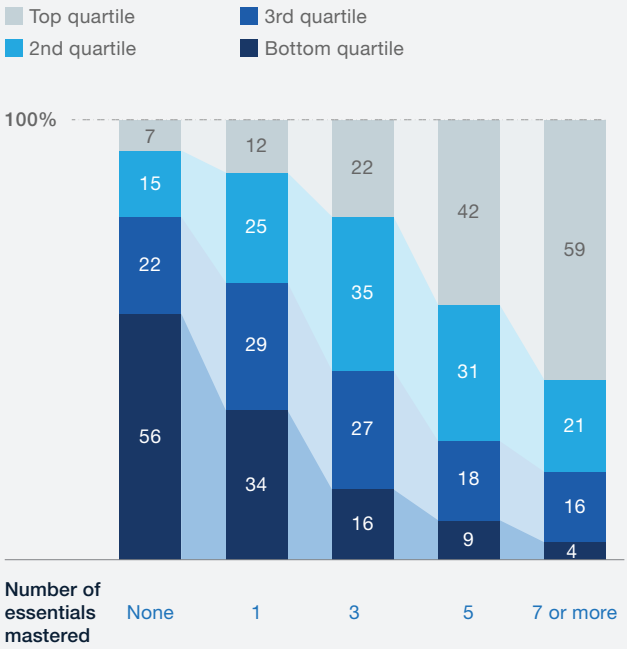
Exhibit 2

The more of the eight essentials of innovation a company has mastered, the better its performance.

The 8 essentials of innovation at scale

1	Aspire	Do you accept innovation-led growth as absolutely critical, and do you have cascaded targets that reflect this?
2	Choose	Do you invest in a coherent, time- or risk-balanced portfolio of initiatives that are resourced to win?
3	Discover	Do you have differentiated business, market, and technology insights that translate into winning value propositions?
4	Evolve	Do you create new business models that provide defensible, robust, and scalable profit sources?
5	Accelerate	Do you beat the competition with fast and effective development and launch of innovations?
6	Scale	Do you launch innovations in the relevant markets and segments at the right magnitude?
7	Extend	Do you win by creating and capitalizing on external networks?
8	Mobilize	Are your people motivated, rewarded, and organized to innovate repeatedly?

Combined effect of mastering multiple essentials,
% of group falling within top 2 performance quartiles, n = 2,463



McKinsey&Company | **Source:** "Innovation at scale: *McKinsey Quarterly* panel survey," November 2012

Indeed, the speed at which technological disruptions now unfold means that they can cripple a business virtually overnight—witness what ride-sharing apps have done to taxicabs. Technology, especially information technology, is also dissolving boundaries between industries and creating whole new business models, as we see with companies such as Airbnb in lodging or Katerra in construction. And along with such external disruptions, companies face internal ones from technological innovations that break down boundaries between functional silos and force companies to work end to end and from the customer back, something often associated with digitalization. Organizations that fail to stay on top of such disruptions can see their performance and their competitiveness rapidly erode.

Meanwhile, recent McKinsey research shows that companies that keep abreast of new technologies and build them into their strategies and operating models have greater success than those that do not. Our colleagues have identified eight "essentials of innovation"—including the translation of technology insights into winning value propositions[1]—and found that the more of these essentials a company has mastered, the better its performance (Exhibit 2).

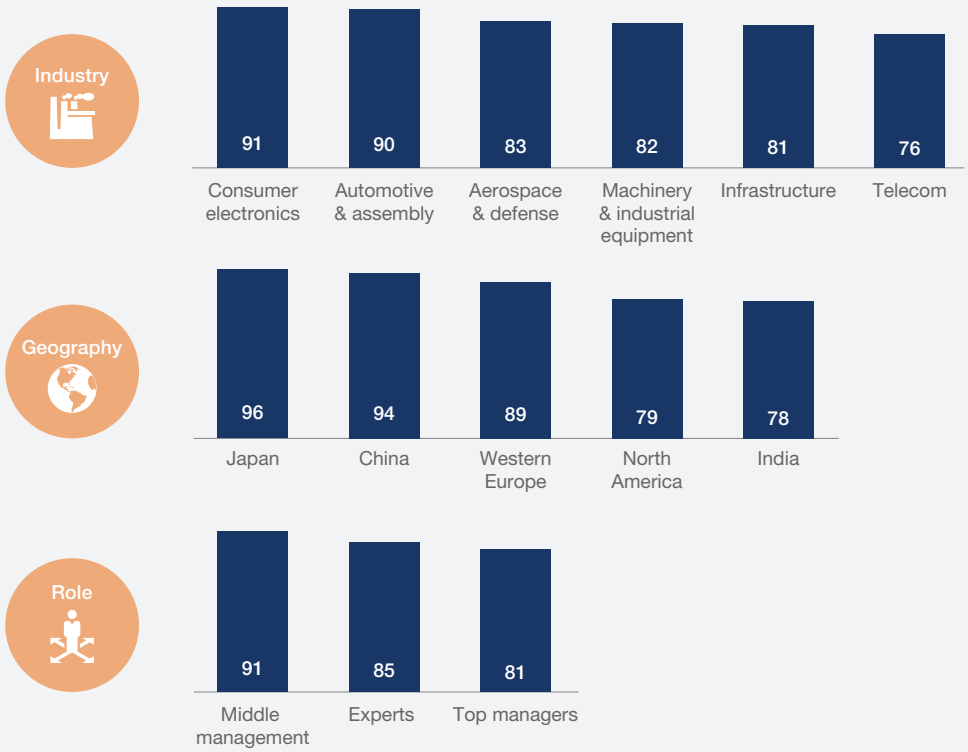
Yet despite the importance of being aware of new, potentially disruptive technologies and being ready to exploit them, many companies tell us that they are not ready for the major technological shifts already under way—let alone prepared to spot new ones as they emerge (Exhibit 3).

[1] Marc de Jong, Nathan Marston, and Erik Roth, "The eight essentials of innovation," *McKinsey Quarterly,* April 2015, McKinsey.com.

Exhibit 3

Many companies understand that they are not ready for the major technological shifts already under way.

Respondents perceiving their company as "not ahead of the curve" with regard to impending megatrends, %



McKinsey&Company | **Source:** R&D of the future global survey, 2016

We believe that a major reason for this lack of preparation is that many companies today have no one on the executive team who owns the responsibility for navigating these shifts. (In a 2016 survey, McKinsey asked companies which of various CXOs were responsible for "identifying and implementing cutting-edge technologies for the business." Twenty-six percent of those surveyed said there was no clear owner for the activity inside their firms.) Every company needs such an individual—which is why we believe that every company needs a chief technology officer (CTO).

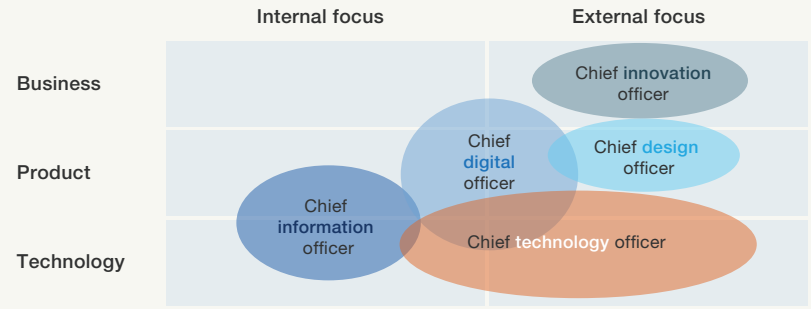
Clarifying the CTO's role

As our colleagues Richard Dobbs, James Manyika, and Jonathan Woetzel have observed, "accelerating technological change"—one of four global forces now creating "a world of near-constant discontinuity"—means that "understanding technology is now a core skill required of every business leader."[2] This is not to say, however, that every leader in an organization needs to "understand technology" in the same way or for the same purposes. Nor does it eliminate the need for a company to have someone in the C-suite who is responsible for knowing which new, potentially disruptive technologies are surfacing, to grasp both the dangers and the opportunities they pose for the firm, and to see and act across the organization to help formulate and execute a company-wide response. That someone should be the CTO (see sidebar, "The evolving definition of the CTO).

[2] Richard Dobbs, James Manyika, and Jonathan Woetzel, *No Ordinary Disruption: The Four Global Forces Breaking All the Trends,* New York, NY: Public Affairs, 2016, pp. 3, 45.

Exhibit

The CTO's position is distinct from those of other CXOs.



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The evolving definition of the CTO

While the title chief technology officer (CTO) has been around for decades, its definition has varied over time and across industries and types of organizations. In our experience, as the role was originally conceived, the CTO provided a single "buck stops here" point of view on the technology trends, policies, and procedures critical to developing or enhancing a company's products and services.

One cause of the confusion around the role of the CTO today is that "technology" can mean a lot of different things, ranging from materials science to deployment of robotics in internal processes to the latest "everything as a service" models. Another cause is the widespread proliferation of CXOs with portfolios that are in some way concerned with technology: When companies have chief information officers, chief digital officers, chief innovation officers, chief design officers, and more, just what is the job of the chief technology officer anyway?

With the IT explosion in the 1990s and 2000s, the CTO role became intertwined, at times, with that of the CIO, who is generally more involved with the technologies supporting and facilitating information and knowledge management within a company than with those driving product strategy. In this article, we do not take a position on how these two roles should be distinguished from each other. Instead, we take the view that any large product-based company today must have someone at a CXO level who is explicitly responsible for understanding how emerging technologies will affect its customers and products. That person, we propose, should be the CTO.

The fact that "digitalization" now permeates all aspects of so many businesses can also make it hard to draw a line around what a CTO's areas of responsibility should be and, in particular, to distinguish between the responsibilities of a chief technology officer and a chief digital officer. The difference lies principally in that a CTO is equally concerned with product development and technology development per se, while a chief digital officer is more oriented toward business models and digital products and also tends to be more internally focused than a CTO (exhibit).

The critical importance of the external-facing aspects of the CTO's job has been described in a statement attributed to former Sun Microsystems CTO Greg Papadopolous, who is reported to have said, "The CFO is not responsible for making revenue every quarter, but if there is a big surprise, fire him. The CTO is not responsible for delivering products every quarter, but if you miss the Internet or a similar technical inflection point, fire him." Yet along with this role of monitoring the external environment for significant and relevant new technologies, the CTO must be able to ensure their effective deployment within the organization.

The importance of this dual-facing aspect of the CTO's role emerges with particular clarity in conglomerates and multi-business-unit organizations, where cross-cutting topics are at risk of not being recognized. Companies can often uncover new, transformative opportunities by finding the ideas that fall between the cracks in the organization and scaling new initiatives so that every business unit benefits. (For example, the impact of 3-D printing might lead to the formation of a center of competence shared by various businesses; or a disruptive plastic material like polyether ether ketone could replace metal components in multiple product categories, requiring a joint-assessment method.) Finding and exploiting such opportunities is another responsibility of the CTO.

How to make the CTO role successful

A CTO who can enable an organization to turn this abundance of threats and opportunities into sustainable success in the marketplace must have a number of qualities: a deep understanding of customers (fluency in design thinking helps) and, for B2B companies, a reputation and networks in the customer space; a deep understanding of the company's current technology; the curiosity to learn about potentially relevant new technologies coming on line or in development; the acuity to see the implications and possible uses of such technologies; external networks (including with actors such as universities, start-ups, and venture capital); a mastery of systems engineering; and a willingness to challenge the status quo.

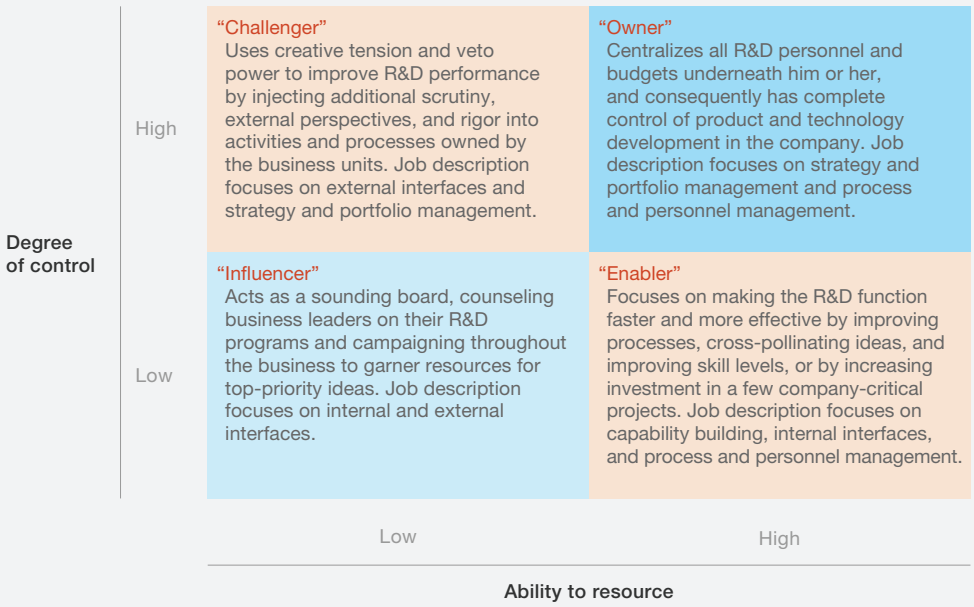
Equally important as such personal qualities, however, is how the CTO role is configured for a given individual and a given company. For executing on the right combination of responsibilities listed above, we have identified four distinct potential CTO styles (Exhibit 4).

While each type of CTO can be successful, it is crucial to identify quickly which approach will work best within a particular company. This is not always easy to do, because there is often little or no time for a honeymoon period in which to define just how the CTO is going to work with the rest of the organization, and a few stumbles can lead to loss of credibility with line management and eventual "organ rejection." The matrix in Exhibit 4 is designed to provide some rough guidelines for determining which style might best suit both the individual in the job and the organization.

Which style best suits a given company bears some relation to the kind of industry the company is in. In general, firms in less technology-intensive industries, with lower R&D spend

Exhibit 4

There are four typical styles that CTOs can adopt depending on their position and profile.



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as a percentage of revenue and where CTOs are likely to have a relatively low level of control over technology agendas and priorities, are good places for "influencers" or "enablers." Influencers (often found in consumer-goods companies, for example) are often scouts, deep thinkers who advocate for innovation through partnerships with providers of new technologies. Enablers are more managerial, tasked with driving efficiencies in multi-business-unit organizations with a high degree of overlap in technologies and projects among the business units.

By contrast, "challengers" and "owners"—who generally have a high degree of control over technology agendas and priorities—tend to thrive in more technology-intensive companies that spend large amounts on R&D. The challenger style often works well in companies with multiple business units, each with its own strong R&D operations, where the need is for someone to prevent the business units from becoming complacent. Owners, for the most part, are found in single-product companies (or firms whose products are similar), where one person can keep everything in his or her head. Auto OEMs are the classic example of companies where owners can be successful in the CTO role—not surprising in a single-product business with limited disruptions historically, and where technical and engineering excellence need to be represented on the top team. (This may change as the industry moves toward multi-business-unit structures given the emerging emphasis on mobility services in the sector.)

Looking at the matrix along the "ability to resource" axis (indicating the degree of formal influence on staffing and resourcing decisions), we find that owners and enablers—who tend to possess this ability to a high degree and have a lot of R&D to actually manage—are generally more internally focused than challengers and influencers, who have more capacity to focus on the external environment and interfaces.

All that said, the styles of influencer and owner are typically the most challenging to execute. Influencers lack the formal power—such as having control over resources—to command the attention and respect of the R&D line, so that only someone both technologically and interpersonally astute is usually able to make this style work. Conversely, owners have that power, but are more likely to become disconnected from market realities, sometimes leading to product-development blunders or to resentment from the business units.

When implemented correctly, the enabler and challenger styles offer a more balanced approach that is particularly effective in companies where R&D is more decentralized. The key is to grant the CTO the right amount of hard power. Enablers get positive power: typically, a combination of expert personnel and financial resources he or she can use to accelerate important projects. Challengers get negative power: the ability to terminate, deemphasize, or delay projects that are inconsistent with the company's strategy, are not on track to achieve the target product profile, or are suffering from significant delays or cost overruns.

Yet no matter which of these four styles makes the most sense for a particular individual and a particular organization, the fundamental requirement is the same: the CTO must own the responsibility—and be given the means—to keep the company ahead of the technology curve, able not merely to adapt to disruptions but also to anticipate them and turn them to the organization's strategic and operational advantage. If ceaseless technological change is now inevitable—which of course it is—having a CTO today seems nothing less than an imperative.

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