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DESIGNING THE TECH FUNCTION OF THE FUTURE

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There is a strange dynamic at play at many traditional companies: technology is increasingly important, yet in many cases, the IT function is not involved in the development of the new, differentiating products and services aimed at ever more discerning and empowered customers. Because many IT departments lack the agility and the in-house expertise to meet quickly evolving business needs, business units are appointing chief digital officers (CDOs) to lead initiatives.

As a result, more technology development is happening in the business units rather than in the classic IT department. Given the evolving demands of the business units, company leaders have a choice to make. They can transform the IT department so it gains the expertise and agility necessary to work closely with business units to develop product and service technologies that differentiate the business. Or they can maintain an IT function that tends only to the internal mission-critical infrastructure, capabilities, and policies that keep the business itself functioning effectively and securely. For companies that choose the latter, business units have responsibility for independently developing new product and service technologies.

We expect that most companies will choose to transform the IT department under the direction of the CIO with the help of the CDO. We also expect that the most effective CDOs will be temporary, completing their digital programs in three to five years and then transitioning to other responsibilities within their companies.

From IT to Tech

IT transformation is part of a larger need to digitize businesses: the vast majority of companies are, or are becoming, technology companies—at least to a certain degree. Witness, for example, the rise of robotics and artificial intelligence, the Internet of Things, and advanced analytic solutions, which are permeating all sorts of businesses. Soon, technology will be embedded in nearly every product, service, and process,

which will be integrated into a broader digital ecosystem. Powerful software will be the backbone of products, services, and customer engagement. Data is already a highly valuable asset for every company, and the ability to analyze and act on that data is at the core of a company's competitive advantage.

To handle the digital shift, companies must bring business and technology together. More specifically, they must rethink how they manage three categories of technology: *product and service* (technology embedded in end products and technology that embeds end products into digital ecosystems and customer interfaces), *production* (technology in the industrial production processes of physical goods), and *enterprise* (infrastructure, platforms and standard software packages).

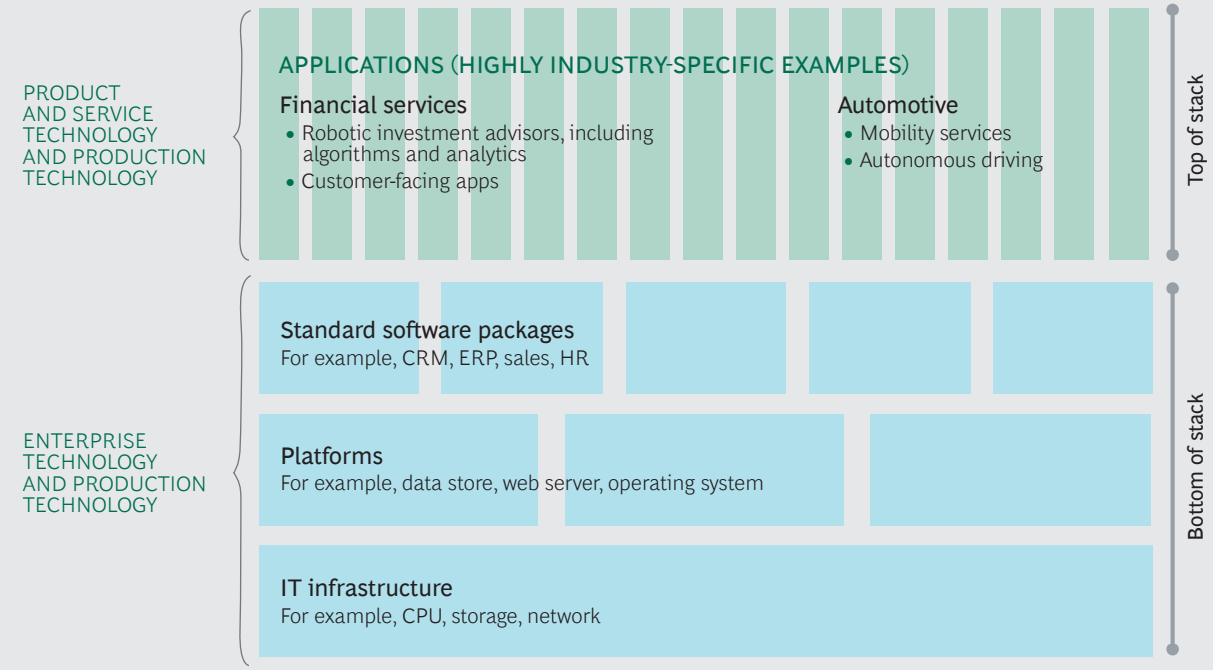
Companies will increasingly build internal capabilities and focus resources on product and service technologies and production technologies for competitive advantage. For example, autonomous cars use a variety of product and service technologies—including, radar, lasers, GPS, odometry, and computer vision—to detect and interpret their surroundings. They also include apps that link the customer to the OEM. Meanwhile, companies will devote fewer internal resources to enterprise infrastructure, opting instead for cloud-based utilities.

Not only does getting the digital transformation right improve a company's operations, but it can also boost valuations. According to our research, traditional asset-heavy companies often trade at low multiples, even below annual revenues, while pure digital companies typically trade at multiples that are several times revenues.

From Value Chains to Stacks

In the past, the benefits of sourcing technology—such as cloud-based utilities—from outside the company have not always outweighed the integration cost. But digitization has enabled "stack architecture," which significantly reduces this integration cost. (Exhibit 1 illustrates a model technology stack for the financial services and automotive industries.) At the bottom of the

EXHIBIT 1 | A Model Technology Stack



Source: BCG analysis.
Note: CRM = customer relationship management; ERP = enterprise resource planning.

stack, nondifferentiating technologies such as infrastructure, platform, and standard software packages are now easily sourced from external providers, reducing costs while improving security, stability, and uptime. At the top of the stack are highly specific and differentiating product and service technologies that give companies access to innovation, agility to accelerate time-to-market, and flexibility to enable customization.

For example, Airbnb has organized its technology function and manages its more than 20 petabytes of data using stack architecture. The bottom of the stack consists of Hadoop infrastructure, the data warehouse, and other core data-processing applications and is provided entirely in the cloud. Meanwhile, the top of the stack consists of product and service technologies such as customized data models and predictive analytics, including search algorithms.

Creating the Tech Function of the Future

Because digitization and stack architecture are changing the game for companies, we have identified five design imperatives that leaders should consider when creating the technology function of the future.

Develop product and service technologies close to the business. With fewer internal resources devoted to enterprise technologies and technologies that are more integrated into the business units, leaders can turbocharge product and service technologies. Small teams can focus on working closely with product managers and customers on new products and services, speeding up iterations and time to market. By organizing as closely as possible to customer products and services, the technology function can become a critical business differentiator.

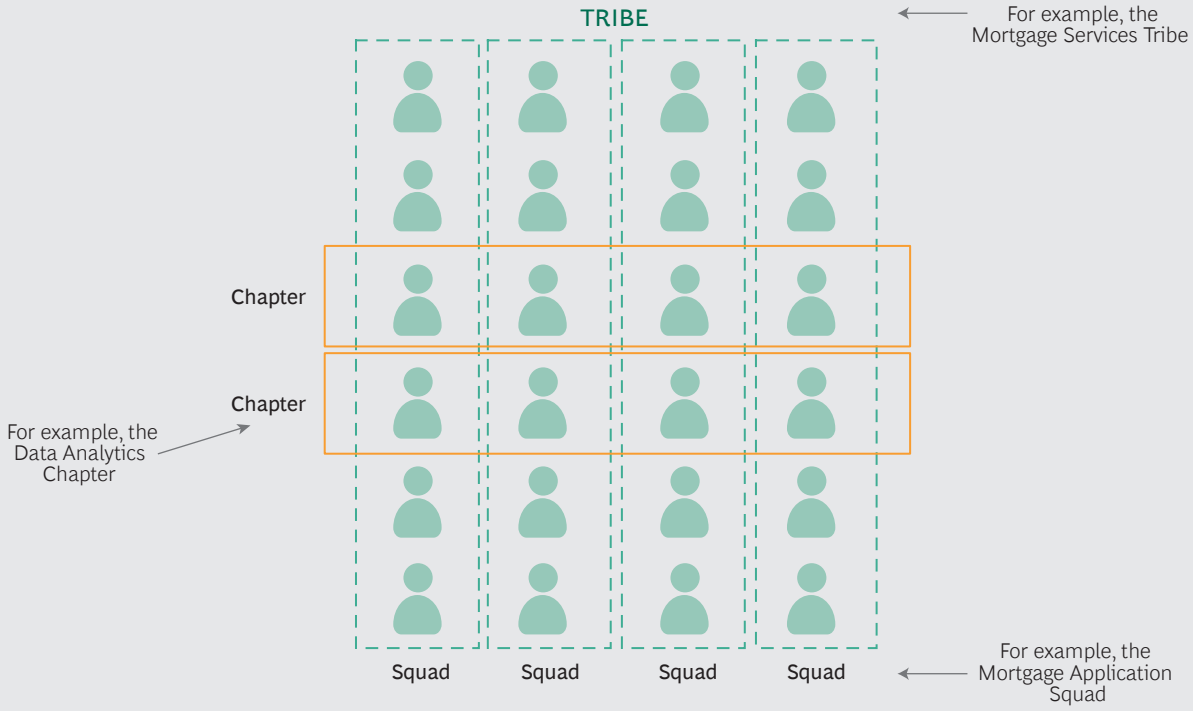
For example, a large international and cross-industry service company largely outsources enterprise IT—such as for enterprise resource planning (ERP) and customer relationship management—while the internal technology function is mostly decentralized and organized around customer segments and services in customer-oriented business units. Each engineering team develops specific services and reports to the head of the business unit. Meanwhile, the central-solutions function develops only features and services that are common to all business units. A central platform unit governs the enterprise-wide architecture and security standards.

Integrate technology and the business. Today's silo-like IT function will be transformed into an embedded and integrated business technology structure. In practice, this means that leaders need to create colocated, cross-functional teams for agile development and effective collaboration of business and technology resources. These teams can develop, test, learn, and iterate far faster than teams that use the old practices. In our work with clients, we have observed that agile development speeds up time to market (measured in the number of months to release) and improves quality (measured in the number of customer-identified product defects per month), each by about 50%.

ING, for example, uses an agile organization structure (inspired by Spotify) made up of "tribes" (consisting of a maximum of 150 people) that are divided into "squads" and "chapters." (See Exhibit 2.) The tribe leader sets overall priorities, ensures knowledge sharing, and allocates available budgets. Squads are empowered multidisciplinary teams of up to nine people who have all the skills and tools needed to design, develop, test, and release a specific product or service to production. The team members have backgrounds in marketing, product management, data analysis, user experience, IT, and other technologies. Chapters, meanwhile, ensure coordination of members of the same discipline—for example, all data analysts—across squads. The chapter leader is responsible for personnel development and performance management of chapter members.

Build the software engineering capability as a critical differentiator. We have seen large incumbent companies staffing more than 75% of the IT roles with generalists. Leaders

Exhibit 2 | The Agile Tribe Organization at ING



Source: ING.

need to make significant changes to this skill mix, moving the organization toward specialized engineering and analytical skills to develop products and services. Not too long ago, it was common for leaders to view software engineering capabilities as commodity services that could be outsourced easily. In light of digitization and stack architecture trends, many companies will develop these capabilities because they impart a competitive advantage.

To build world-class engineering capabilities, leaders need to focus on recruiting, developing, and retaining scarce and highly specialized technology talent that is as good as that provided by outside agencies. To attract such talent, companies need to create a work environment that offers greater collaboration, risk taking, and adaptability. At least on an interim basis, companies might need to establish a technology center of excellence to support individual business units with scarce skills.

Ensure powerful governance and steering capabilities. In the future, business units will all have their own capabilities for developing products and services, so strict rules and regulations will be necessary. Leaders will need to ensure a strong governance and steering function to coordinate certain areas such as vendor management; ensure that standards are met in such areas as cybersecurity, data, and application architecture; and avoid unexpected side effects such as heavy loads affecting specific parts of the infrastructure.

Key steering capabilities include the following:

- **Technology architecture management** ensures that company-wide technology and architecture choices guarantee basic interoperability and leverage scale for both applications and infrastructure.
- **Data management** secures data throughout its entire life cycle by developing strong data architectures and creating and executing robust policies and procedures.

- **Vendor and ecosystem management** provides the capability to source and develop strategic vendors and sets a framework for interacting with all vendors connected to the company's ecosystem, taking into account the many ways vendors can link into the digital ecosystem.

- **Security and cybersecurity management** ensures a consistent company-wide approach to security aimed at minimizing the risk of attack and focused on organization, processes, and people. (See "Building a Cyberresiliant Organization," BCG article, January 2017.)

Microsoft exemplifies a company that has maintained a centralized shared-service function for internal mission-critical infrastructure, capabilities, and policies. The company CIO is responsible for providing the IT services that keeps Microsoft itself—a business that relies heavily on IT to operate—functioning effectively and securely. Meanwhile, the customer-facing technology—code written for software and services, data centers, and the network infrastructure that runs Microsoft's cloud offerings—is decentralized to the business units.

Create a digital foundation using cloud services. Building a strong digital foundation includes simplifying and sourcing as much nondifferentiating bottom-of-the-stack functionality as possible from external providers to free up resources for more differentiating tasks. (See "Simplifying IT to Accelerate Digital Transformation," BCG article, April 2016.) In particular, we expect that enterprise technologies will be cloud based, with companies using just a handful of high-performance providers for IT infrastructure, platforms, and all nondifferentiating functions of enterprise technologies, such as HR and ERP systems. With this in mind, companies will need digital sourcing skills for frequently scanning the market for new technology solutions.

According to research from MIT, an effective digital foundation has three key elements.[1]

- **An Operational Backbone.** Modular architecture ensures secure and stable operations, supports seamless end-to-end transaction processing, accesses "a single source of truth," and automates repetitive business processes.

- **A Digital Services Platform.** This provides access to business and technology services, facilitates data analysis, is accessible to external and internal partners, and leverages the cloud and open-source software. Many digital services platforms consist of a set of business services that are constantly expanding and enabled by application programming interfaces; analytics engines with a growing set of data repositories, such as data lakes; and a developer platform that enables an increasing number of partner offerings.

- **Digital Linkages.** These link the operational backbone with the digital services platform, so digital services can access customer and product master data and transaction-processing systems.

From 2000 until about 2012, the Lego Group built an operational backbone to create a tightly integrated, durable production environment, ensuring the reliability and security of business transactions. But when the company started to use digitization for product innovation, it found that the existing enterprise platform lacked adequate agility, such as a scalable 24-7 environment that facilitated gathering customers' input. In response, Lego created a digital services platform to complement the existing enterprise platform. This empowered self-governing teams to do rapid iterations on the basis of customer input—related, for example, to new Lego products—and thus deliver new functionality to the marketplace faster.

INFORMATION TECHNOLOGY IS at a crossroads and senior leaders need to respond in a coherent way that best serves the business. Leaders who want IT to retain its strategic role must transform it with an eye to

agility, speed, and specialized skills. The alternative is for IT to focus only on internal mission-critical infrastructure, capabilities, and policies that keep the business itself functioning effectively and securely. This is still an important role, but it carries less strategic weight.

Ultimately, the role of the technology function will vary widely depending on the needs of the business and the ambition level of its leaders. Every company has the power to transform IT and improve its competitive positioning.

NOTE

1. MIT CISR, "Designing Digital Organizations—Summary of Survey Findings," 2017, https://cisr.mit.edu/blog/documents/2017/02/28/mit_cisrwp415_ddosurveyreport_rosssebastianbeathjhabcg.pdf.

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