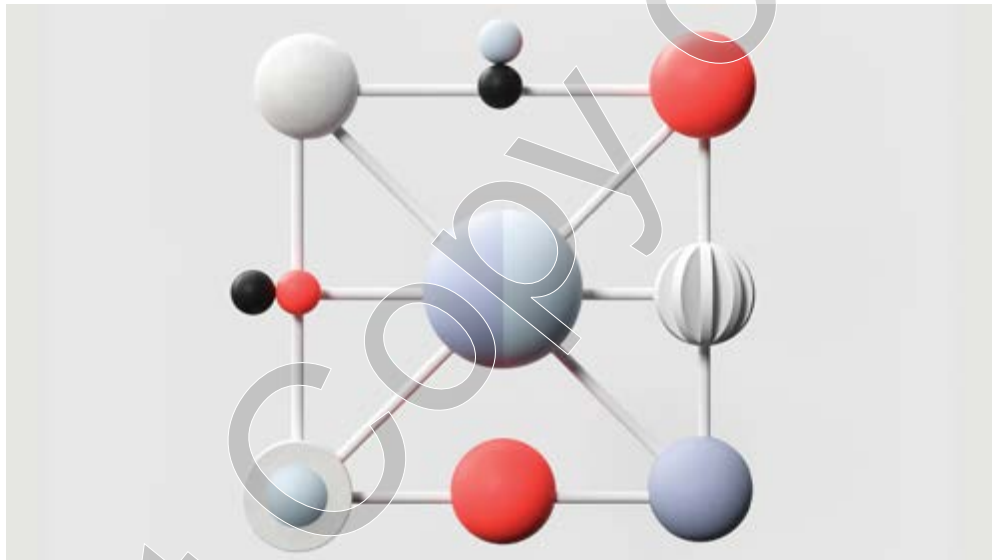


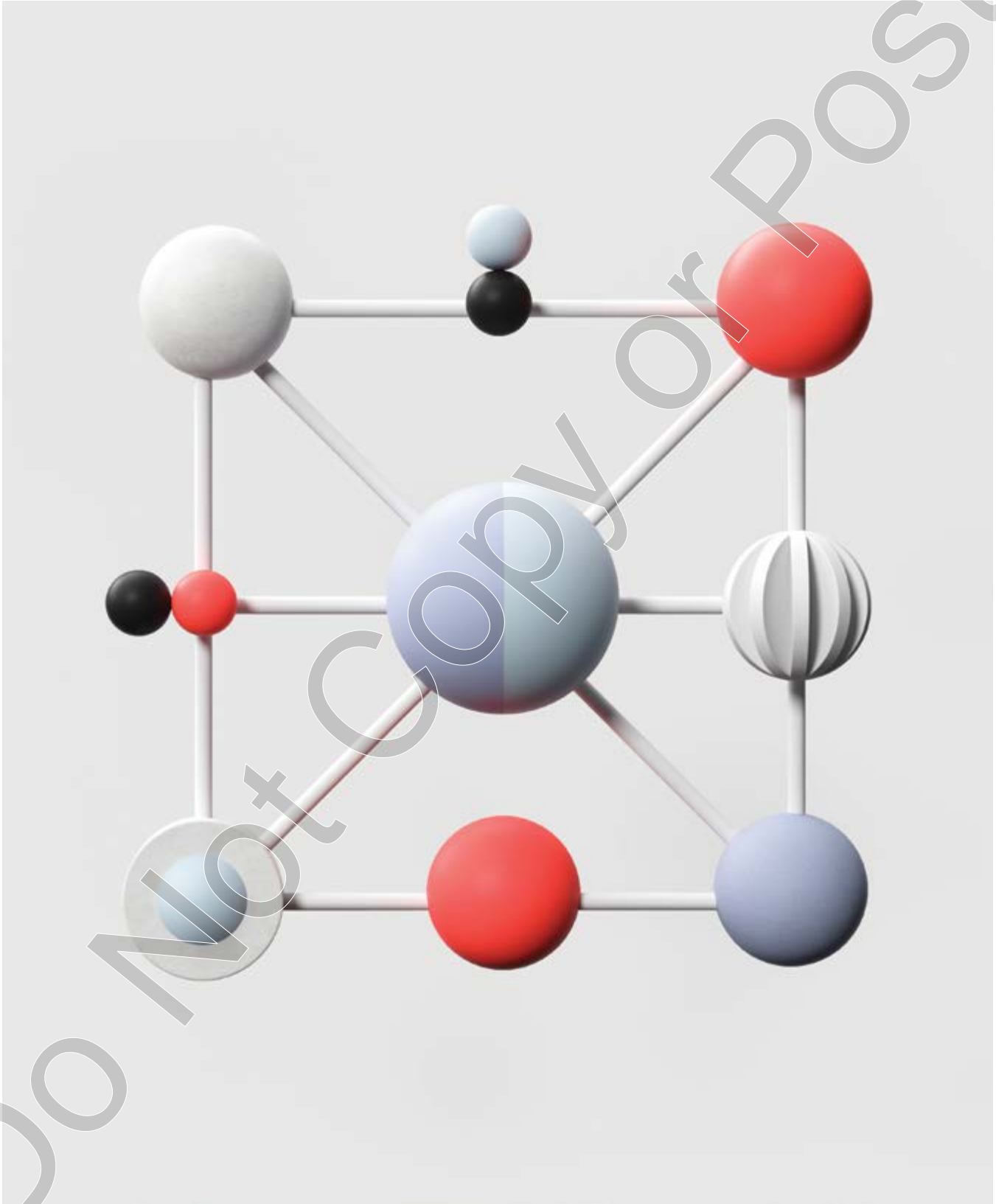


Digital Literacy



Democratizing Transformation

by Marco Iansiti and Satya Nadella

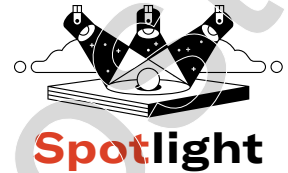


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Microsoft



Democratizing *Transformation*

Give your entire workforce the capacity to become innovators.

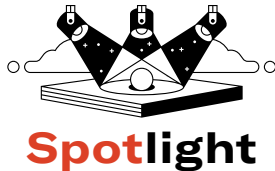
OVER THE PAST decade, Novartis has invested heavily in digital transformation. As the Swiss pharmaceutical giant moved its technology infrastructure to the cloud and invested in data platforms and data integration, it recruited AI specialists and data scientists to build machine-learning models and deploy them throughout the firm. But even as the technical teams grew, managers from across the business—sales, supply chain, HR, finance, and marketing—weren't embracing the newly available information, nor were they thinking much about how data could enhance their teams' work. At the same time,

the data scientists had little visibility into the business units and could not easily integrate data into day-to-day operations. As a result, the investments resulted in only occasional successes (in some aspects of the R&D process, for example) while many pilots and projects sputtered.

More recently, however, pilots targeting both R&D and marketing personalization started showing business value and captured the attention and imagination of some of Novartis's more creative business executives. They became increasingly excited about opportunities to deploy AI in various parts of the company and began to earnestly champion the efforts. (Disclosure: We have both worked with Novartis and other

companies mentioned in this article in a variety of ways, including board membership, research, and consulting.) They realized that technologists and data scientists alone couldn't bring about the kind of wholesale innovation the business needed, so they began pairing data scientists with business employees who had insight into where improvements in efficiency and performance were needed.

Novartis also invested in training frontline business employees to use data themselves to drive innovation. A growing number of teams adopted agile methods to address all kinds of opportunities. The intensity and impact of transformation thus accelerated rapidly, driving a range of innovation initiatives,



including digitally enabling sales and sales forecasting, reconceiving the order and replenishment system for health-care-services customers, and revamping prescription-fulfillment systems and processes.

The progress in digital transformation became invaluable as the company dealt with the initial chaos of the pandemic. Novartis business teams partnered with data scientists to devise models to manage supply-chain disruptions, predict shortages of critical supplies, and enable quick changes to product mix and pricing policies. They also developed analytics to identify patients who were at risk because they were putting off doctor visits. As the Covid crisis wore on, the value of AI became obvious to managers companywide.

Before this wave of AI adoption, Novartis's investments in technology consisted almost entirely of packaged enterprise applications, usually implemented by the IT department with the guidance of external consultants, vendors, or systems integrators. But to build companywide digital capability, under the leadership of then chief digital officer Bertrand Bodson, Novartis

The Elements of Tech Intensity

To enable transformation, companies must create synergy in three key areas:

Capabilities

- Organizational culture
- Training and development
- Low-code/no-code tools
- Agile teams

- Organizational architecture
- Citizen developers
- Product management

Technology

- Machine learning
- Deep learning

- DevOps pipelines
- Data encryption
- Real-time analytics

Architecture

- Data platform
- Horizontal integration and normalization

- Data documentation
- API strategy
- Experimentation and risk
- Data governance

not only developed new capabilities in data science but also started to democratize access to data and technology well outside traditional tech silos. The company is now training employees at all levels and in all functions to identify and capitalize on opportunities for incorporating data and technology to improve their work. In 2021, the Novartis yearly AI summit was attended by thousands of employees.

The potential for employee-driven digital innovation is impossible to calculate, but according to the market research firm IDC's Worldwide IT

Industry 2020 Predictions report, enterprises across the global economy will need to create some 500 million new digital solutions by 2023—more than the total number created over the past 40 years. This cannot be accomplished by small groups of technologists and data scientists walled off in organizational silos. It will require much larger and more-diverse groups of employees—executives, managers, and frontline workers—coming together to rethink how every aspect of the business should operate. Our research sheds light on how to do that.

IDEA IN BRIEF

THE PROBLEM

Many companies struggle to reap the benefits of investments in digital transformation, while others see enormous gains. What do successful companies do differently?

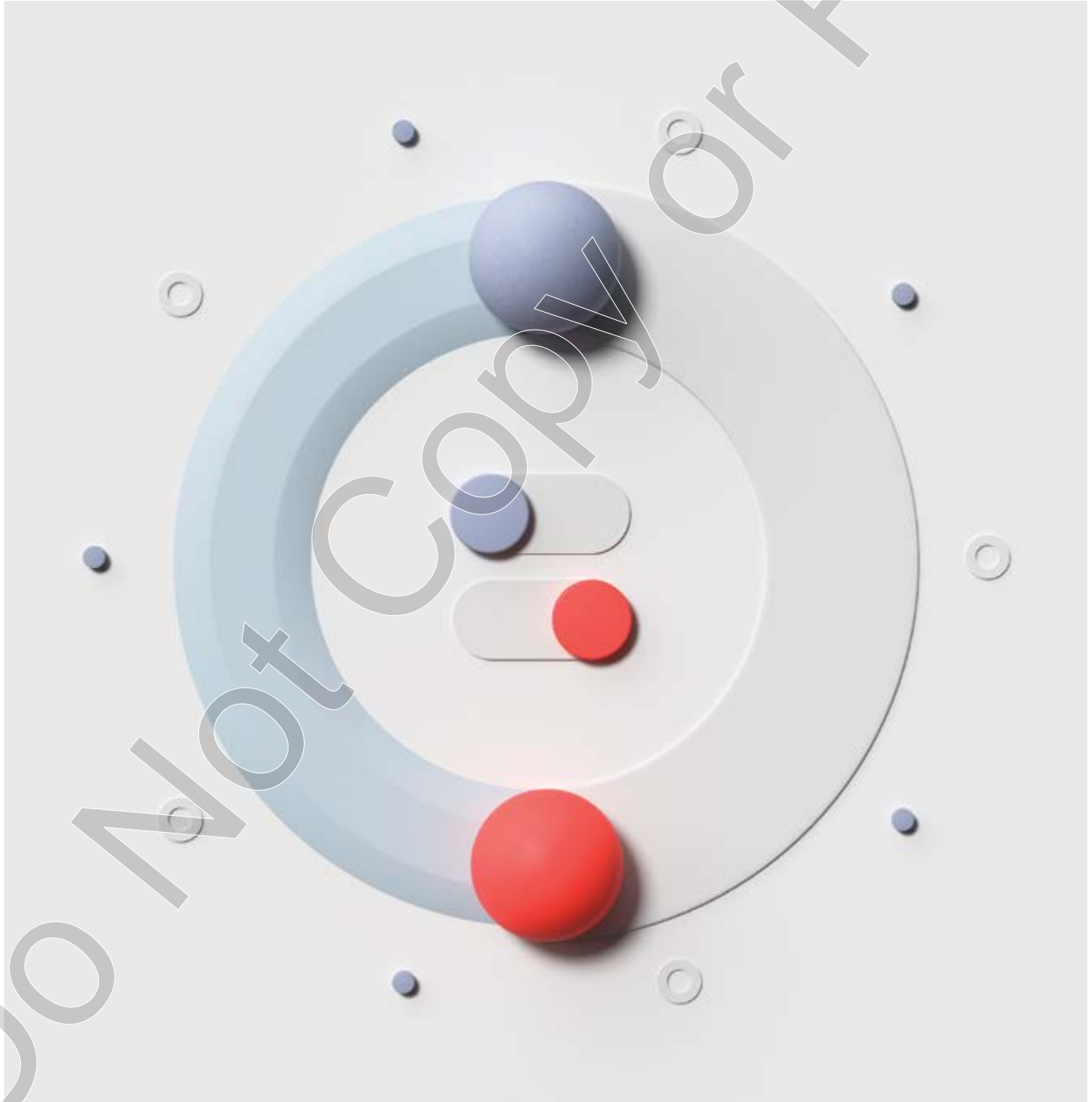
THE JOURNEY

This article describes the five stages of digital transformation, from the traditional stage, where digital and technology are the province of the IT department, through to the platform stage, where a comprehensive software foundation enables the rapid deployment of AI-based applications.

THE IDEAL

The ideal is the native stage, whose hallmarks are an operating architecture designed to deploy AI at scale across a huge, distributed spectrum of applications; a core of experts; broadly accessible, easy-to-use tools; and investment in training and capability-building among large groups of businesspeople.

- ● Digital transformation requires that executives, managers, and frontline employees work together to rethink how every aspect of the business should operate.



- Companies underestimate the importance of getting employees to pull transformation into their functions rather than having IT groups push the changes out to the business.

The Success Drivers

When we started our research, we wanted to understand why many companies struggle to reap the benefits of investments in digital transformation while others see enormous gains. What do successful companies do differently?

We looked at 150 companies in manufacturing, health care, consumer products, financial services, aerospace, and pharma/biotech, including a representative sample of the largest firms in each sector. Some were failing to move the needle, but many had made dramatic progress. Perhaps surprisingly, we found that outcomes did not depend on the relative size of IT budgets. Nor were

the success stories confined to “born digital” organizations. Legacy giants such as Unilever, Fidelity, and Starbucks (where one of us, Satya, is on the board)—not to mention Novartis—had managed to create a digital innovation mindset and culture.

Our research shows that to enable transformation at scale, companies must create synergy in three areas:

Capabilities. Successful transformation efforts require that companies develop digital and data skills in employees outside traditional technology functions. These capabilities alone, however, are not sufficient to deliver the full benefits of transformation; organizations must also invest in developing process agility and, more broadly, a culture that encourages widespread, frequent experimentation.

Technology. Of course, investment in the right technologies is important, especially in the elements of an AI stack: data platform technology, data engineering, machine-learning algorithms, and algorithm-deployment technology. Companies must ensure that the technology deployed is easy to use and accessible to the many nontechnical employees participating in innovation efforts.

Architecture. Investment in organizational and technical architecture is necessary to ensure that human capabilities and technology can work in synergy to drive innovation. That requires an architecture—for both technology and the organization—that supports the sharing, integration, and normalization of data (for example, making data definitions and characteristics consistent) across traditionally isolated silos. This is the only real, scalable way

to assemble the necessary technological and data assets so that they are available to a distributed workforce.

Many large companies are making headway in each of these areas. But even leading companies tend to underestimate the importance of getting employees to pull transformation into their functions and their work rather than having central technology groups and consultants push the changes out to the business. As Eric von Hippel of MIT has advocated for many years, frontline users, who are closest to the use cases and best positioned to develop solutions that fit their needs, must take a central role, joining agile teams that dynamically coalesce and dissolve on the basis of business needs.

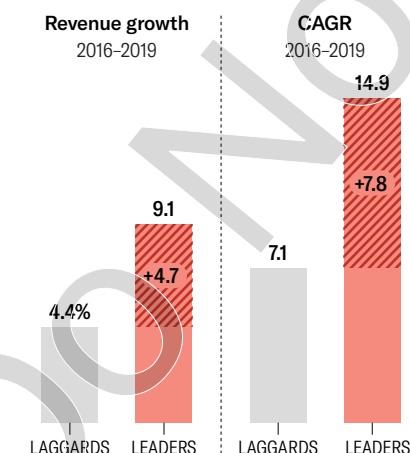
Building Tech Intensity

Our research unpacks how capabilities, technology, and architecture work together to build what we call *tech intensity*. Derived from the economics concept of intensive margin—how much a resource is utilized or applied—tech intensity refers to the extent to which employees put technology to use to drive digital innovation and achieve business outcomes. Our research found that companies that made good investments in technology and made tools accessible to a broad community of data- and tech-skilled employees achieved higher tech intensity—and superior performance. Companies that failed to develop tech- and data-related capabilities in their employees and offered only limited access to technology were left behind.

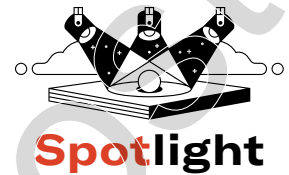
We ranked the tech intensity of the 150 firms in our study and found that

Digital Transformation Pays Off

We studied 150 companies in a range of industries and found that revenue growth and compound annual growth rate among the leaders (the top quartile) in tech intensity were more than double that of the laggards (the bottom quartile).



Source: Keystone



the top quartile of the sample grew their revenues more than twice as fast as the bottom quartile. (See the exhibit “Digital Transformation Pays Off.” To score your firm’s tech intensity, go to www.keystone.ai/techintensity.) We also found that technology, capability, and architecture indices correlated with other measures of performance, from productivity and profits to growth in enterprise value. Using an econometric technique known as *instrumental variables*, we also found evidence that the relationship between tech intensity and performance was causal: That is, greater intensity (especially investments in technical and organizational architecture) powered higher revenue growth.

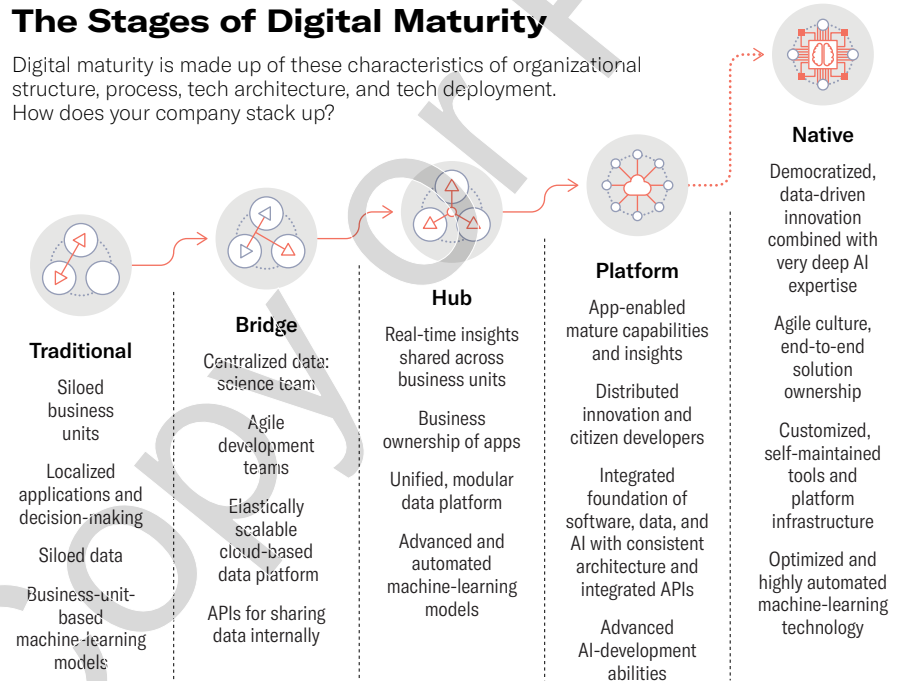
Staging the Transformation

Our analysis confirms that just spending money on technology does not result in more growth or better performance; in fact, in some cases it can actually damage the business if it accentuates divisions and inconsistencies across groups. Instead, it is the architectural, managerial, and organizational approaches to transformation that best explain the substantial and enduring differences among firms. We found that companies typically progress through five stages on their transformation journey. (See the exhibit “The Stages of Digital Maturity.”)

Traditional model. Not surprisingly, many companies fit what we consider to be the traditional model of digital innovation, whereby digital and technology investments are the province of the IT department (or other technical specialist groups) and impact is scattered across groups, mostly in inconsistent ways. IT

The Stages of Digital Maturity

Digital maturity is made up of these characteristics of organizational structure, process, tech architecture, and tech deployment. How does your company stack up?

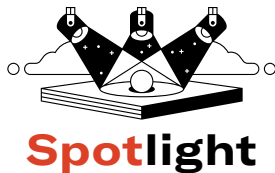


works with business units to fund projects and manage implementation—say, for the deployment of an enterprise application or a data platform technology. The projects and their implementations are customized to the specific requirements of the individual silos, business units, or functions. The result is that over time, the technology and data infrastructure reflect the quirks of individual groups, without any consistency and connectivity. This sort of disjointed approach makes it virtually impossible to share, scale, or distribute innovation efforts across the organization.

Many businesses in the traditional model still spend a great deal of money on information technology. Consider a financial services firm we studied, whose tech and analytics budget is among the

top in its industry, in both absolute and relative terms. The company has spent heavily on state-of-the-art data-platform technology and hired thousands of IT specialists and data scientists, who sit isolated in a separate IT group, while few (if any) employees on the business side are involved in the organization’s digital innovation efforts. The company thus lacks the architecture and capabilities required to foster any intensity in tech adoption. Not surprisingly, the firm’s IT and data sciences efforts have stalled, and business impact has been minimal.

A telltale sign that a company is in the traditional stage is that perceptions of impact among technology and business employees are dramatically different. The former perceive impact to



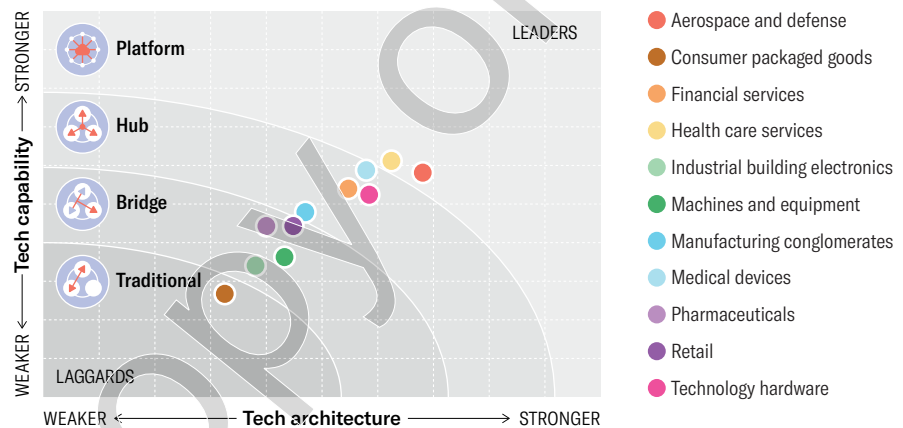
be high (as measured by the effort they put into their work), while the latter measure it as much lower (according to how their everyday activities have benefited).

Bridge model. To break free of the traditional constraints of silos—organizational and infrastructural—companies typically start by launching pilots that bridge previously separate groups and developing shareable data and technology assets to enable new innovations. They might first focus on specific functional opportunities such as optimizing advertising, manufacturing, or supply-chain capabilities. These companies are piloting not only technology but also a fundamentally different model of innovation in which executives, managers, and frontline workers from the business side work in collaboration with IT and data scientists. Victor Bulto, Novartis’s head of U.S. pharmaceuticals, was instrumental in launching early pilots (focusing, for example, on identifying at-risk patients) and served as a champion for many initiatives as the organization moved through the bridge stage. Lori Beer, JPMorgan Chase’s global CIO, likes to talk about the demonstrated impact of piloting AI to simplify expense reporting and approval—a process-improvement pilot that won over many employees.

Hubs. As more and more pilots demonstrate the success of the new approach, organizations form data and capability hubs and gradually develop the capacity to link and engage additional functions and business units in pursuit of opportunities for transformation. As they progress down this path, leaders begin to realize that

Digital Maturity by Industry

We looked at 150 companies in a range of industries and plotted the average levels of technology capability and technology architecture for each industry. Companies in consumer packaged goods, for example, tended to be at the early stage of the transformation journey; aerospace and health care firms were much more advanced.



the bottleneck in innovation has shifted from investments in technology to investments in the workforce. The limiting factor at this stage is the number of business employees with the capability—the know-how and the access—to drive digital innovation. Companies thus need to invest in coaching and training a much larger community of employees.

Fidelity strives to develop what it calls *digital athletes*. It began to build hubs by creating centralized data assets (a companywide data lake, for example); now it is scaling up training for thousands of business employees, giving them the capacity to deploy digitally enabled solutions across the entire business. Digitally savvy investment specialists and tax experts, for example, are working closely with data scientists

and technologists to create innovative solutions with a special focus on personalization and tailored customer impact. They’ve also created an app aimed at onboarding and engaging younger investors and another app for delivering AI-powered recommendations to Fidelity financial advisers, to name just a few examples.

Starbucks, too, is focused not only on technology and architecture but also on developing broad-based, agile innovation skills in its employees to power its hubs. CEO Kevin Johnson explains, “We’ve gone from large teams working in silos to smaller, cross-functional teams [everywhere], and from evaluating every idea as pass-fail to rapid iteration.” Starbucks is now a digital innovation powerhouse, with sophisticated customer apps enabling



Train and coach your employees to understand the potential of technology and data, and release the innovators within your workforce.

remote ordering, loyalty programs, and payment systems along with internal systems enabling AI-based labor allocation and inventory management.

Platform model. As companies enter the platform stage, data hubs merge into a comprehensive software foundation that enables the rapid deployment of AI-based applications. Firms focus on building sophisticated data-engineering capabilities and encouraging the reuse and integration of machine-learning models. Analytics-based prediction models are applied across the business, with an increasing focus on the automation of basic operational tasks. Organizations begin to function a bit more like software companies, developing comprehensive capabilities that enable product and program management and rapid experimentation.

Over the past five years, Microsoft has gone through almost every stage of this journey. Years ago, we were just as siloed as most companies, with each product-based organization segregating its own data, software, and capabilities. As we connected and normalized data from different functions and product groups, we were able to deploy integrated solutions in areas ranging from customer service to supply-chain management.

We integrated all our data in a companywide data lake, and we built what we call a *business process platform*, which provides software and analytics components that teams use to enable innovation in areas ranging from Xbox manufacturing to managing advertising spend. We also invested in training programs for nontechnical employees, cultivating data-centric and

machine-learning capabilities throughout the organization.

Native model. The most successful companies among the 150 in our study have deployed an entirely different type of operating architecture, centered on integrated data assets and software libraries and designed to deploy AI at scale across a huge, distributed spectrum of applications. Its hallmarks are a core of experts; broadly accessible, easy-to-use tools; and investment in training and capability-building among large groups of businesspeople. These companies are approaching the capacity of digital natives such as Airbnb and Uber, which were purpose-built to scale companywide analytics and software-based innovation. Airbnb and Uber are certainly not perfect, but they come close to the native ideal.

At Microsoft, we still have a lot to learn, but in some parts of the organization we are starting to approach the native model. As is common in any enterprise, the progress has not been uniform. Different groups have achieved different levels of capability, but the results overall are encouraging, as we see increasingly innovative solutions to internal and customer-facing problems. Most critically, our companywide approach to understanding, protecting, and working with data has progressed by light years.


The Imperative for Leaders

The mandate for digital transformation creates a leadership imperative: Embrace transformation, and work to sustain it. Articulate a clear strategy and communicate it relentlessly.

Establish an organizational architecture to evolve into as you make the myriad daily decisions that define your technology strategy. Deploy a real governance process to track the many technology projects underway, and coordinate and integrate them whenever possible. Champion agility in all business initiatives you touch and influence. And finally, break free of tradition. Train and coach your employees to understand the potential of technology and data, and release the innovators within your workforce.

This mandate extends to technology providers. Despite much investment, technologies are still too complex and are often too hard to use and deploy. We need tools and technology that make driving transformation intuitive for frontline workers while keeping data secure. Let's not forget that until recently many of us were relying on specialists in Fortran and Cobol to model business problems and even to perform basic mathematical operations. Spreadsheets brought about a revolution in mathematical modeling; we need technology providers to bring the same revolution to AI and make using a machine-learning application as easy as creating a pivot table.

Momentum is growing. But we must sustain the efforts to ensure that companies of all stripes make it across the digital divide. ☺ **HBR Reprint S22031**

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