

# Technology Report 2020

Taming the Flux

**BAIN & COMPANY** 

## Acknowledgments

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The authors wish to thank Bain Partners Bob Bechek, Jamie Cleghorn, David Deming, Eliza Kennedy, Jordan Lee and Brian Murphy; Associate Partners Sanjin Bicanic, Sushant Khandelwal and Amish Thakker; Practice Senior Manager Shikha Dassié; Senior Managers Horia Fratean, Kenzie Haygood and Jake Tenney; Managers Elisabeth Bentley Duffy and Tarun Gupta; Consultant Gunjan Jain; and Associate Consultants Min Choi and Stan Lawera for their contributions; and Jeff Bauter Engel for his editorial support.

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# A General Manager's View of Technology Markets



## ***What will it take to win in a rapidly changing industry grappling with Covid-19?***

Dear Colleague:

Whenever we gather Bain & Company's Technology practice team, we take every opportunity to have clients join us as guests, speakers and advisers. No surprise, keeping our customers' voices as a steady presence in our partner meetings is highly motivating. Over time, however, those clients have remarked that they also benefit. They've encouraged us to find a way to package some of the experience of a Bain Technology practice meeting. In particular, they've highlighted several unique features they cherished in the discussions, content and relationships:

- A sharp focus on shareholder value
- A CEO's or general manager's view of strategy—demanding clear articulation of competition, advantage and executable simplicity to get results
- An unrelenting focus on operational improvement as a source of advantage
- A global mindset

So, after a discussion at our partner meeting in January, we committed to create the first in a series of Bain global Technology Reports. Our hope is to fill an unmet appetite among our client leadership and further enrich the partnerships we have with clients.

Then, in February, the world changed. As the pandemic disrupted our clients, we directed all of our attention outward to client-facing support. We were prepared to deprioritize this report. However, amid the uncertainty, our clients were turning to us more than ever for signposts, discussion and decision making. In the end, we kept the report and added a chapter on Covid-19 at the beginning. We're struck by our clients' resilience. Yes, the crisis laid bare overlooked and underestimated weaknesses among technology companies. But it also accelerated existing plans and created

new, unexpected growth as people around the world scrambled to replicate their lives in virtual format with the help of technology.

The report is conceived to respond to our clients' interest. The first section, value evolution, takes an analytic view of how equity values and profit pools develop. While equity valuations are often short term, their long-term evolution holds important reminders of the rate of flux and direction of technology markets.

The second section offers a general manager's view of major competitive battlegrounds in the technology sector. We think of the general manager's view of strategy as that of a P&L owner: consumed with finding the match between market opportunities and the competencies of their organization. This is inherently forward-looking, focused on growth and earnings, and with a sharp view of the available profit pool, competitive advantage and the simplicity required for an organization to take action. Our clients find this approach more valuable than unverifiable market forecasts, complex frameworks and broad declarations about equity returns that don't always take into account the capacity to win or mobilizing an organization.

The third and last section contains examples of leadership innovation that creates advantage through the operations of the enterprise itself. Most great organizations ultimately outcompete their foes through disciplined execution, leading to speed and efficiency. Execution includes talent, culture, process and infrastructure. Here again, we endeavor to take the general manager's view, rooted in the specific strategy, as opposed to boilerplate methodologies and IT systems implementations.

I have no doubt that 2021 will be another busy and exciting year for the technology industry. CEOs and general managers will grapple with the Covid-19 disruption while trying to keep their organizations focused on efficiency, growth, innovation and ever-shifting product boundaries. We at Bain look forward to continuing the discussion with our friends across the industry's ecosystem.

A handwritten signature in black ink, appearing to read 'David Crawford', with a large, stylized initial 'D'.

**David Crawford**

Leader of Bain's Global Technology Practice



# Covid-19: The Unanticipated Catalyst

The pandemic is accelerating transformation across the technology industry.

**By David Crawford, Anne Hoecker and Chris Johnson**

It's safe to say that at the beginning of the year, everyone expected a very different 2020. Then Covid-19 hit. The virus has devastated families, communities and the global economy. Companies in every industry took steps early in the pandemic to protect and support employees, customers and their businesses, while trying to plan for an uncertain future.

In the technology sector, the crisis laid bare overlooked and underestimated weaknesses. It also created new, unexpected growth as people around the world scrambled to replicate their lives in virtual format with the help of technology. But most technology companies haven't drastically altered their existing plans.

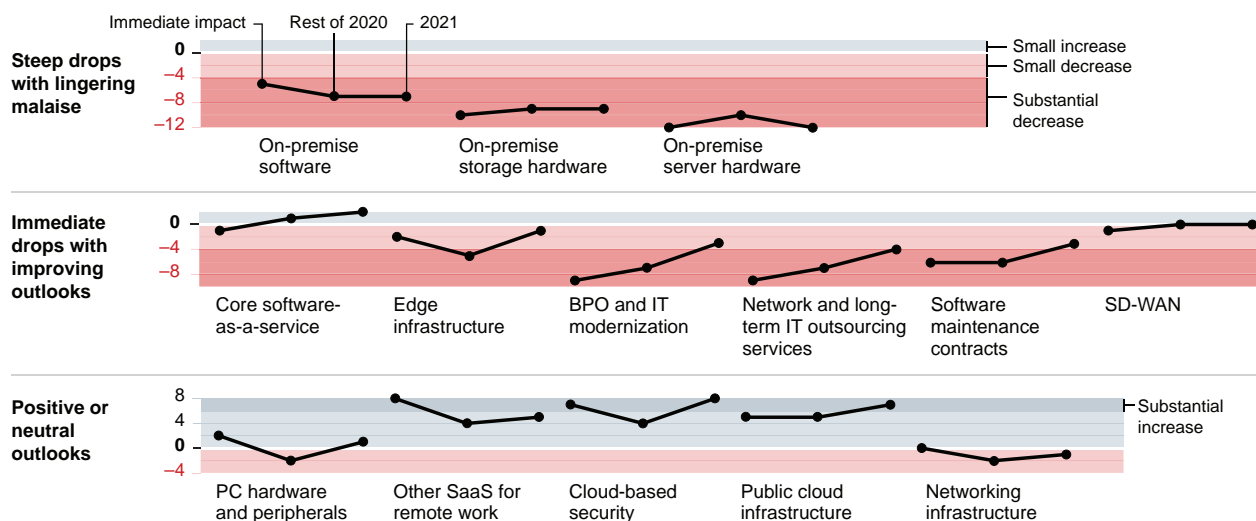
One of the clearest examples: The long-term shift from on-premise to cloud computing continues to be a critical priority, according to a cross-section of IT decision makers Bain & Company has surveyed monthly since March (see Figure 1). When the crisis hit, companies paused many of their IT investments. Early in the pandemic, IT decision makers said they expected decreased spending on software maintenance contracts and on-premise IT to continue at least through 2021. The expected spending reductions have only grown more pronounced as the pandemic has unfolded.

It wasn't all belt-tightening. IT decision makers said they immediately boosted spending on cloud-based security and software-as-a-service for remote work in the wake of the pandemic. They expect their cloud budgets to continue growing over the next year and beyond.

**Figure 1:** IT buyers expect the cloud-computing shift to continue despite Covid-19

**How will Covid-19 and the economic environment affect your company's IT spending immediately, over the remainder of 2020, and in 2021, compared with your spending before the outbreak?**

Expected percentage change by IT segment



Notes: Percentages are straight average of survey responses, not weighted by company size or spending; excludes respondents who selected "not sure/can't discuss"; SD-WAN is software-defined wide area network; BPO is business process outsourcing  
Source: Bain Covid-19 IT Buyer Survey (n=132, July 6-7)

**Figure 2:** Technology companies are reshaping their businesses in response to Covid-19



Source: Bain & Company

At the same time, the pandemic has spurred technology executives to reshape many aspects of their businesses with one critical objective: resilience (see Figure 2).

Retooling the supply chain has become an urgent priority for many leadership teams. They want to make them less brittle, not just cost-effective. Covid-19 disruptions have underscored how fragile extremely lean global technology supply chains have become after decades of shortening cycle times, stripping out costs and inventory, and concentrating production in China and a few other countries.

Technology executives are showing similar levels of commitment to automation wherever possible, but the pandemic has made automation a way of boosting resilience more than lowering costs. Companies are accelerating and programmatically scaling up their experiments with robotic process automation, artificial intelligence and other advanced automation tools.

As part of this, technology firms are rethinking their traditional reliance on selling products and services in person at industry conferences. The pandemic has mandated a dramatic shift to virtual sales, and that approach is likely to persist well after the crisis. Virtual channels can reduce costs, improve productivity and speed up sales cycles. It turns out they’re often just as effective for closing deals, if not more so.



The ways employees have adapted are also remarkable in many cases. For months, many have worked productively from home offices. They've kept their employers competitive despite having to navigate an isolated and often hectic home environment, with children, significant others and relatives similarly stuck under one roof. As a result, employer subsidies for remote-work tools—such as additional phone lines, faster Internet, in-home daycare and meal delivery—have quickly become a new front in the war for talent.

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The implications for office space and real estate alone are staggering. Many technology companies are considering allowing significant portions of their staffs to work from home permanently; reducing their office footprint; and replacing large banks of cubicles with fewer, better-equipped hoteling spaces.

Technology has always moved fast, but the transformation across the industry has accelerated faster than some in the industry thought possible. Like past crises, this one will favor those who boldly adapt and extend new ways of operating.

“ This rate of creative destruction speaks directly to the vibrancy and capacity for innovation of the technology sector.



1.

# Value Evolution



# Fast-Forward Darwin: The Speed Imperative in Tech

The pace of industry evolution continues to pick up.

**By David Crawford and Matthew Crupi**

For a sobering reminder of the pace of change in technology markets, just look at the turnover at the top.

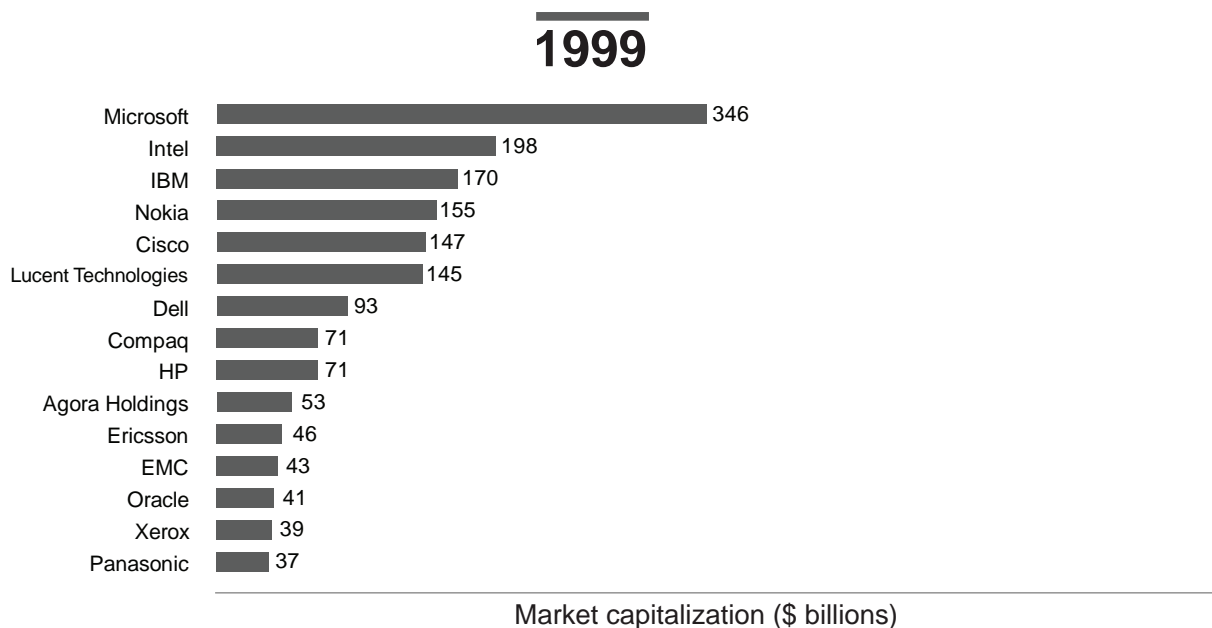
In 1999, the list of the 15 highest-valued technology companies worldwide was populated by mainframe legacy companies such as IBM; enterprise resource planning (ERP) darlings such as Oracle; and the winners of the PC/workgroup computing phenomenon: Microsoft, Intel, Cisco, Dell and HP (see *Figure 3*).

A decade later, about half of the list had been replaced. The most notable additions were early winners in search (Google), mobile (Apple, Qualcomm, Samsung) and ERP consolidation (SAP). For the first time, a semiconductor foundry (Taiwan Semiconductor Manufacturing Co.) also made the list (see *Figure 4*).

By 2019, 40% of the top 15 had turned over again. The newcomers illustrate the importance of social media (Facebook) and the growing influence of China (Tencent, Alibaba). But the decade's most transformative trend was the massive global success of cloud technology. It enabled the growth of other newcomers to the list (Amazon, Netflix, Adobe), and stalwarts from 2009 (Microsoft, Apple, Alphabet) rode the wave to massive valuations 10 years later (see *Figure 5*).

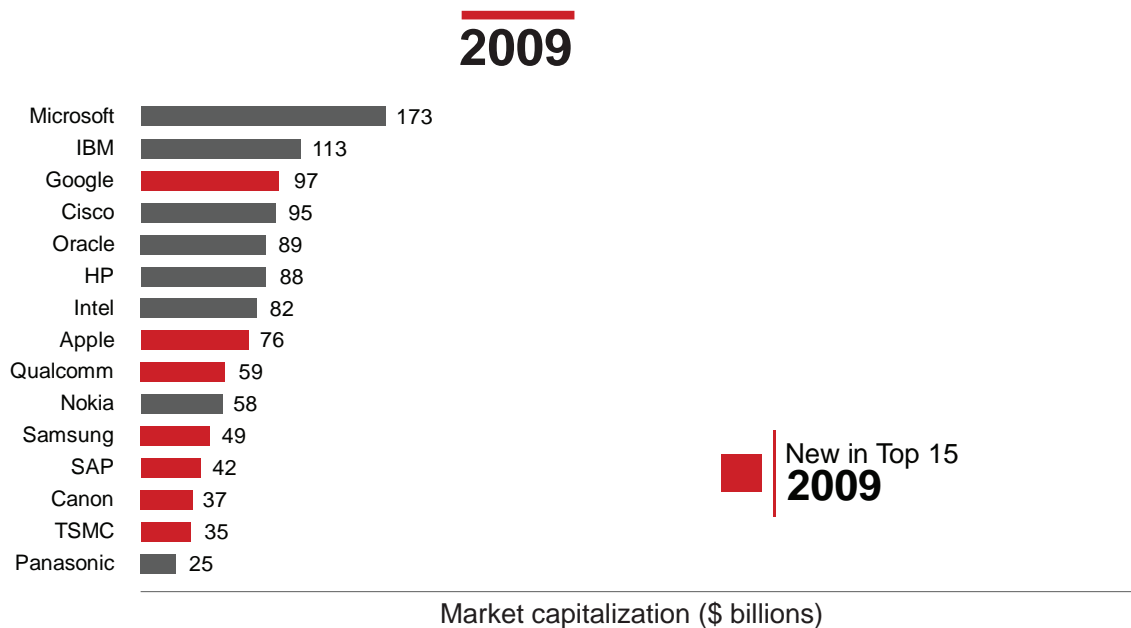
Only four companies remained on the list through the entire 20 years: Microsoft, Intel, Cisco and Oracle.

**Figure 3:** The 15 most-valuable technology companies were a mix of established and up-and-coming companies



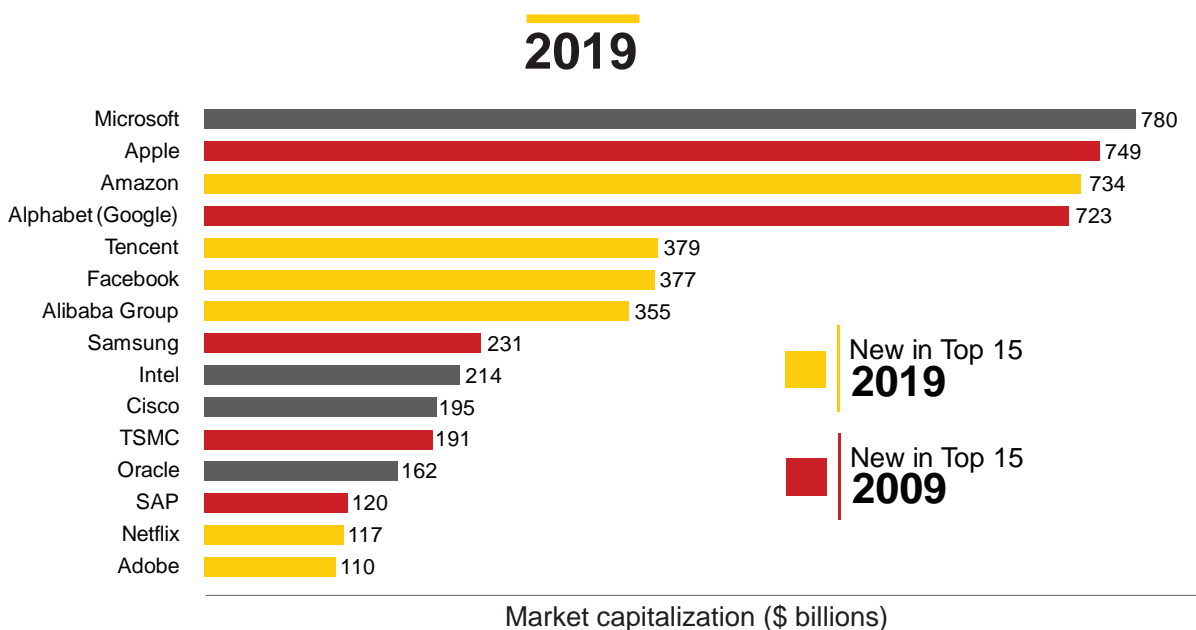
Note: Market capitalization data is from Jan. 1, 1999  
Source: S&P Capital IQ

**Figure 4:** About half of the list of most-valuable technology companies changed from 1999 to 2009



Note: Market capitalization data is from Jan. 1, 2009  
Source: S&P Capital IQ

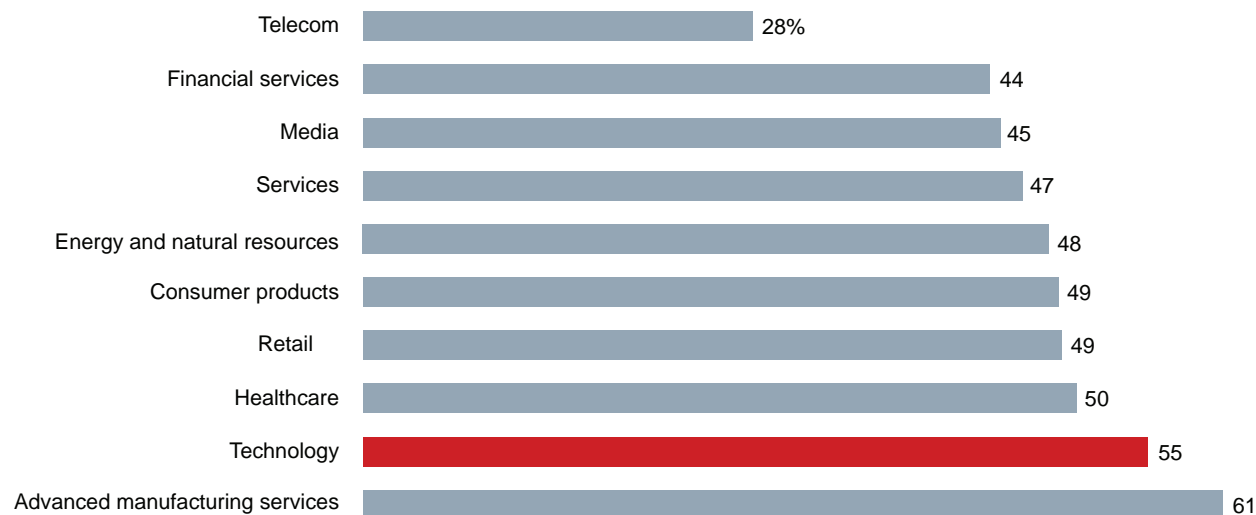
**Figure 5:** Much of the list of most-valuable technology companies turned over again from 2009 to 2019



Note: Market capitalization data is from Jan. 1, 2019  
Source: S&P Capital IQ

## Figure 6: Technology companies are easily disrupted

Percentage of companies that underperformed for three or more years (1996–2018)



Notes: Includes companies on the S&P 1500 in 1995 and 1996; underperformance defined as having an annual market capitalization growth rate at least 2 percentage points lower than the sector's three-year rolling average; advanced manufacturing services includes the aerospace and defense, industrial, real estate and transportation sectors; percentages are rounded  
Source: Bain analysis, based on data from Compustat (n=1,317)

This rate of creative destruction speaks directly to the vibrancy and capacity for innovation of the technology sector. But is this dynamic nature par for the course in most industries?

The answer is no.

Bain research shows that technology companies are 12% more likely to be disrupted than companies in retail and 25% more likely than those in financial services, two other industries that have historically gone through disruptions (see Figure 6). Although the term “disruption” has become a cliché, here we’re specifically referring to companies whose annual market capitalization growth lags their sector’s average by 2 percentage points or more for at least three years in a row. Only advanced manufacturing and services companies have a higher likelihood of being disrupted than technology companies.

And once a technology company falls behind, it can be difficult to repair. The same Bain research suggests that a technology company that has been disrupted is 12% less likely to return to sector-average market capitalization growth or higher than companies in retail and 17% less likely than those in healthcare, for example (see Figure 7).

Even more striking, the data shows that once a technology company trails its sector for three years or more, its chances of turning things around are very low, indeed (see Figure 8).

Why is strong business growth so difficult to maintain in the technology industry? Many industry CEOs attribute it primarily to the speed at which technology transitions occur.

**Figure 7:** Once disrupted, technology companies can be hard to repair

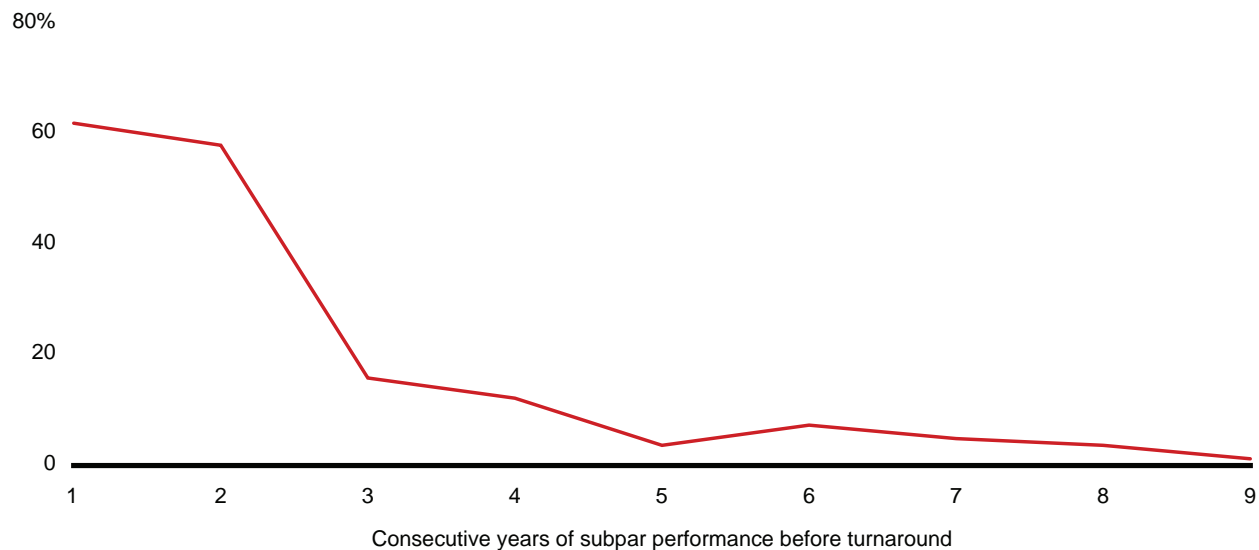
Percentage of companies that recovered after underperforming three or more years (1996–2018)



Notes: Includes companies on the S&P 1500 in 1995 and 1996; underperformance defined as having an annual market capitalization growth rate at least 2 percentage points lower than the sector's three-year rolling average; recovery occurs when the growth rate returns to the sector's three-year rolling average or better after three or more years of underperformance; advanced manufacturing services includes the aerospace and defense, industrial, real estate and transportation sectors; percentages are rounded  
 Source: Bain analysis, based on data from Compustat (n=674)

**Figure 8:** The longer a technology company underperforms, the smaller the chances of a turnaround

Percentage of underperforming technology companies that recovered (1996–2018)



Notes: Includes companies on the S&P 1500 in 1995 and 1996; underperformance defined as having an annual market capitalization growth rate at least 2 percentage points lower than the sector's three-year rolling average; recovery occurs when the growth rate returns to the sector's three-year rolling average or better  
 Source: Bain analysis, based on data from Compustat (n=148)



In some industries, such as manufacturing or oil and gas, the cycle times for a paradigm-shifting product to evolve and take hold can take many years, sometimes decades. However, the transition from feature phones to smartphones, for example, was completed in just seven years—from the introduction of the Apple iPhone in 2007 to the sale of Nokia’s handset unit to Microsoft in 2014.

Consumer mobile applications can ramp up with even more dizzying speed. ByteDance was reportedly worth \$78 billion just seven years after its 2012 founding. The China-based company rode the runaway successes of TikTok and Musical.ly, an app acquired in 2017 and later merged with TikTok. These apps helped usher in an era of videostreaming and social media built on simple tools that allow users to post short, creative videos and riff off of each other’s creations. TikTok is now a global phenomenon with hundreds of millions of daily users, although it’s currently confronted by a controversy over how it handles user data and is under pressure from the Trump administration to become part of a US-based company.

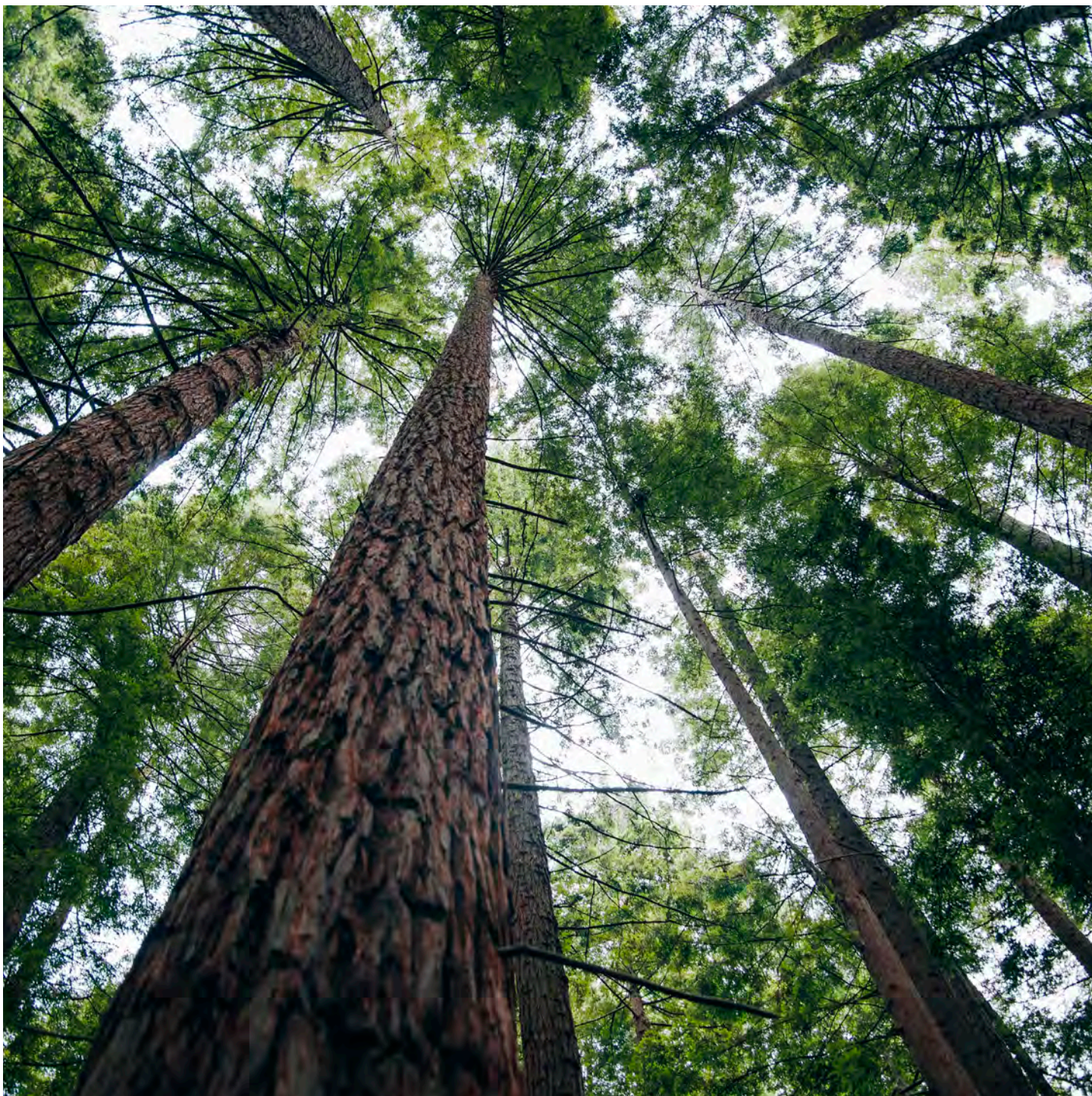
The pace of these transitions continues to accelerate. After launching in 2004, it took Facebook less than four years to reach 50 million users, according to news articles. By 2016, it took Instagram Stories less than two months to get to 50 million users, BuzzFeed News and other media outlets reported.

This also speaks to the “winner-takes-most” effect in the technology industry. Due to abundant cloud-computing infrastructure and mobile connectivity worldwide, a technology platform can reach a massive audience at unprecedented rates. And, of course, increasing scale digitally is nearly frictionless. It doesn’t require the time or costs involved in producing or distributing physical products. Ultimately, scale accrues so quickly to the winners that once a transition is missed, it’s difficult for other companies to get in the game.

As all technology executives know, technology talent is remarkably mobile and often compensated with company stock. When a technology firm falls behind in its sector, employees often dust off their résumés and begin scouting new jobs at the next fast-rising company.

Finally, most technology companies find they must rely on mergers and acquisitions to reposition and extend their businesses. But many lose several years mired in a common series of pitfalls before they hone their M&A strategy and skills. These missteps often include assigning core-business veterans to new market domains where they lack necessary expertise; hiring token outsiders who struggle to lead veteran teams; and making tiny acquisitions and overintegrating them to the point that the benefits of the deal are dissipated. The time lost navigating these mistakes often closes the company’s window for recovering.

Technology CEOs understand these challenges well, but that doesn’t make them any less daunting. So, how do leading technology companies create value and—just as important—maintain it? The keys are getting the most out of their core businesses and being willing to evolve, even when it’s painful in the short term.



# Creating Value in Tech through Constant Reinvention

Leading companies find ways to win platform transitions.

**By David Crawford, Ravi Vijayaraghavan and Chris Johnson**

The largest value-creating transformations in technology involve two things: winning a platform battle, and accelerating growth by either repositioning the core business or extending its capabilities into new domains.

The highest-valued technology companies are all platform winners that established their successful platforms as a market transition unfolded. There's Microsoft with Azure and Office 365, Amazon with e-commerce and Amazon Web Services, Google with search and Android, Facebook with social media, Adobe with Creative Cloud, and so on.

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The term “platform” is often used broadly. Here, we use it very specifically to indicate a product or service upon which others build their livelihood—one that attracts an ecosystem of partners and customers who collectively deliver value. The concept is as old as road widths, but is more prevalent in the technology sector than other industries. Now, it's becoming more critical as abundant foundational infrastructure such as cloud computing and mobile communications has enabled global, interconnected platforms to rapidly scale up.

The playbook for establishing a successful platform is no secret: mobilize early, offer the best ecosystem economics, win the anchor partners and customers, scale up the business, and extend and deepen customer engagement. However, the specifics of each platform strategy vary, and the journey is fraught with pitfalls. A platform by nature creates so-called network effects that can result in attractive economics and a winner-takes-most dynamic. As a result, platform battles are usually hotly contested, with intense races to scale.

The key to the other half of the value-creation equation depends on where a technology company falls in its life cycle—disruptor or incumbent. When a company already has a mature platform-based business model, the formula for value creation involves repositioning the core business as the market transition occurs. When a company's platforms are still nascent and growing, the formula for value creation more often involves extending them into new domains.

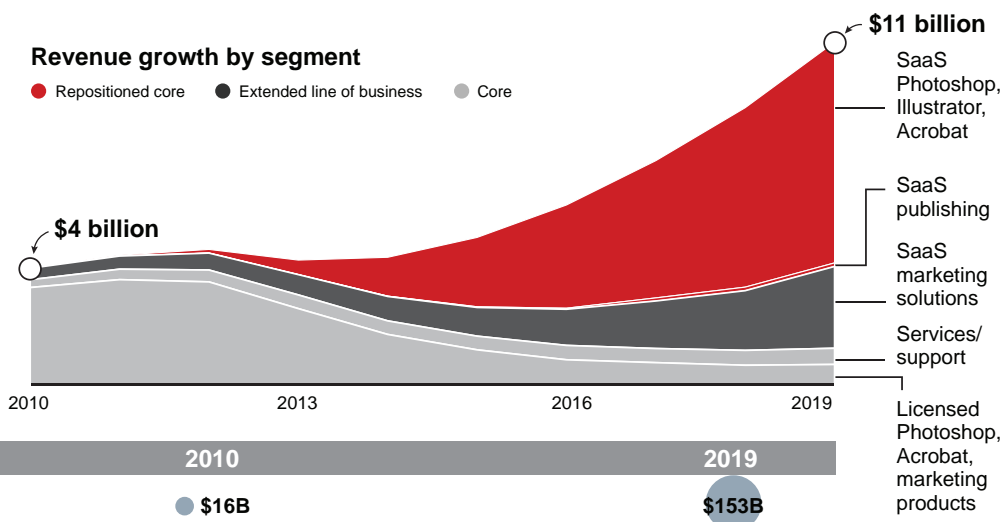
The core repositioning formula is particularly potent if the market has concluded such a repositioning is unlikely. Examples include Microsoft's and Adobe's repositioning around the cloud, and Nvidia's repositioning from mobile devices to graphics and the data center, as artificial intelligence growth exploded (see *Figures 9a, 9b and 9c*).

**Figure 9a:** Adobe repositioned its core business around the cloud

## Adobe

**Market transition:**  
Software-as-a-service (SaaS)

**Reposition:**  
Creative Suite to Creative Cloud



Notes: Year refers to fiscal year; market capitalization calculated on the day after fiscal year results were announced; multiple equals market capitalization on the day after fiscal year results were announced, divided by net income in that fiscal year  
Sources: Bain analysis, based on data from company financial reports and S&P Capital IQ

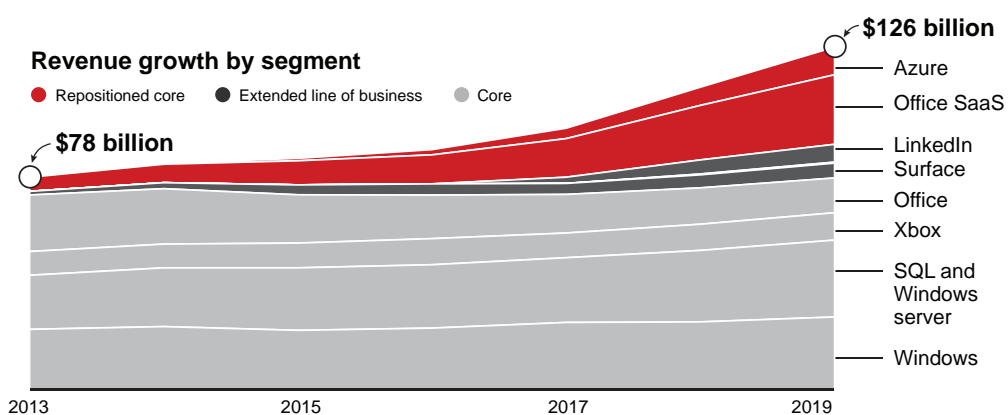
**Figure 9b:** Microsoft repositioned its core business around the cloud

## Microsoft

**Market transition:**  
Platform-as-a-service/  
SaaS

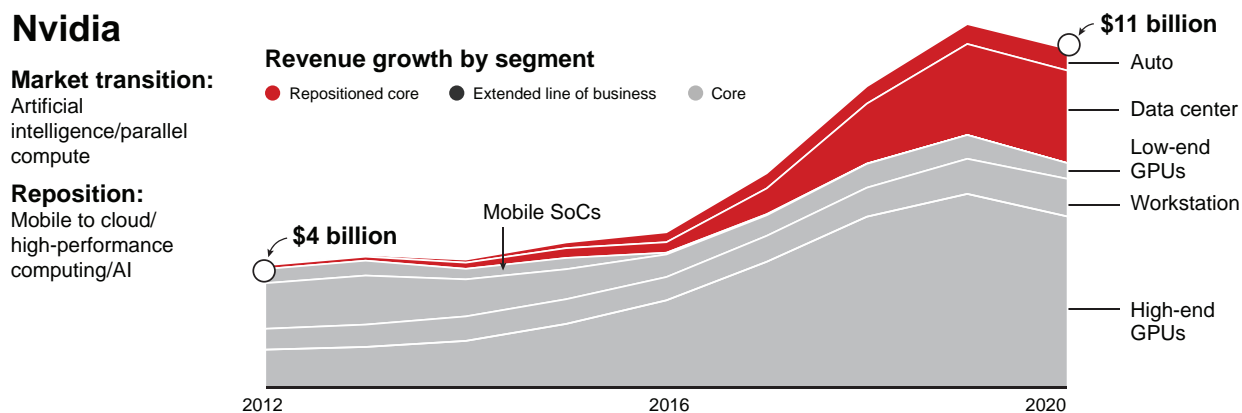
**Reposition:**  
Windows to Azure

**Reposition:**  
Office to Office 365



Notes: Year refers to fiscal year; market capitalization calculated on the day after fiscal year results were announced; multiple equals market capitalization on the day after fiscal year results were announced, divided by net income in that fiscal year; SQL is structured query language  
Sources: Bain analysis, based on data from company financial reports and S&P Capital IQ

**Figure 9c:** Nvidia repositioned its core business around graphics and the data center



Value creation	2012	2020
Market capitalization	● \$10B	● \$177B
Multiple	17x	63x
Profit margin	■ 15%	■ 26%

Notes: Year refers to fiscal year; market capitalization calculated on the day after fiscal year results were announced; multiple equals market capitalization on the day after fiscal year results were announced, divided by net income in that fiscal year; SoCs are system on chips; GPUs are graphics processing units  
Sources: Bain analysis, based on data from company financial reports and S&P Capital IQ

These transitions can be tricky. The new platform can pose conflicts for the old by cannibalizing the core business and alienating existing partners or customers. The better today's business is performing, the greater the resistance to change. But waiting until growth slows is often too late.

Adobe timed the refocus of its core business well. In 2011, the US-based company charged \$700 for a copy of its Photoshop software, available only on compact discs. CEO Shantanu Narayen decided to begin switching to a software-as-a-service model in which Adobe licensed a bundle of programs starting at \$50 per month, delivered through the cloud. Adobe was making a big bet that its new Creative Cloud would make it a stronger company in the long run, even if it took a hit initially.

The transition likely gave Adobe executives heartburn. From 2011 to 2014, the company's total annual revenue declined slightly from \$4.2 billion to \$4.1 billion, as its boxed software business shrank. But the Creative Cloud quickly began to deliver on its promise. In 2014, Adobe's annualized recurring revenue was \$1.6 billion for the segment that includes Creative Cloud. By 2019, the bet had paid off in a big way. Annualized recurring revenue for the Creative Cloud segment had swelled to \$7.3 billion. The company had 89% recurring revenue, and its stock price was trading at more than 50 times its earnings. From 2010 to 2019, Adobe's market value jumped from \$16 billion to \$153 billion.

Of course, many companies have missed the opportunity to refocus their businesses, and ended up worse off. Nokia, for example, was unable to adapt its feature phone business for the smartphone era.

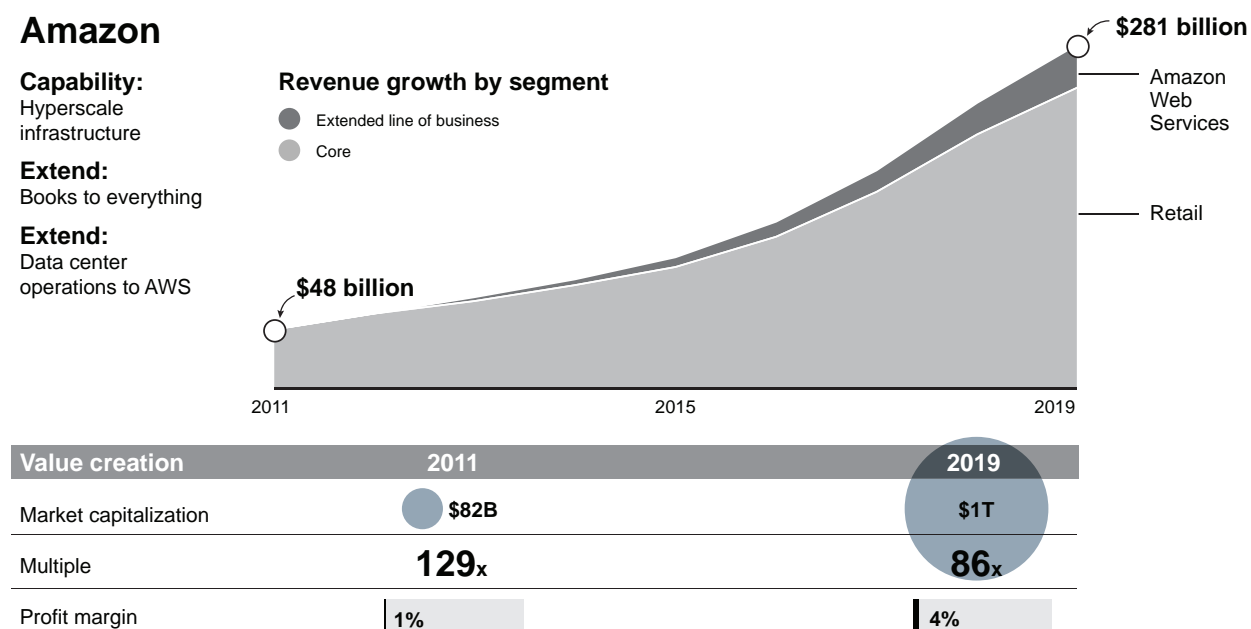
In the years following the introduction of the Apple iPhone, Nokia lost billions of dollars in market value and ended up selling its handset unit.

Technology companies in a high-growth phase face a different set of challenges when trying to extend their capabilities to create new businesses. The trick is to find the sweet spot where the organization's strengths match a promising market opportunity. Examples include Amazon's extension into cloud-computing services with AWS; Apple's extension into mobile media devices, smartphones and media content; and Alibaba Group's extension into payments, cloud computing and digital transformation of businesses. These companies built on their core strengths to reach new customers, deepen their relationships with existing ones, or accomplish both (see Figures 10a, 10b and 10c).

Alibaba Group has successfully navigated several business extensions. From the start, the China-based company's main growth engine has been online marketplaces. But five years after the company's 1999 launch, its leaders took advantage of the organization's e-commerce know-how and created an online payments service called Alipay. That product was later spun out as Ant Group, now one of the largest financial-technology firms headquartered in China.

As Alibaba's popularity grew, it had to build a massive computing infrastructure to handle the millions of transactions on its various e-commerce platforms. Company leaders realized they could turn those

**Figure 10a:** Amazon extended its core capabilities into cloud-computing services



Notes: Years refer to fiscal year; market capitalization calculated on the day after fiscal year results were announced; multiple equals market capitalization on the day after fiscal year results were announced, divided by net income in that fiscal year  
 Sources: Bain analysis, based on data from company financial reports and S&P Capital IQ

**Figure 10b:** Apple extended its core capabilities into mobile media devices, smartphones and media content

## Apple

**Capability:**

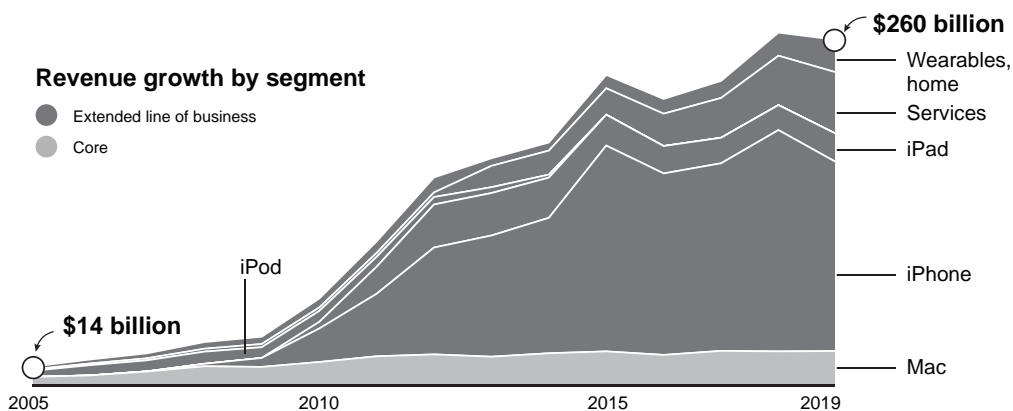
Integrated device design

**Extend:**

Integrated computing device (Mac) design to iPod/iPhone/iPad

**Extend:**

Cloud services



Value creation	2005	2019
Market capitalization	\$41B	\$1.1T
Multiple	31x	20x
Profit margin	10%	21%

Notes: Years refer to fiscal year; market capitalization calculated on the day after fiscal year results were announced; multiple equals market capitalization on the day after fiscal year results were announced, divided by net income in that fiscal year

Sources: Bain analysis, based on data from company financial reports and S&P Capital IQ

**Figure 10c:** Alibaba extended its core capabilities into cloud computing and digital transformation of businesses

## Alibaba Group

**Capability:**

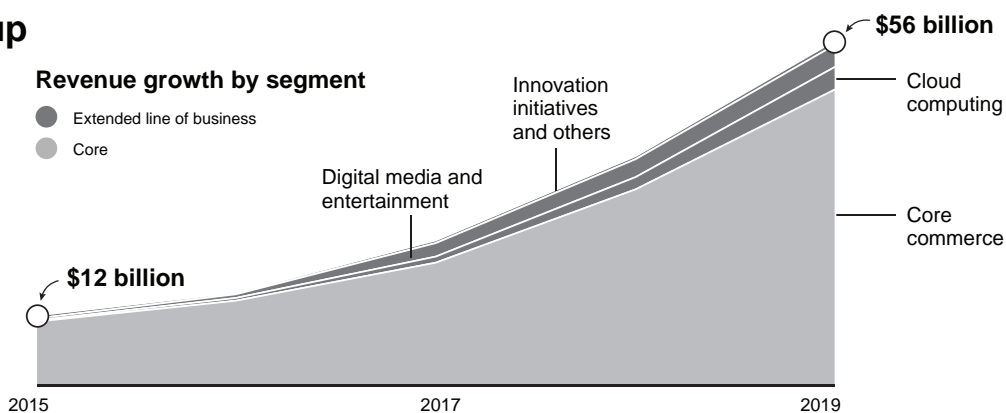
E-commerce

**Extend:**

Cloud/infrastructure-as-a-service

**Extend:**

Digital transformation/product development services



Value creation	2015	2019
Market capitalization	\$217B	\$455B
Multiple	55x	38x
Profit margin	32%	23%

Notes: Years refer to fiscal year; market capitalization calculated on the day after fiscal year results were announced; multiple equals market capitalization on the day after fiscal year results were announced, divided by net income in that fiscal year; innovation initiatives and others includes Alibaba's digital transformation and product development services

Sources: Bain analysis, based on data from company financial reports and S&P Capital IQ

assets and their experience into a new business offering third-party cloud-computing services. Alibaba Cloud was born in 2009 and had grown to \$3.7 billion in annual revenue a decade later.

More recently, Alibaba has made a push to help enterprises digitally transform their businesses with the help of its analytic capabilities and expertise spanning e-commerce, cloud computing, financial technology, supply chains, sales and marketing, and consumer insights. Alibaba's series of business extensions have made it one of the most valuable technology companies in the world, with a market capitalization of \$455 billion at the end of its 2019 fiscal year.

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Whether a company needs to reposition or extend its core business, the essential job of management is to deeply understand the transition occurring in its sector and create a plan built around the firm's strengths.

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Whether a company needs to reposition or extend its core business, the essential job of management is to deeply understand the transition occurring in its sector and create a plan built around the firm's strengths. This encompasses not only its strategic products and services, but also its operational capabilities and employees' skills and expertise. Once the company has lined up its competencies with the sector's evolution, it can invest strategically in product and service expansions, partnerships, and mergers and acquisitions to navigate the market transition quickly and successfully.

“ Today’s leading AI companies recognize that data and talent are the engines of AI growth, and are investing heavily in both.

# 2.

## Competitive Battlegrounds





## Beyond Moore's Law: Capture Value from Data

The explosion of data has made AI, the hybrid cloud and the Internet of Things the fiercest battlegrounds in technology.

**By David Crawford**

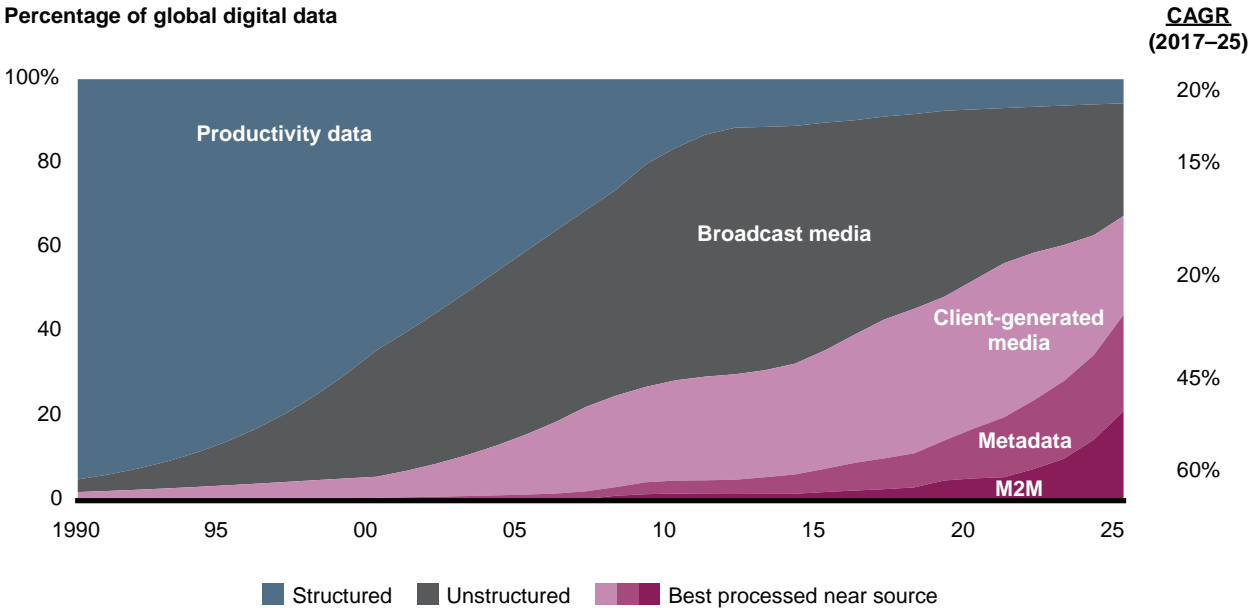
With value creation shifting along the lines described in the previous section, general managers of technology businesses need to match evolving customer needs with their competitive strengths and the competencies of their organizations. It can be hard, however, for managers to find sound coverage of market transitions that provides predictive headlights extending past the next two or three quarters. Our goal in this competitive battlegrounds section is to bring important transitions to light in a way that provides medium-term insights. We focus on prime-mover technology trends and the investment patterns of leading contenders that have long-term predictive value. This “battleground” approach provides insight that can be more easily adapted to a company’s specific situation.

In the past, we’ve sometimes focused on Moore’s Law as the industry’s prime mover. But in recent years, this phenomenon of dramatic growth in computer processing power has slowed and grown more expensive.

Today, data takes the top spot. Its exponential growth and evolving mix predict sweeping changes to IT architecture and business dynamics (see Figure 11). The rate of data growth is almost unfathomable: IDC estimates the amount of data created over the next three years will be greater than the data created over the past three decades.

The nature of data is as important as the quantity. The fastest-growing areas today are user-generated media and metadata. This data is often unstructured and latency-sensitive. Companies are making

**Figure 11:** As data grows exponentially, the mix is shifting



Notes: Productivity data includes relational databases, business intelligence suites, web data, search, social and mobility; broadcast media includes broadcasting, digital TV, over the top and streaming; client-generated media includes user-generated image, video and speech, and video surveillance; M2M is machine to machine  
 Source: Bain analysis, based on data from IDC, analyst reports, industry whitepapers and industry interviews

significant changes to the architecture of networks and data centers to accommodate this shift. Specifically, the hyperscale data center is starting to blend with the network as computing capabilities become embedded throughout, extending all the way to connected devices at the network's edge. As a result, Microsoft, Amazon, Google and other technology companies show no signs of slowing their massive investments in edge computing, hybrid cloud technologies and the Internet of Things. Meanwhile, more and more companies will turn to artificial intelligence and other advanced analytics technologies in order to manage—and, more important, capture value from—the extraordinary loads of unstructured data.

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We expect these areas—data analytics, cloud and edge computing, and the IoT—to be the fiercest competitive battlegrounds in technology over the next year and beyond.

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We expect these areas—data analytics, cloud and edge computing, and the IoT—to be the fiercest competitive battlegrounds in technology over the next year and beyond.

The last competitive battleground that will define the sector for the foreseeable future is not technological, but geopolitical: China. The country is a critical market for global technology companies, and the Chinese technology sector is a rising star. But the trade war and other tensions with the US and other countries have created enormous uncertainty for technology companies and China's position in the industry.

Technology executives that get a handle on these emerging battlegrounds will have a better shot at guiding their companies through the transitions underway.



## Alan Turing as a Service: AI Transforms Tech Products

The industry is redefining products with AI, which has triggered a race for the best data and talent.

**By Paul Renno, Roy Singh and Velu Sinha**

Our podcasts, business literature and public earnings calls confidently espouse the criticality of data, machine learning and artificial intelligence (AI) to our future. AI and machine learning (ML) companies took in nearly one-fifth of all US-based venture funding in the first half of 2020. Google and many other technology leaders are now “AI-first” companies; cloud and mobile have taken a back seat.

It’s clear that data, machine learning and AI will play a fundamental role in the technology industry’s growth and evolution in the coming years. Every business will be affected in some way by these technologies. Now, the question for executives is, “What should I do about it?”

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Today’s leading AI companies recognize that data and talent are the engines of AI growth, and are investing heavily in both. The leaders are also finding new and creative ways to put AI technologies at the core of their products. These companies’ strategies hold lessons for all business executives trying to figure out how they can capitalize on these critical technologies.

A good place to start is by defining the terms “AI” and “machine learning,” how they’re being used, and what they can ultimately deliver. Our definition is intentionally broad to emphasize the intent, as opposed to any specific tool or model. Machine learning refers to techniques for developing computer algorithms that learn from data instead of being specified explicitly by programmers. Artificial intelligence uses ML and other techniques to enable programs to behave autonomously and provide human-like responses.

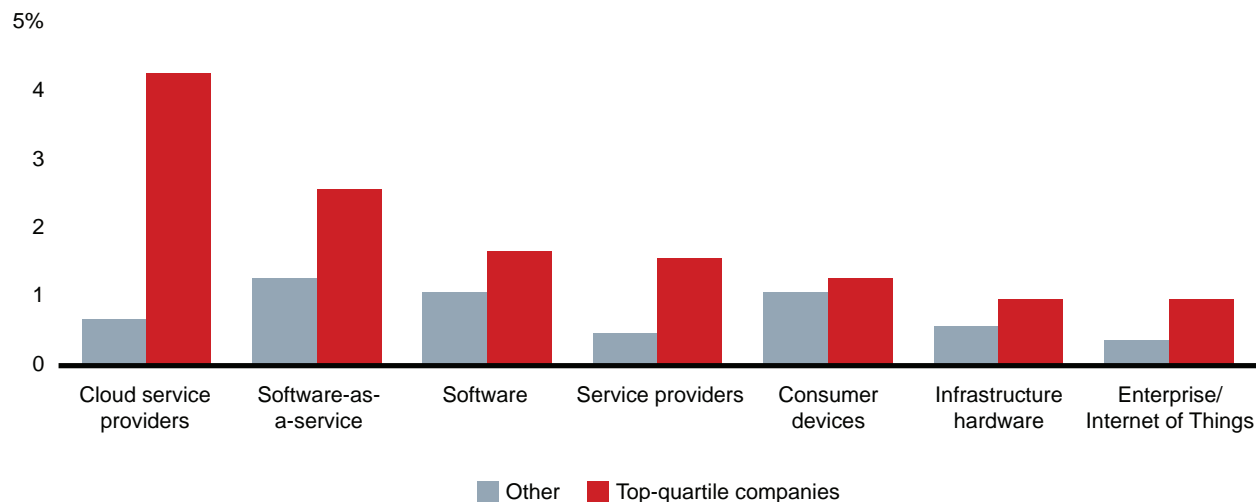
Coined in 1955, the term “artificial intelligence” encompasses a range of analytical and reasoning computing techniques. These started with sets of rules, called expert systems, and have evolved into complex, many-layered neural networks that train themselves using thousands of machines in cloud data centers. Like other recent technology advances, the growth of AI and ML has been spurred over the last 10-plus years by the dramatic reduction in the cost of storage and computing power driven by Moore’s Law; the proliferation of data generated by the Internet and mobile devices; and the wide availability of data and ML tools through cloud platforms and open source.

What can we learn from the early successful users of AI and ML? The key insight is they’ve engineered their businesses and products with feedback loops that capture valuable user data, which is used to build intelligent ML models, which in turn power differentiated services that increase customer



**Figure 12:** Leading companies are investing heavily in AI talent

### Share of employees in artificial intelligence roles



Notes: Quartiles are based on the rate of annual revenue growth; AI roles defined as those with titles related to machine learning, artificial intelligence, data scientist, deep learning, natural language processing, generative adversarial networks, computational linguist, imaging and vision architect, applied scientist, research scientist, computer vision architect, classification software engineer, predictive modeling, predictive analytics, neural network, natural language understanding, cognitive; other terms were applied based on firm-specific recruiting materials  
Source: Bain analysis, based on data from LinkedIn and S&P Capital IQ

stickiness and result in further data capture. LinkedIn and Netflix recommendations are good examples. Their device and web user interfaces generate data on user engagement. This enables Netflix to make personalized movie and show recommendations, and LinkedIn to provide personalized newsfeeds and recommend professionals with whom to connect.

Consumer web companies, cloud service providers and software-as-a-service businesses were the early movers, but the transition to AI-enabled businesses is coming to all technology firms. However, some are better positioned than others. Leading companies recognize that AI product development is constrained by the available talent, and they're quickly scooping it up. Across the technology stack, the top-performing companies as measured by revenue growth are investing heavily to expand their AI workforces. In many technology segments, these leaders have two to three times more AI talent on staff than the rest of the field (see Figure 12).

What does that mean? The leaders' talent advantage could help them develop more innovative AI products and capture a larger share of this critical market.

## AI opportunities

Leaders in the next wave of AI adoption view data, ML and AI as critical to the future of their businesses. These companies are redefining their products by infusing them with these technologies in three primary ways.

**Adding features.** Companies are using AI and ML to make their products smarter, more automated and ultimately more productive for customers. Since launching its Einstein tool in 2016, Salesforce has embedded AI capabilities across its primary offerings: Sales Cloud, Marketing Cloud and App Cloud. These applications now bring automation and increased intelligence to around 20 functions, including customer lead scoring, sales forecasting, language and sentiment analysis of customer communications, customer churn predictions and next-best-action recommendations.

Salesforce’s executives recognized good data—and good data management—must underpin all of this, so they acquired Krux in 2016. This data management platform interacts with more than 3 billion browsers and devices, supports more than 200 billion data collection events and processes more than 5 billion customer relationship management records. The platform’s tools unify third-party data with first-party data to improve the ML models that support customers’ applications.

**Creating services.** AI is affecting industries that traditionally haven’t relied much on technology. Compass, a home-brokerage start-up backed by SoftBank, hired the former chief technology officer of AI at Microsoft, Joseph Sirosh, in 2018. As CTO, Sirosh has helped Compass develop AI-powered services based on the extensive data being collected in the company’s core real estate product lines.

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## AI is affecting industries that traditionally haven’t relied much on technology.

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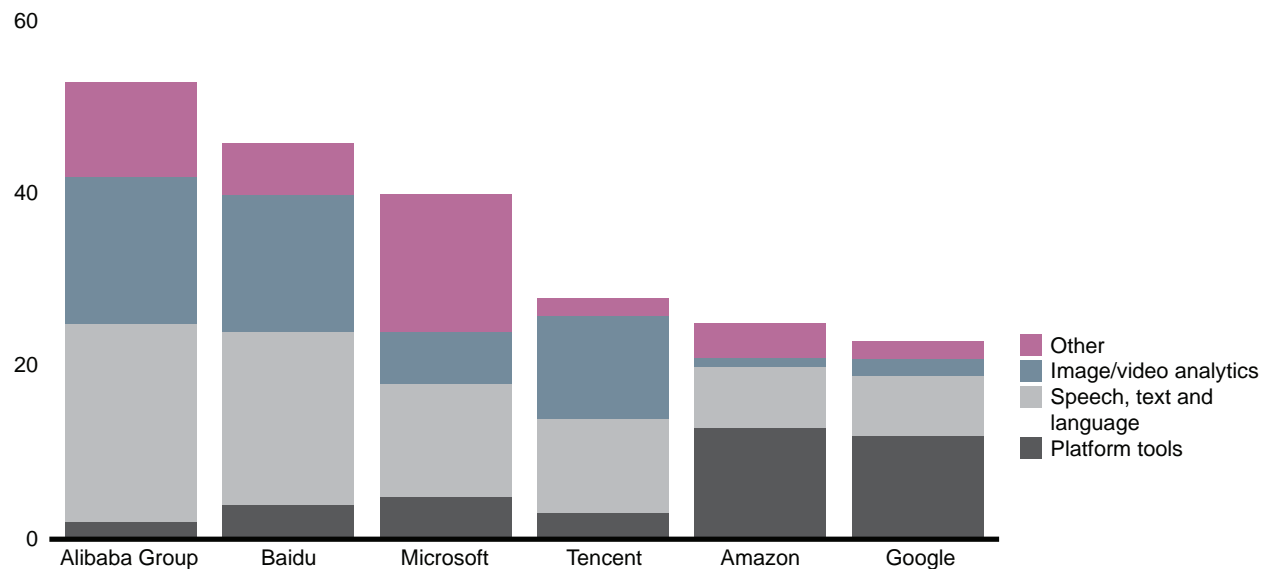
For example, Compass offers a “Concierge” service that recommends and fronts the cost of home improvement services such as staging, flooring and painting. Based on before-and-after photographs of tons of properties and extensive transaction data, Compass is using AI to help sellers visualize potential home improvement investments and make better-informed decisions that will maximize sale value. By the end of 2019, nearly 20% of active Compass listings included this value-added service; Compass takes a fee based on results. AI-enabled services like these have helped Compass become one of the top brokerages in the US by sales volume, according to Real Trends.

**Building platforms that democratize AI.** The most powerful early influencers of the AI transition are developers of cloud tools and services, including US- and China-based companies such as Google, Microsoft, Amazon, Facebook, Alibaba, Baidu and Tencent. Many of these companies saw opportunities to help their customers more effectively organize, analyze and interpret the large volume of data they were collecting and processing in the cloud (see *Figure 13*).

Baidu took advantage of its search engine’s leading market position in China to become the preeminent provider of ML tools in the Chinese cloud market. Based on search data from hundreds of millions of consumers, Baidu developed its Baidu Zhishu index to analyze trending interests across dif-

**Figure 13:** Cloud service providers are significantly expanding their AI tools and services

### Number of artificial intelligence and machine learning services



Notes: Data as of August 2020; services and products based on services marketed to external customers  
Sources: Company websites

ferent user segments, geographies, topics and media, including text, images and videos. These large data sets, and the associated ML tools, were embedded into the heart of Baidu's cloud offering and deep learning platform, PaddlePaddle. They've propelled the popularity of Baidu's cloud platform among AI and ML developers.

Other cloud leaders have taken a similar approach, including Amazon, which has created an AI flywheel with its Alexa products. More data helps improve the products, which wins more customers and attracts more talent (both internal and external) to the company's AI platform. This feeds additional advances in AI technologies and better products—and the cycle continues.

## The AI journey

Now that these technologies are maturing, a lot more companies are expected to weave intelligent capabilities into their products. But the technology industry is still learning how to get the most out of AI and ML. They're complex, and a lot can go wrong on a product's journey from idea to development to the market. Learning from the early adopters, companies can maximize their chances of success by taking the following steps.

**Build a differentiated data asset.** The use of 21st century technology, computer science and applied mathematics to create personalized and automated products is an exciting topic in the board-

room. Data governance usually inspires less enthusiasm among the C-suite. Yet in the increasingly competitive AI battleground, more and better data beats better algorithms.

That's why leading companies take an exacting approach to managing their data assets. They also make investments to enrich the value of their proprietary data assets. Web crawling, crowdsourcing, computer vision, sensors and partnership deals can all provide a significant boost to data assets.

Executive teams investing in AI should remember this important trend: the growing sensitivity around data ownership, usage and privacy. Europe has been at the forefront of regulations regarding privacy and transparency, and strong regulations are emerging across the globe in national and regional markets such as India and California.

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Executive teams investing in AI should remember this important trend: the growing sensitivity around data ownership, usage and privacy.

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Amid that backdrop, companies such as Google, Apple and Microsoft have developed more advanced differential privacy and homomorphic encryption techniques, and these are reaching the mainstream. The US Census Bureau now plans to release data using some of the latest privacy technologies. And healthcare groups fighting the Covid-19 pandemic are experimenting with federated learning and other privacy techniques to more securely share sensitive data.

**Develop critical skills and processes.** Most technology companies recognize that data scientists are a necessary component of bringing intelligence to their products. But some overlook the fact that many other roles and skills are required to support the delivery of AI and ML features. These include data and ML product management and design; data stewardship, contract negotiation and sourcing; data labeling operations; and ML system engineering and technology operations.

Developing these new capabilities can be challenging. Product designers and data scientists frequently appear to hail from different planets, and product management is still an emerging discipline at many technology companies. Top-performing companies ensure these new teams have the resources and support they need to excel.

In addition, these new capabilities require new processes that will add complexity to an organization. Google has referred to ML as “the high-interest credit card of technical debt.” The company has documented 28 separate tests that can be applied to any ML model that it uses. This is more complicated and rigorous than typical software product development processes, but while ML is more complex, the potential return on investment can be much bigger.

**Redesign product workflows with data, ML and AI in mind.** The most successful leadership teams think through the opportunities to use and capture data at every stage of their customers' journey. These leaders also keep their fingers on the pulse of new battlegrounds for value-added intelligent assistant services that they can layer on top of today's simpler product workflows. A well-known example: Google Maps has evolved from a simple query interface for locations to a context-sensitive intelligent assistant that has become an essential tool for many.

**Participate in fast-moving technology ecosystems.** ML and data management technologies are developed as open-source projects more often than in other software domains. Some ML and data management open-source projects have a single, large corporate backer, such as Google's TensorFlow and Facebook's PyTorch. Some have multiple large backers: Presto is actively developed by Facebook, Uber and Netflix, among others. And other projects have influential academic stakeholders. Projects such as Jupyter, Apache Spark and Ray, for example, all have significant ties to the University of California, Berkeley. Winning the technology, data and talent race will usually involve a mix of partnerships, strategic participation in open-source initiatives, mergers and acquisitions, and organic product development.

## **Leadership required**

While the possibilities of AI and ML technology are exciting, organizations must invest in the underlying data, skills, processes, product designs and partnerships necessary for success. It's tempting to assume that AI can also address some of these foundational challenges and pull itself up by its bootstraps, but in reality, human leadership and guidance will remain essential. Executives will need to apply their best judgment in placing the right AI and ML bets to navigate complex uncertainties around customer adoption, technology capabilities and ecosystem dynamics. To quote Gerd Gigerenzer, an expert in decision making: "If risks are known, good decisions require logic and statistical thinking. If some risks are unknown, good decisions also require intuition and smart rules of thumb."



# The Future of Hybrid Cloud: Fight, Ally or Exit

Cloud service providers are shaping the sector,  
but their ecosystems will create roles for many.

**By Mark Brinda, Bill Radzevych and Jani Kelloniemi**

If you talk to a CIO, you're likely to come away thinking that the hybrid cloud is one of the most critical areas of investment that will define their IT strategy over the next decade. But what does hybrid cloud actually mean?

A lot of the current focus and energy in the market revolves around three related but distinct hybrid cloud value propositions: the ability to seamlessly integrate cloud infrastructure from multiple vendors, to move workloads and data between on-premise systems and a public cloud, and to extend cloud capabilities to edge computing environments.

If you listen to cloud providers, you'll hear a lot about multicloud and edge. The truth is that today's hybrid cloud deployments focus mainly on the simpler and more practical need: applying public cloud resources to legacy data and applications.

The multicloud value proposition is more a dream than a reality at this point. Two out of three CIOs indicate they plan to use multiple public cloud infrastructure providers to avoid vendor lock-in and control costs, according to Bain & Company's Covid-19 IT Buyer Survey. However, when we look at actual spending, very few companies have succeeded in doing so. Companies use many clouds when it comes to their software-as-a-service applications. But looking just at their computing infrastructure—which is most relevant to hybrid cloud purchase decisions—more than 70% of companies are using only one provider. Those who do use multiple public clouds spend more than 90% of their public cloud budget with a single vendor (see Figure 14).

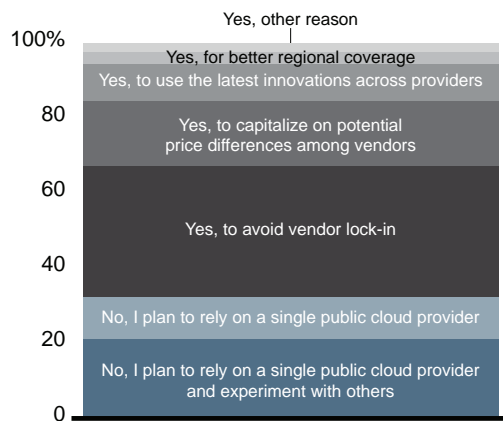
**Figure 14:** CIOs say they want to use multiple public clouds, but most rely on a single vendor

**Two-thirds of CIOs claim an intent to use multiple clouds at scale**

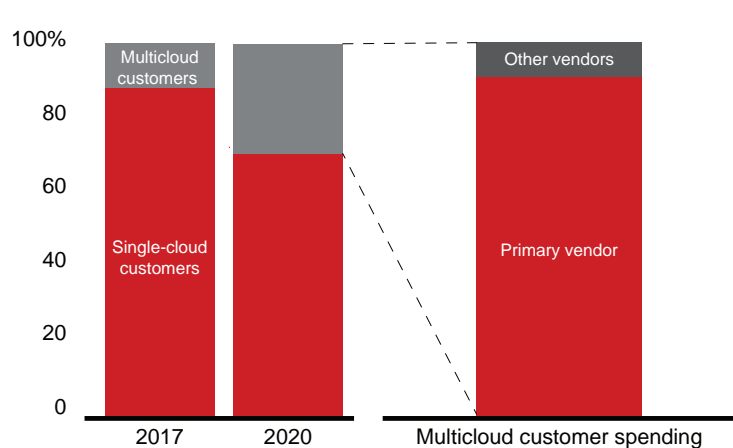
**Despite multicloud growth, 71% of companies use one cloud**

**Even for companies with multiple vendors, more than 90% of public cloud spending goes to one provider**

Percentage of CIOs who do or don't plan to use more than one public cloud, and why



Percentage of companies



Sources: Bain Covid-19 IT Buyer surveys, 2020 (n=200 April 6-8, n=159 May 4-6, n=132 July 6-7); spending and utilization data provided by 7Park Data

Why the discrepancy between desire and reality?

First, the average company uses 53 cloud platform services that go beyond basic computing and storage. These services support products in artificial intelligence (AI), mobility services, augmented reality (AR), virtual reality (VR) and more. This makes it nearly impossible to seamlessly migrate an application from one infrastructure provider to another, as the application will call on a platform service that isn't there. Second, the complexity of operating across multiple public clouds creates security and downtime risks. Third, companies are struggling to develop, hire and retain the talent to operate one cloud infrastructure environment at scale, let alone several. Lastly, the differentiation across the current public clouds is just not significant enough to offset all of these challenges.

The other two hybrid cloud value propositions are more real.

The link between on-premise infrastructure and the public cloud is crucial to many companies' IT operations today. Many CIOs currently rely on this link to modernize legacy systems with advanced cloud services, to provide backup and disaster recovery capabilities, or to gain extra computing capacity during periods of peak usage. It's challenging enough for CIOs to capture value from these kinds of hybrid cloud use cases. The loftier goal of deploying and running multiple public cloud infrastructure environments at scale, and then connecting and securing them—that's well beyond the reach of mainstream IT organizations.

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The two competitive battlegrounds that will determine the direction of the hybrid cloud market are edge computing and the link between on-premise and public cloud systems. Investments in these areas have a stronger likelihood of paying off.

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For the third proposition, edge computing, the question is “when?” not “if?” In a recent Bain survey, only 35% of CIOs said they're looking for end-to-end hybrid solutions that encompass the edge, the computing that occurs at or near the source of the data. Nevertheless, enterprise investments in the edge are growing. As video, the Internet of Things, autonomous driving, AR/VR and other emerging technologies continue to advance, more workloads will take advantage of edge resources. The connection between edge environments and the cloud is going to be a critical issue as edge deployments scale up. Having a seamless and interoperable development, security and operations environment; common analytic tools; and one-touch provisioning will be major sources of value when enormous volumes of data are generated at the edge and need to be efficiently processed.

What does that mean? The two competitive battlegrounds that will determine the direction of the hybrid cloud market are edge computing and the link between on-premise and public cloud systems.



Investments in these areas have a stronger likelihood of paying off. Bets on enabling multicloud interoperability are riskier and face some structural barriers that may not be overcome, at least in the near term.

Cloud service providers (CSPs) are behaving accordingly, especially the leaders, Amazon and Microsoft. It's no surprise these CSPs are more focused on helping customers take full advantage of their proprietary cloud services than they are on enabling multicloud integration.

Leading CSPs are setting the hybrid cloud agenda from a position of strength. Their advanced AI capabilities, strong balance sheets, best-in-class developer talent and CIO relationships rate highly in this kind of platform battle.

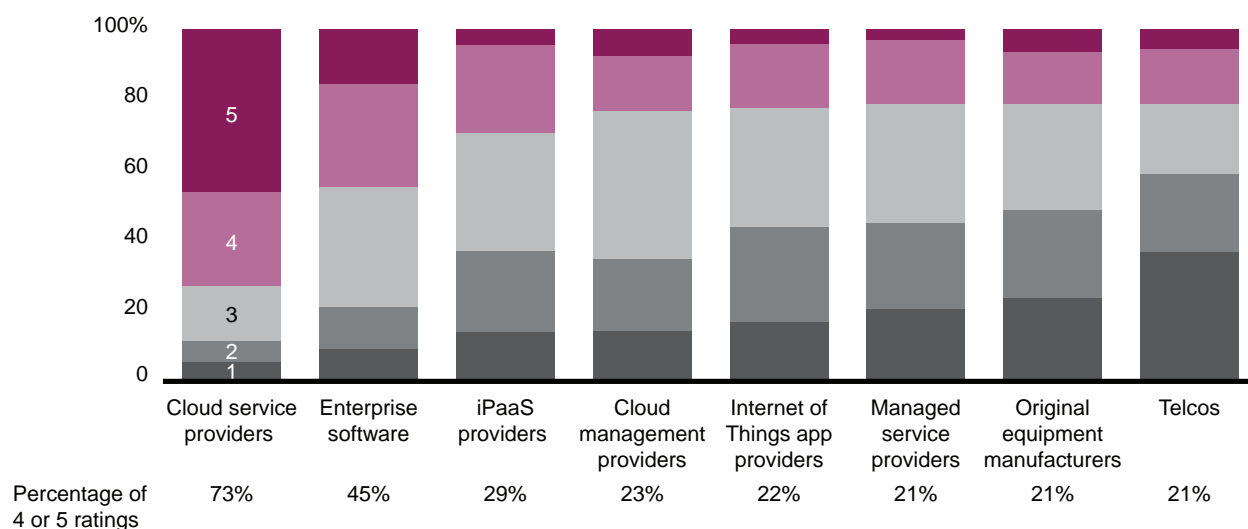
And CSPs are cementing their leadership position. A recent Bain survey of CIOs found that 73% view CSPs as critical, strategic IT partners today. About 80% said they expect CSPs to be strategic partners in three to five years. Most competitors' products and services are perceived as commodities (see Figure 15).

For CSPs, the hybrid cloud market opens the door to managing additional computing workloads, expanding into new markets and pushing the rest of the field to fight, ally or exit.

**Figure 15:** CIOs rely most on cloud service providers to shape their companies' IT systems and strategy

**For each of the following types of companies, please indicate their level of influence or impact in shaping your organization's IT infrastructure and strategy today.**

Share of mentions, on a scale of 1 (least influence) to 5 (most)



Note: iPaaS stands for integration platform as a service  
Source: Bain Cloud CIO Pulse Survey, 2020 (n=202)

## “Cloud-to-prem” hybrid

The fiercest battle in the hybrid cloud will be over the last on-premise target: legacy mission-critical workloads. Migrating these workloads to the cloud will take years because of their cost, complexity, longevity and sensitivity—think core banking software, medical imaging databases and supply chain systems.

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CSPs are making a bid to accelerate the transition by connecting legacy systems to advanced cloud services and creating a common development platform that will ease eventual migration. The offerings from Amazon, Microsoft and Google are all nascent and not widely adopted today. But these products—Amazon’s AWS Outposts, Microsoft’s Azure Stack Hub and Azure Arc, and Google Cloud Platform—give CSPs a point of entry into the on-premise environment. If CSPs demonstrate their cloud platforms can handle these critical workloads, they’ll build even more trust with CIOs and capture a greater share of the market.

CSPs are threatening original equipment manufacturers’ (OEMs) on-premise infrastructure stronghold. But OEMs have a significant advantage: their systems currently run these legacy workloads. Contrary to some headlines, investment in the on-premise hardware behind these “value” workloads has been quite sticky.

The question is whether companies will trust OEMs to help them take full advantage of cloud services or whether they’ll see their cloud strategies as thinly veiled attempts to keep as much infrastructure on premise as possible. OEMs have started to collaborate with CSPs to provide hardware—Dell EMC is serving as the hardware and channel partner for Azure Stack Hub—and have introduced their own on-premise, software-enabled hybrid products.

Another relevant priority for CIOs is the desire to simplify on-premise infrastructure through hyper-converged infrastructure (HCI) products. These systems bundle three products—a server, a storage system and a fiber channel switch that connects the two—in a single box with preinstalled hypervisor software to run it all. HCI can be an efficient way to deploy private cloud infrastructure. In response to demand from CIOs, Dell EMC launched an HCI product coengineered by and deeply integrated with VMware’s VCF, sold via subscription. Hewlett Packard Enterprise offers Ezmeral, software delivered

through the company's end-to-end hybrid offering, HPE GreenLake. Nutanix, the originator of the HCI category, remains a leader and over time has migrated from an appliance model to a subscription-based software model.

All of these efforts are allowing OEMs to stay relevant. Sales of branded servers are still forecast to grow by a modest 1% compound annual growth rate from 2019 through 2024, according to Bain analysis of IDC data. By comparison, public and private cloud revenues are each expected to grow around 20% per year from 2019 to 2023, according to Bain analysis of IDC and Gartner data.

If you believe virtualization isn't going anywhere anytime soon, VMware likely has a role in the hybrid cloud's future, given its entrenchment in the sector. Between 60% and 75% of virtual machines are run on VMware software, according to Morningstar. The Pivotal acquisition and organic investments in a new suite of apps, Tanzu, have strengthened VMware's offering by embedding Kubernetes, the open-source container orchestration system, into the control pane. Recognizing VMware's position, Amazon has formed a partnership to sell a version of its new on-premises product, AWS Outposts, that runs VMware's cloud.

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It's too early to definitively pick winners in the hybrid battle for the future of on-premise infrastructure. There are clear leaders and likely to be roles for many, even if it means forming partnerships with competitors.

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Then there's IBM and its \$34 billion acquisition of Red Hat. IBM is playing from behind in the public cloud battle, but with Red Hat, it now has some industry-leading assets that are directly relevant to the hybrid cloud. Red Hat Enterprise Linux is the leading paid Linux vendor and is particularly strong in the cloud, and Red Hat's OpenShift container orchestration platform is the leading product in that critical control point. IBM has proactively reconfigured its infrastructure and middleware solutions to run on OpenShift. Considering the fact that IBM's solutions and services continue to run many of the world's most mission-critical systems, there is a path to hybrid cloud leadership.

Lastly, managed service providers (MSPs) face significant challenges in this evolving hybrid cloud landscape. OEMs' future challenges will hit MSPs sooner, as customers increasingly shift commodity workloads from a hosted data center to the public cloud. What remains in MSP data centers are the legacy, complex workloads. Unfortunately for MSPs, managing these custom workloads is more expensive and less profitable. As the volume of new deployments declines, this will put pressure on their utilization-driven business model.

What will MSPs do in response? One possible route is helping to solve CSPs’ “people problem” by supplying the scarce talent required to manage these hybrid cloud environments and helping with the migration on the front end. But MSPs face the same talent shortage as the rest of the industry. They’ll need focus and strong execution in order to pivot from acquiring and developing skills needed to manage legacy environments to those required for the hybrid cloud. Rackspace is already pursuing this opportunity. In a partnership with Amazon, Rackspace provides AWS-specific technical resources and advisory services for data migration and related projects. Whichever route MSPs take, they’ll have no choice but to fundamentally change their current business model of high-volume workload hosting.

It’s too early to definitively pick winners in the hybrid battle for the future of on-premise infrastructure. There are clear leaders and likely to be roles for many, even if it means forming partnerships with competitors.

## **“Cloud-to-edge” hybrid**

Although edge computing is a lower priority for CIOs, enterprise spending in this area is surging. It’s projected to grow around 35% from 2019 to 2024, compared with roughly 2.5% growth of non-public cloud spending, according to Bain analysis of IDC data.

CSPs are following suit and investing heavily in edge infrastructure, especially Internet of Things applications. Amazon, Microsoft and Google have each introduced cloud-to-edge products in recent years, and collectively they’ve spent or announced planned investments into the IoT totaling around \$10 billion to date. Their efforts are advancing technologies such as mobile-edge computing—see Amazon’s deal to run AWS Wavelength on Verizon’s 5G network.

Although CSPs’ edge products are still maturing, the leading companies are delivering value to customers by bringing their AI and analytics capabilities to edge environments. Microsoft’s Azure Stack Edge, for example, intakes raw data inputs and intelligently routes instructions across devices.

The challenge for CSPs is they have little industrial and operational technology experience. Many will look to industrial OEMs for partnerships, in which CSPs provide machine learning models and other advanced software. The OEM would then handle the aspects where it has deeper expertise: hardware, knowledge of industrial IoT applications, strong customer and channel relationships, and experience navigating the four walls of the factory.

Nevertheless, industrial OEMs don’t want to cede software and other high-margin, value-added territory to CSPs. They don’t want to be relegated just to equipment manufacturing. As a result, some are deploying their own cloud solutions, though they’re still early. For example, Schneider Electric offers EcoStruxure, which provides edge control; connected products that link server, mechanical and power rooms; and capabilities such as predictive analytics, smart alarms and communicating real-time sensor data. Meanwhile, Siemens’s MindSphere has expanded its integrations with AWS and Azure.

Like industrial OEMs, telecommunications firms don't want to cede the most valuable parts of the edge computing market to CSPs. But telcos aren't in as strong a starting position as industrial OEMs. In a 2019 Bain survey, large enterprise IT customers ranked telcos sixth out of seven groups best positioned to provide edge computing services. CSPs ranked No. 1.

That said, whenever telcos are unable to secure direct customer relationships for their multiaccess edge computing offerings, they still can play important roles as partners providing edge computing via their networks of cell towers and central offices. In the near term, we don't expect many edge use cases requiring significant computing resources between the far edge (meaning devices) and the public cloud. In the future, telcos could enable edge applications such as mobile AR or communication between vehicles and everything else, where data-latency requirements surpass the capabilities of distributed data centers. For these cases, telcos could provide connectivity and/or hosting services to CSPs through their existing infrastructure, via partnership agreements or on the open market. These deals are already happening; the Verizon and Amazon partnership is a prime example.

Aside from raw connectivity and access to distributed networks, the question remains as to what higher-value solutions telcos can provide. Two options could be aiding enterprises in network orchestration or providing private LTE or 5G networks.

## **What's the end game?**

CSPs have put themselves in pole position, but the hybrid cloud race has a long way to go. Vendors across the competitive landscape still have an opportunity to build a successful business before the dust settles. Executives trying to hone their company's strategy in this evolving market should start by asking themselves the following questions:

- What cloud solutions are our current and prospective customers investing money in now, vs. what's on their long-term wish list in a perfect world? Does that warrant adjusting our product roadmap?
- How many cloud infrastructure platforms—not including any software-as-a-service applications they might have—are our clients using at scale today?
- How are our customers thinking about containerization? Are they refactoring legacy workloads and viewing container orchestration as a control point in their hybrid cloud, or are they using containers on new, cloud-native applications? What does this mean for our product roadmaps and our partnership strategy?
- Are we well-positioned to respond to customers' needs in these areas? What investments can we feasibly make now that would deliver the most value?



# The Internet of Things Gets Real

It's about analytics, not simply connecting devices.

**By Ann Bosche, Michael Schallehn, Darren Jackson and Christopher Schorling**

Many skeptics of the Internet of Things (IoT) are overlooking the crucial point: Although the number of new connected devices over the past decade fell short of projections, the devices that did get connected are starting to deliver real value.

The reality is not everything needs to be connected to the Internet. The key to success in the IoT is to apply data analytics on top of high-value devices. For businesses, this can unlock insights that lead to better decision making and powerful gains in efficiency, productivity and return on investments (ROI).

Building on their strong data analytics capabilities, cloud service providers (CSPs) have made the most substantial investments in the IoT over the past couple of years. They are creating new IoT platforms and services, and addressing the challenges that have held the sector back.

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The reality is not everything needs to be connected to the Internet.  
The key to success in the IoT is to apply data analytics on top of  
high-value devices.

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The CSPs' moves are changing the sector's dynamics, as we've seen in the broader hybrid cloud sector (see "The Future of Hybrid Cloud: Fight, Ally or Exit" in this report). That creates new strategic decisions for enterprise IT companies and industrial original equipment manufacturers (OEMs) if they want to stay competitive and expand their share of the market.

## Seeing the value

Looking across the IoT's key battlegrounds, the sector is finally beginning to deliver on its promise in two critical areas: enterprise and industrial companies. And it's the analytics and targeted use on critical machines that make it valuable.

While the hype swelled and subsided over the past decade, many of these companies kept working diligently in the background on their IoT efforts. Now, the IoT is integral to many businesses' operations. They're using it for factory floor automation, equipment inspection and maintenance (including of remote assets), real-time shipment tracking, retail theft prevention and crowd safety, among other applications.

Manufacturers are making it easier to deploy such IoT applications by building sensors and connectivity right into their devices and equipment. For example, German manufacturer Trumpf has started equipping its laser cutters and other machines with Device Gate, a system that collects sensor data and sends it to the cloud for analysis. These kinds of moves by Trumpf and other IoT vendors show the sector is maturing.

Let's unpack three examples that illustrate how enterprise and industrial companies are taking advantage of the IoT.

### **Plant asset optimization**

Woodside, the global oil and gas company headquartered in Australia, has made significant IoT investments over the past five years. The company equipped its liquefied natural gas facility in western Australia with 200,000 sensors and used Amazon's cloud and edge IoT platforms to collect the data. Armed with historical data and the information now coming off the devices, data scientists teamed up with plant engineers to develop applications to strengthen production monitoring, equipment maintenance and worker safety in ways that simply weren't possible before. Considering it's a \$10 billion facility in a remote location, even incremental improvements in costs, operations and worker protection can make a significant difference for the business.

For example, the facility's acid gas-removal unit can't be monitored by sight. Using connected sensors, Woodside can better predict and prevent this machine from foaming, which would require shutting down the plant.

Woodside has also improved maintenance scheduling and productivity by digitally monitoring lubricant levels on turbines, using that information to perform preemptive maintenance before there's a breakdown. The company increasingly deploys robots to handle routine surveillance and provide insights that help staff improve maintenance and facility uptime.

These changes have reduced equipment downtime. Just as important, they've reduced the number of hours that workers need to be on site, decreasing their exposure to high temperatures and stressful situations.

### **Factory quality control**

A large technology company developed a system that uses computer-vision technology to perform quality control on complex metal parts produced through a die-casting process. The product combines an HD camera, a trained artificial intelligence (AI) model, a robotic arm and back-end cloud computing powered by Alibaba Cloud.

The manual inspection process caught fewer than 20% of parts defects, which led to downstream delays in production and customers returning faulty parts. The automated system detects defects more than 99% of the time. It's being implemented in hundreds of factories across Asia.

### **Population monitoring**

The Covid-19 crisis is accelerating adoption of the IoT. For example, theme park operators have deployed Insight Enterprises' monitoring system that uses cameras with infrared sensors at park entrances to identify, in real time, patrons with a fever, one of the most common symptoms of the coronavirus. Each



camera can take up to 30 temperature measurements simultaneously and alert security personnel through a mobile app.

The system significantly improves efficiency and safety. Previously, nursing staff had to screen each guest with contactless thermometers, which is time consuming, disrupts guests' experience and puts staff at greater risk.

Insight has used Microsoft's cloud platform, Azure, to develop and deploy the application quickly. It uses technologies from Intel and other partners to process the video footage at the network's edge, so frontline personnel and other park stakeholders can receive crucial information quickly. Security protocols ensure that this sensitive data is shared only with people who have appropriate permissions.

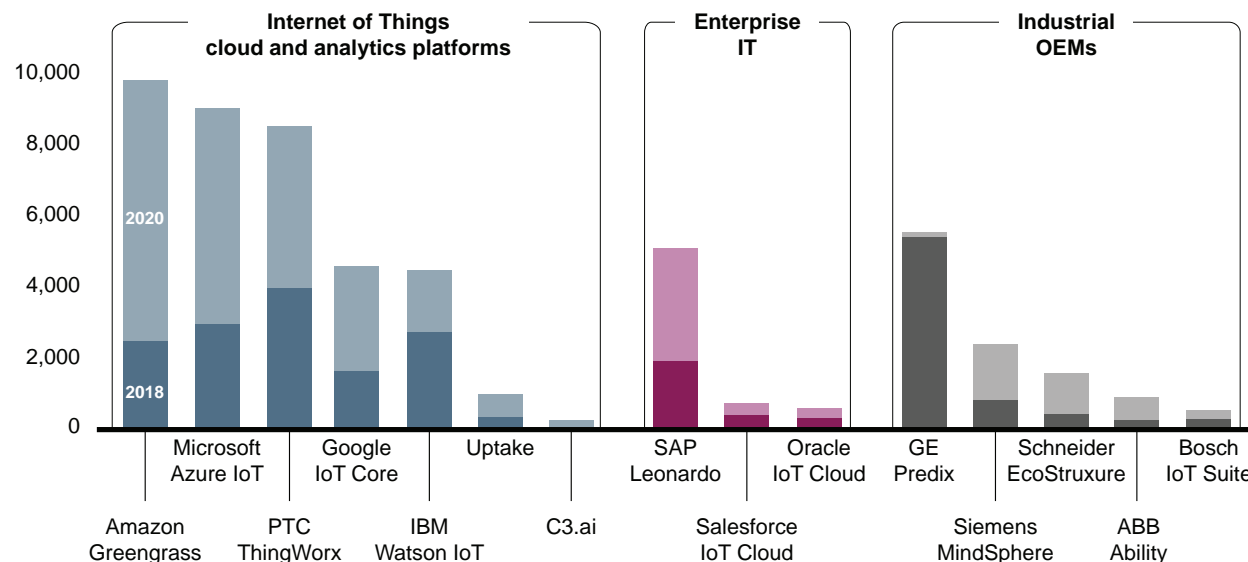
The system can also be configured for uses in other settings, such as environmental monitoring and observing industrial equipment.

## Cloud companies advance the field

The common thread through these examples: CSPs play a central role by providing back-end and developer services that speed up the time to market. And the data indicates CSPs will continue to drive a lot of the growth and innovation during the next phase of the IoT (see Figure 16).

**Figure 16:** Amazon and Microsoft IoT platforms have attracted the most developers

### Number of developers on LinkedIn mentioning each platform (2020)

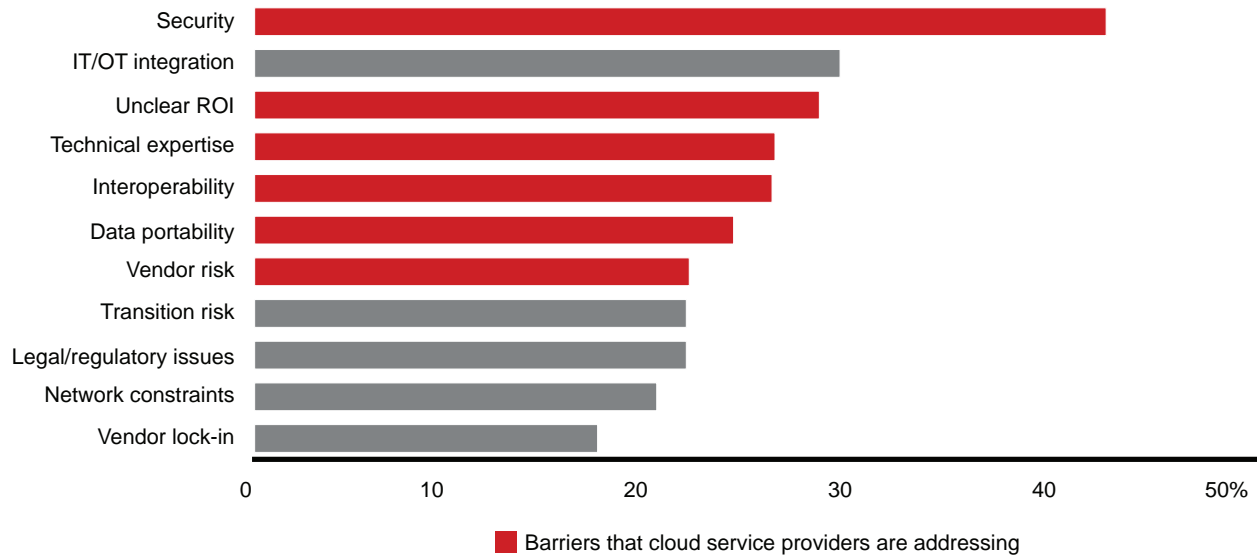


Notes: Data as of July 30, 2020; OEMs are original equipment manufacturers  
Sources: Bain analysis, based on data from LinkedIn and company websites

**Figure 17:** Cloud service providers are addressing some of the biggest barriers to IoT adoption

What are the most significant barriers limiting your adoption of IoT/analytics solutions?

Percentage of respondents (asked to choose three barriers)



Sources: Bain IoT customer survey, 2018 (n=627); market participant interviews

Since 2018, Amazon Web Services (AWS) and Microsoft Azure have each more than tripled their number of developers, based on Bain analysis of developers' self-declared proficiency in IoT on their LinkedIn profiles. That makes AWS and Microsoft Azure the most active IoT platforms, with 9,800 and 9,000 developers, respectively.

PTC isn't far behind, with 8,500 developers on its ThingWorx platform. No other competitor in cloud, enterprise IT or industrial manufacturing has surpassed 6,000 developers, according to Bain's analysis.

Cloud companies' growing influence in industrial and enterprise IoT might seem surprising at first blush. They don't have the most expertise with connected devices in these settings. But they do have the strongest data analytics capabilities, which is the key to generating value in the IoT.

CSPs are doing a lot more than providing the cloud backbone for the IoT. The leaders—particularly Microsoft and Amazon—are investing heavily to address many of the biggest barriers to IoT adoption (see Figure 17). In particular, CSPs are increasingly making it easier for customers to bring third-party devices online, integrate them with their existing systems, glean useful insights from the data they produce, and do it all securely.

Microsoft, for example, in 2018 announced a \$5 billion investment in IoT and edge technology over the next four years. A key part of its strategy is building IoT solutions that are essentially plug and

play. The Azure IoT Central platform has software architecture templates and implementation examples for 10 use cases across four industries, such as improved logistics and inventory management for retail. The offerings include a library of third-party edge devices, such as network gateways, that are certified by Microsoft and can be connected with the click of a button. Microsoft is also investing in IoT security, both through development of new products (Azure Sphere) and acquisitions (CyberX).

And CSPs have bolder ambitions to ingrain themselves more deeply in customers' IoT strategies. CSPs are introducing new products that expand their cloud platforms to the edge, either through software (Microsoft's Azure Arc) or hardware that runs their cloud software out of the box (Amazon's AWS Outposts, Microsoft's Azure Edge Zones).

These products allow CSPs to capture and analyze data right at the point where it's created. In addition, these products bring cloud services such as databases and AI technologies to the edge, allowing CSPs to take advantage of their well-established developer communities.

All of these moves by CSPs are about building another layer of value on top of businesses' connected devices, which could enable CSPs to capture a significant piece of the future growth in the IoT.

## **Where does that leave everyone else?**

Although CSPs have momentum, there's room for many winners in the IoT. Incumbent enterprise IT companies and industrial OEMs have opportunities to grow their share of the market. CSPs have made it easier for them to plug into a more standard framework to build complete solutions more quickly. Enterprise IT companies and industrial OEMs also have assets that are hard for CSPs to replicate, based on decades of building successful businesses in these industries.

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Although CSPs have momentum, there's room for many winners in the IoT. Incumbent enterprise IT companies and industrial OEMs have opportunities to grow their share of the market.

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The incumbents have deep knowledge of customers' businesses and potential IoT use cases, and they tend to offer higher-touch implementation services. Industrial OEMs have additional advantages: their proprietary data and equipment insights, as well as their access to sector-specific sales channels, such as industrial distributors. Enterprise IT vendors have more advantages as well. In many industries, they already provide the software that informs critical business decisions such as supply chain management or enterprise resource planning (ERP).

But these vendors are under pressure to move quickly, or risk ceding the highest-value territory to CSPs, as we said in this report's previous article on the hybrid cloud. We're covering some of these themes again in this piece in order to more deeply explore the implications specific to the IoT battleground.

Based on our observation of sector trends and experience helping companies develop IoT strategies, the following actions can help vendors grab a stronger foothold in the market.

**Beat 'em or join 'em.** Enterprise IT companies and industrial OEMs have a crucial decision to make: build their own IoT platform, or plug into CSPs' platforms and deliver value to customers in other ways. Either option is a viable path to a meaningful IoT business, but companies that have a realistic shot at creating a thriving developer platform should consider pursuing it because they can capture a larger slice of the market.

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Enterprise IT companies and industrial OEMs have a crucial decision to make: build their own IoT platform, or plug into CSPs' platforms and deliver value to customers in other ways. Either option is a viable path to a meaningful IoT business.

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Leading companies evaluate that decision by first considering their existing assets. Companies that already sell software that controls equipment and analyzes data from that equipment are in a good starting position to create a new IoT platform. Relationships with developers working for specialized software companies, systems integrators or customers will also be critical to the new platform's success. Lastly, companies pursuing this path must be willing to make sustained investments in moving their software to a cloud-based delivery model, developing new capabilities in advanced technologies such as AI, and attracting and training a broad developer community.

Companies that lack the resources or expertise to compete directly with CSPs can partner with them and build valuable IoT offerings on top of CSPs' platforms.

**Focus on getting a few solutions right.** Leading companies pick a smaller set of use cases, which makes it easier for them to deliver solutions better suited to customers' needs. Once you prove the ROI with flagship customers in a select few areas, it becomes easier to entice new customers trying to solve similar problems. Focusing on too many targets makes it harder to build depth rapidly in any one of them.

**Make it easy.** The IoT isn't known for quick and simple implementations. Making it easier to build and deploy these solutions is critical for both delivering value to customers and continuing the sector's progress.

Making IoT solutions work on a broader scale will require a lot of integration middleware to knit edge devices together with back-end software and computing infrastructure. Think of all the machines on a factory floor; they have so many different ways of creating, naming, storing and managing data. It's a huge task to make them talk to a central repository, let alone each other. This is both a product opportunity for middleware vendors and a service opportunity for specialized systems integrators.

In addition, leading vendors are finding ways to deliver products that work right out of the box.

For example, an enterprise IT company might collaborate with a sensor manufacturer to pipe sensor data directly into ERP software. This would enable customers to monitor critical operations processes in real time and automate decision making.

Or, a company could tap into a CSP's application development platform to quickly create IoT solutions that are easy for customers to use. One construction tools company developed a simple asset-tracking system by adding Bluetooth tags to its products and using a CSP's platform to write an app that a construction supervisor can access on a smartphone.

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In the end, success in the IoT comes down to adding value for customers. That means not only collecting data from equipment, but analyzing that data to reveal powerful insights that guide businesses toward better decisions.

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In the end, success in the IoT comes down to adding value for customers. That means not only collecting data from equipment, but analyzing that data to reveal powerful insights that guide businesses toward better decisions. Vendors that figure out how to deliver this value to customers in a fast, simple and reliable way will put themselves in the strongest position to excel in the IoT.



# US and China: The Decoupling Accelerates

Geopolitical tensions are pushing technology companies to revisit their global strategies.

**By Anne Hoecker, Shu Li and Jue Wang**

Escalating tensions between the US and China have accelerated the unraveling of globalization more quickly than many predicted even a year ago. This trend isn't likely to reverse course. Now, executive teams at leading technology companies both within China and around the world are coming to grips with a new reality that has serious implications for their businesses: the US and Chinese economies and technology ecosystems are headed toward decoupling.

Seemingly every week, the geopolitical conflict between the two countries intensifies: new companies on an entity or watch list, threats of new tariffs, military drills in the South China Sea, embassy closures, changes in Hong Kong's status, US executive orders to ban Chinese network equipment and social apps, and more.

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At the heart of it, the US and China agendas are at odds.

American politicians want to level the playing field for US companies. US political leaders are now pushing back harder than ever against China's joint venture requirement for companies headquartered outside its borders that want to access certain sectors in China. American leaders also want to bring jobs back to the US and balance the trade deficit. This stance was evident during the previous Democratic administration, and it sharpened over the last couple of years under Republican President Donald Trump. There are currently around 300 bills in Congress related to China. This desire to be stricter with China isn't likely to change with the US election in November, considering public remarks from leaders of both political parties.

Meanwhile, China's leaders want to sustain growth of its gross domestic product and ensure a secure and controllable technology supply chain. China's leaders also wish to build a thriving indigenous technology sector. This aspiration has grown stronger after recent sanctions by the US. The focus is driven both by supply assurance and security goals. Supply assurance: Chinese leaders would like to decrease the country's reliance on external suppliers of semiconductors, hardware and software, by having "good enough" local alternatives. Security: After Edward Snowden leaked information about NSA spying programs, China's leaders have worried about depending on US-based technologies for critical infrastructure. Recent events have only reinforced China's need for a secure technology source, including the US placing Huawei Technologies and ZTE on the Entity List, and restricting HiSilicon's access to Taiwan Semiconductor Manufacturing Company's (TSMC) leading-edge technology.

In the long term, the US wants to maintain its technology leadership position, and China wants to rise to that level. But the political maneuvering and growing momentum toward decoupling are pushing technology executives in China, the US and around the world to reevaluate their global strategies.

## A prize that can't be ignored

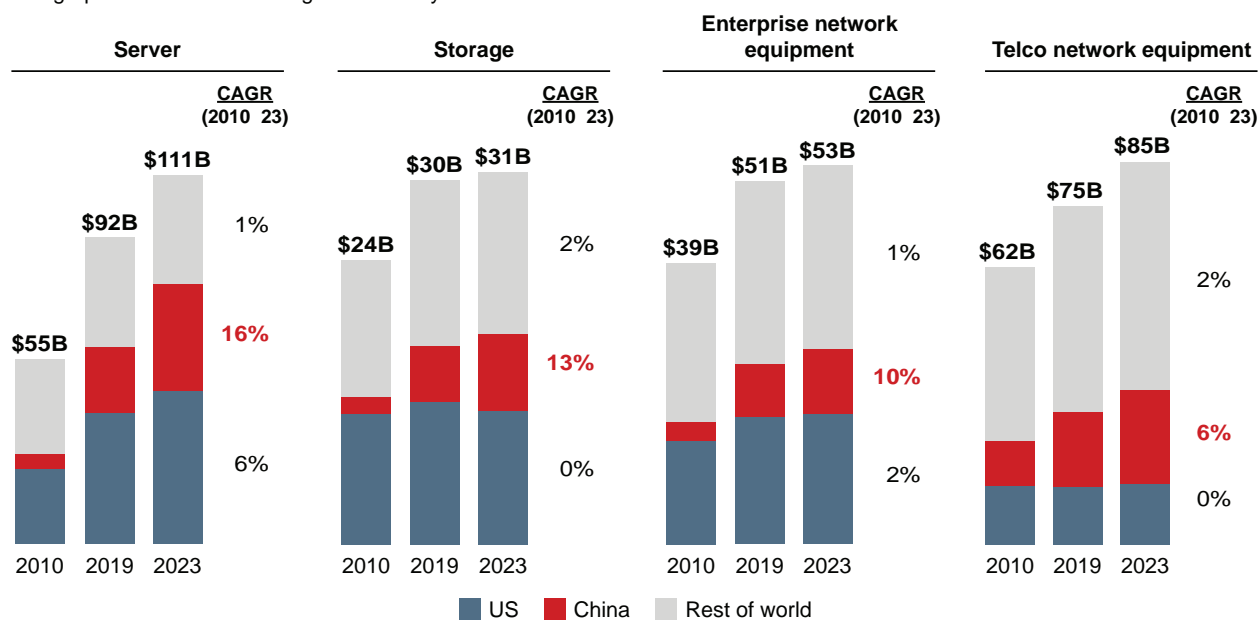
Even with the geopolitical challenge, global technology companies can't ignore China. It's a huge market and growing fast. China consumption represents up to 25% of global demand in server, networking, PC and smartphone products, and the country's consumption of most technology products is increasing at least twice as fast as the global average (see Figures 18 and 19).

But China's domestic market isn't just a big prize for multinational technology companies. China's homegrown technology sector is a successful and dynamic market unto itself. Four of the top six smartphone companies worldwide are Chinese (Huawei, Oppo, Vivo and Xiaomi). Huawei has become the global market leader in telecommunications network equipment. Alibaba Cloud is now the third-largest infrastructure-as-a-service business in the world. China's enormous population of smartphone users has enabled rapid growth of mobile apps such as TikTok, which topped 800 million monthly active users within three years of launching, 100 million of them in the US.

China lags in some technology areas, particularly semiconductor equipment and manufacturing, electronic design automation tools, CPUs, GPUs, field-programmable gate arrays and infrastructure

**Figure 18:** China is a large and growing market for global enterprise and networking hardware companies

Geographic markets' share of global industry

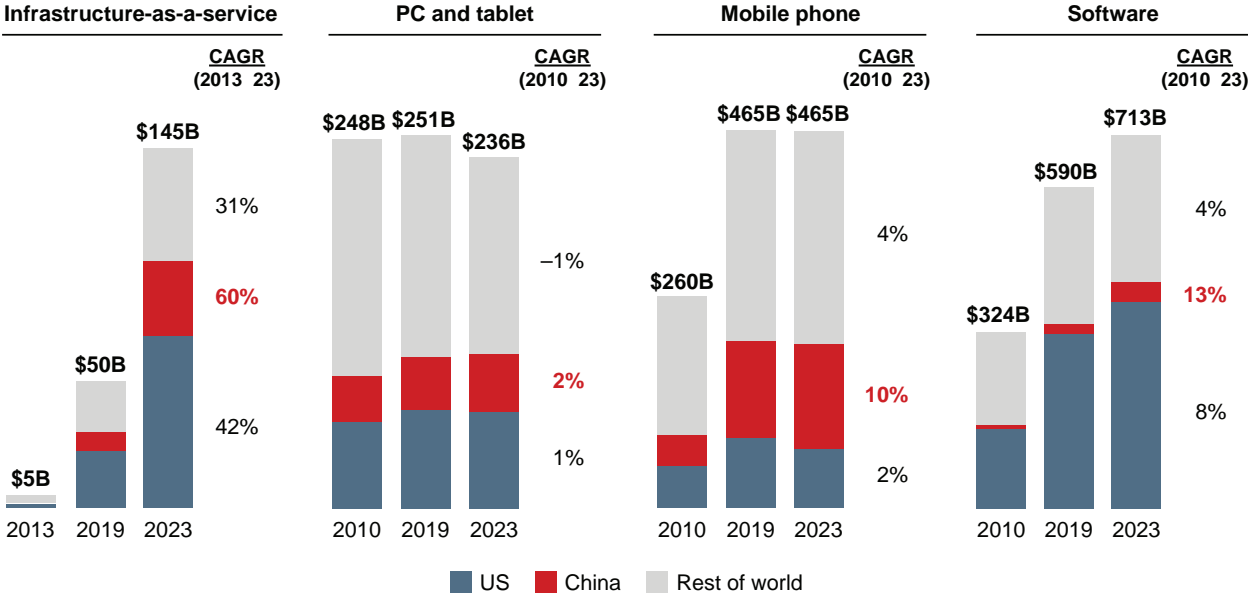


Notes: Server includes server and internal storage; storage shows external storage only  
Source: Bain analysis, based on 2020 data from IDC



**Figure 19:** China is a large and growing market for global cloud, device and software companies

Geographic markets' share of global industry



Source: Bain analysis, based on 2020 data from IDC

software. As the country pushes toward a secure, indigenous supply chain, these are areas of concern and, therefore, focus.

### The move toward decoupling

China’s technology sector is rising as the globalization era comes to an end. Expanding tariffs, cyber-security concerns and US interventions are reversing years of mostly open, global trade. We’re calling this new era “slowbalization,” a term coined in 2015 by Dutch trend-watcher Adjiedj Bakas and popularized last year by *The Economist*. The global economy has been moving in this direction for a while, but over the past year it unexpectedly accelerated. The Covid-19 pandemic, the anti-China sentiment that followed, and the increasingly tense political climate have raised the stakes and contributed to slowbalization’s momentum. Now, it’s clear the world isn’t going back to globalization—it’s headed toward decoupling.

This scenario would create two walled gardens in global trade: a China-allied trading bloc and supply chain, and a US-allied one. That has big implications for technology companies, which would face significantly higher barriers to doing business across the two ecosystems (see *Figure 20*).

Decoupling is forcing technology leadership teams in China, the US and everywhere else to make tough decisions about the future of their supply chains, products, customers, employees and even organizational boundaries.

**Figure 20:** China and the US are moving from globalization toward a decoupled system

	Globalization	Slowbalization	Decoupled
Supply chains	<ul style="list-style-type: none"> <li>▶ <b>Limited tariffs</b>, rapid growth of global demand</li> <li>▶ <b>Global supply persists</b> with diminished IP protection</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Modest tariffs</b> in select segments, slowing global demand</li> <li>▶ Cybersecurity concerns and nationalism <b>influence buying</b></li> <li>▶ <b>Global supply persists</b> for concentrated sectors</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>Significant tariffs</b> and sanctions slow demand substantially</li> <li>▶ Cybersecurity concerns and nationalism <b>dictate buying</b></li> <li>▶ With rare exceptions, <b>bloc-aligned supply chains</b> emerge               <ul style="list-style-type: none"> <li>– China-allied trading bloc and supply chain</li> <li>– US-allied trading bloc and supply chain</li> </ul> </li> </ul>
Intellectual property	<ul style="list-style-type: none"> <li>▶ <b>Low US intervention</b>; multinational corporations (MNCs) share next-generation intellectual property (IP)</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>US intervention in technology transfer</b>; MNCs prohibited from sharing next-generation IP with China and joint ventures (JVs)</li> </ul>	<ul style="list-style-type: none"> <li>▶ <b>US prohibits all IP sharing</b> with China bloc; MNCs reposition JVs as 100% indigenous</li> </ul>
Indigenous technology push	<ul style="list-style-type: none"> <li>▶ China <b>continues push</b> for thriving indigenous technology sector</li> </ul>	<ul style="list-style-type: none"> <li>▶ China's indigenous technology push <b>favors JVs</b>, seeking technology transfer</li> </ul>	<ul style="list-style-type: none"> <li>▶ China continues to push for <b>self-reliance</b></li> </ul>

Source: Bain & Company

**Supply chains:** Making supply chains more resilient is a top priority for technology companies across the globe. Chinese companies are investing in business continuity measures and a secure, self-reliant supply chain. That effort has become more urgent in light of stricter US export regulations.

Companies in the US also want to add redundancy in order to reduce dependence on Chinese suppliers. Some are pursuing a “China-plus-one” model. For example, Apple reportedly has looked into the possibility of moving one-third of its production for some devices out of China. Dell and HP were both making plans last year to relocate up to 30% of their notebook production outside of China, according to news reports. Given its large US customer base, TSMC announced plans to build its first advanced semiconductor factory in the US.

**Products:** Technology companies have wrestled with the question of localization of products for years. Should an international company partner with a local business in China to gain access to the market with a mandate requiring purchases from indigenous companies? How can a Chinese company expand globally?

On the US side, Hewlett-Packard Enterprise has a successful partnership with H3C that opens up the Chinese enterprise IT market for HPE. On the China side, Alibaba in 2018 doubled its investment in Southeast Asian online shopping giant Lazada to \$4 billion. In addition, Chinese smartphone brands such as Oppo, Vivo and Xiaomi have expanded their operations in European and Latin American markets in the past three years.

The question of localization is again at the forefront of executives' minds as China, the US, India and other countries increase restrictions on technology companies. Huawei's business has been hampered by a Trump executive order forbidding US companies from working with the company or buying its products. AMD pulled away from its Chinese joint venture with Sugon and other partners after the US government added those partners to the Entity List. TikTok was banned in India, and is under pressure from the Trump administration to become part of a US-based company. Alibaba suspended subsidiary UCWeb's services in India after the app was banned, and the company is reportedly pausing investments in Indian start-ups. China also issued new measures on cybersecurity review for critical information infrastructure, including the telecommunications, energy and technology industries.

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**Customers:** As more companies get added to watch lists and face tighter restrictions, leading suppliers are revisiting which customers they should invest in. On one hand, customers' efforts to diversify their supplier base could enable suppliers to strengthen their businesses by building new and trusted relationships during a challenging time. By the same token, regulatory constraints could tie some suppliers' hands. In those cases, suppliers might backfill the revenue hole left by one departing customer by investing in its competitors.

**Organizations:** Technology companies are increasingly exploring the option of creating new regional entities to ensure continued access to the market outside of their bloc. The early examples of this have had spotty success. Conflicts over decision rights for leadership and product roadmaps continue to be murky waters to navigate.

As companies evaluate their strategies for product localization and organizational separation, it's important to set themselves up for success by involving the government of the parent company's home country early. This can increase the chances of a two-way-street strategy—a lesson several companies learned the hard way.

## Finding the balance

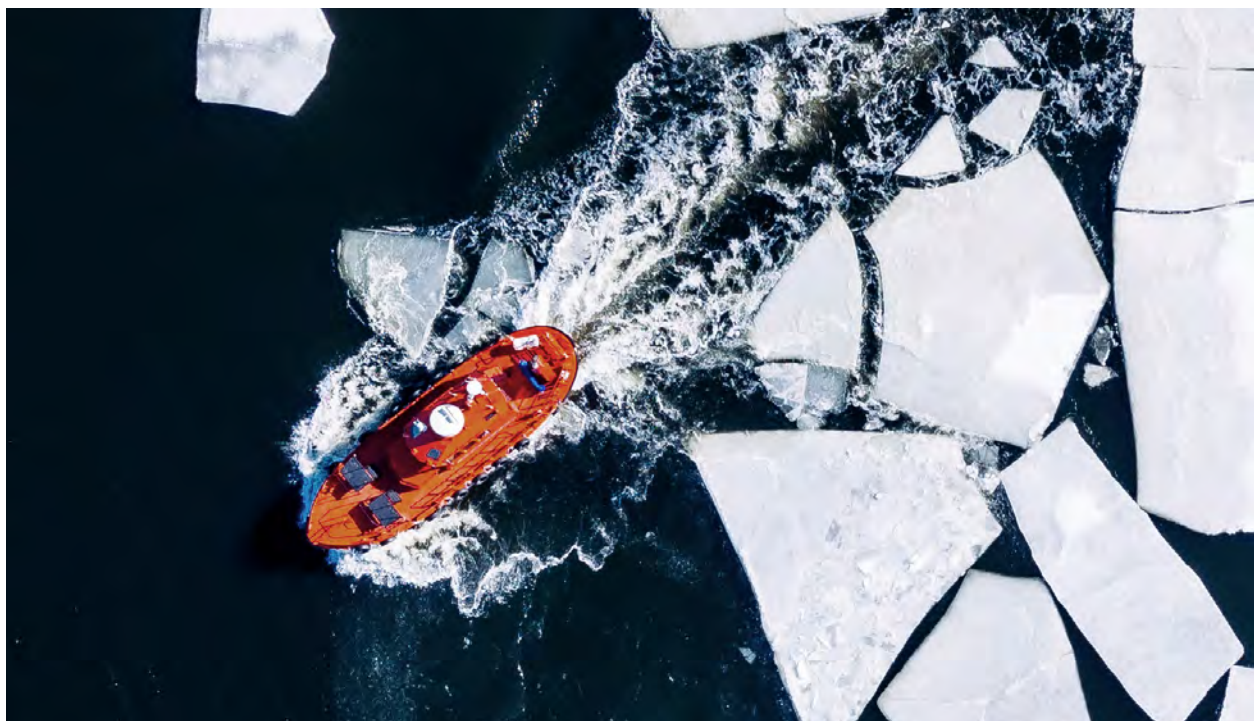
As the march toward decoupling continues, more technology companies will revisit their US and China strategies. How can they balance the desire to sell into both the US and China blocs, protect IP and outgrow competitors?

Based on our work with technology companies across the globe, here are several key strategies for companies in each market to consider.

**US companies trying to sustain business in China.** Executives at leading companies first map out a multiyear strategy for product localization, based on the company’s competitive advantage over local alternatives, and what’s considered “good enough” in the target segment. In addition, they might look to acquire assets or build new business models in segments where China or the eastern bloc has a strength that the US lacks, such as 5G equipment. In general, all companies should consider a “China-plus-one” supply chain model to increase resilience.

**Chinese companies looking to expand globally.** Leading companies focus first and foremost on maximizing growth in the home market so they have a solid business foundation to withstand global headwinds. Once ready to invest outside of China, geographic diversification can help mitigate geopolitical risks. Leading companies also build partnerships through equity investments and other types of deals, establish regional entities and operations, and implement mechanisms to separate their local organizations and data platforms. Lastly, they prepare a contingency exit strategy.

**Companies headquartered everywhere else.** In the short term, US-China tensions might not hamper many of these companies. They might find open doors in both China and the US. But the march to-



ward decoupling will affect every company in the long run. Businesses based outside the US and China should start laying the groundwork for localization in both blocs by making adjustments now across their supply chain, products, customer base and organization. Compared with their US and Chinese counterparts, this group has more degrees of freedom. But their choices also come with more uncertainty at this point.

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Ultimately, the right answer depends on the company and its industry, and must be graded against what the US and Chinese governments are likely to allow. The complexities are high, but the prize is continued access to a large, global technology market.

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Ultimately, the right answer depends on the company and its industry, and must be graded against what the US and Chinese governments are likely to allow. The complexities are high, but the prize is continued access to a large, global technology market.

“ Companies that invested more in automation before the pandemic have weathered the crisis better than others.

# 3.

Operational Advantage





# How Technology Companies Can Sharpen Their Operational Advantages

Leading companies are investing in supply chains, process automation, go-to-market strategies and M&A.

**By Anne Hoecker**



The competitive battlegrounds in technology create plenty of opportunities for the sector’s companies. But capitalizing on those opportunities requires strong operational capabilities.

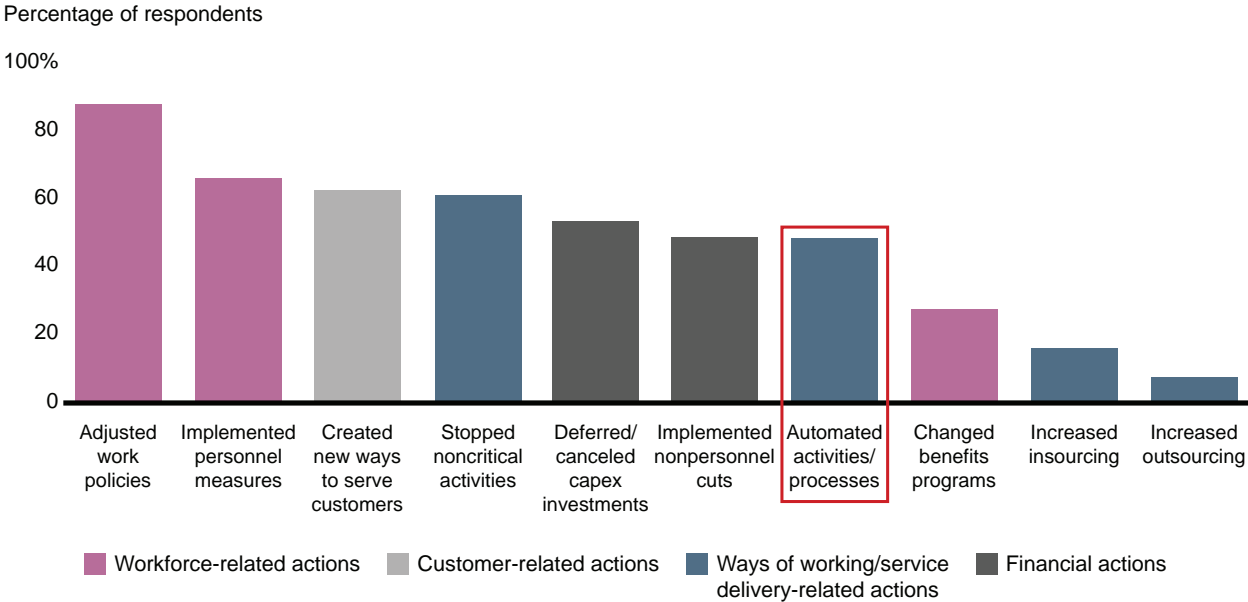
Leading companies start with cost-effectiveness. This is true both for mature companies that need to improve efficiency to protect and expand their margins, as well as high-growth technology companies trying to free up funding to supercharge their growth. The best companies have a disciplined process to continuously evaluate costs and find areas to boost efficiency. These aren’t just cookie-cutter cost targets. Their goals are guided by rigorous benchmarking and unlocked by new ways of operating.

This year, the Covid-19 pandemic has brought resiliency to the fore for many companies, alongside efficiency. The importance of having a resilient and reliable supply chain has grown since the trade war between the US and China accelerated over the past few years; Covid-19 has only increased the urgency of transforming supply chains.

Automation is another capability that has risen near the top of many executives’ agenda this year. When we surveyed leaders across all industries over the summer, around half of respondents said their organization had increased its automation activities as a result of the pandemic (see Figure 21). Many companies’ automation capabilities have also evolved from mostly basic scripting five years ago to more advanced, sophisticated technologies.

**Figure 21:** Around half of companies increased automation in response to Covid-19

**Which actions has your organization taken to mitigate the impact of the Covid-19 outbreak?**



Source: Bain Automation Survey, 2020 (n=500)

Effective go-to-market approaches and strategic mergers and acquisitions will also play crucial roles in positioning technology companies to win their battlegrounds. The pandemic has accelerated companies' use of virtual sales, new channels and digital tools to market their products. In many cases, they've seen better results and aren't going back to old methods.

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On the M&A side, scope deals are dominating the landscape. That's partly because there are fewer opportunities for scale acquisitions. But the shift to scope deals is also strategic: Technology companies are looking to add capabilities and move into faster-growing segments in these turbulent times.



## Beyond Cheaper and Faster: Resilience in Tech Supply Chains

Covid-19 and growing trade tensions have made revamping supply chains a more urgent priority for many companies.

**By Peter Guarraia and Peter Hanbury**

When Covid-19 blew up supply chains around the world, technology executives felt that familiar pit in their stomachs. Although the nature and scale of this pandemic is an unprecedented tragedy, it was the latest in a series of significant blows to the technology supply chain over the past decade (see Figure 22).

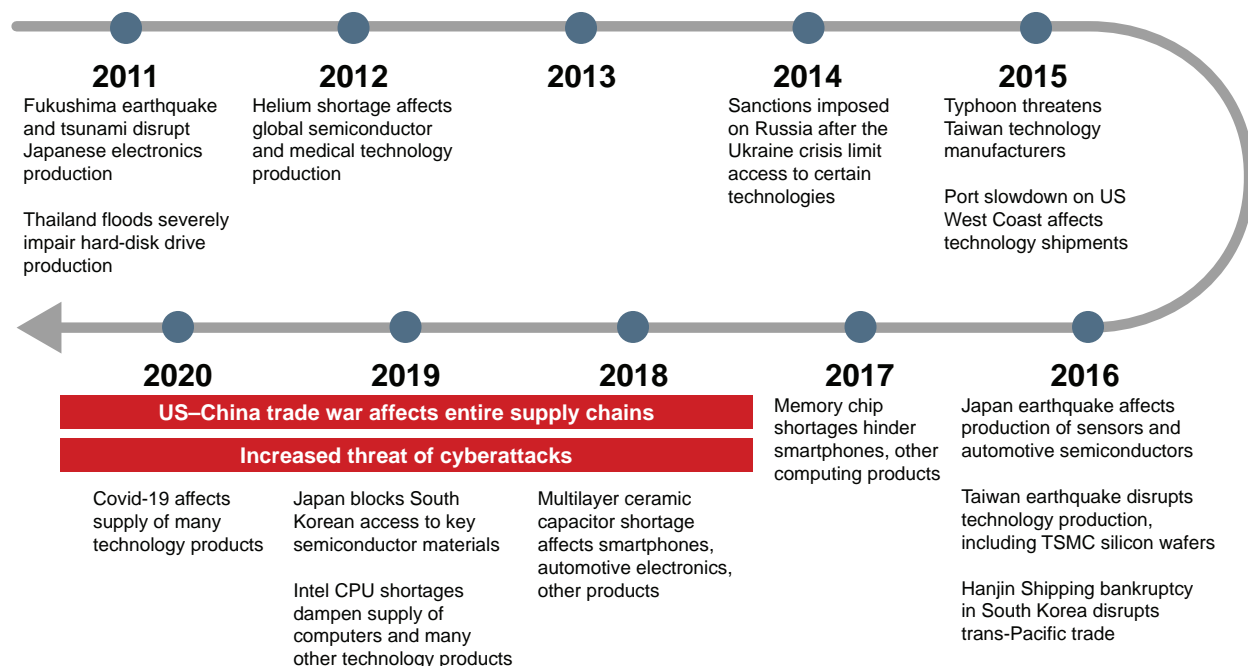
Most technology companies have dealt with each of these convulsions in a painful, brute-force manner. In response to Covid-19, operations teams spent months in war rooms manually tracking material shipments, trying to map Tier 2 and 3 suppliers, and shifting production to new locations such as Vietnam.

Those kinds of actions don't fix the cracks at the foundation of supply chains. At best, they just blunt the impact of disturbances.

Covid-19 has pushed technology supply chains to their limit. Lockdowns and the disease's spread have squeezed factory production and created headaches for shipping and other logistics. The pandemic also threw typical demand patterns for technology products off-kilter in the short term. Some segments saw an uptick, such as work-from-home equipment, while others nosedived, such as technology components for the automotive industry.

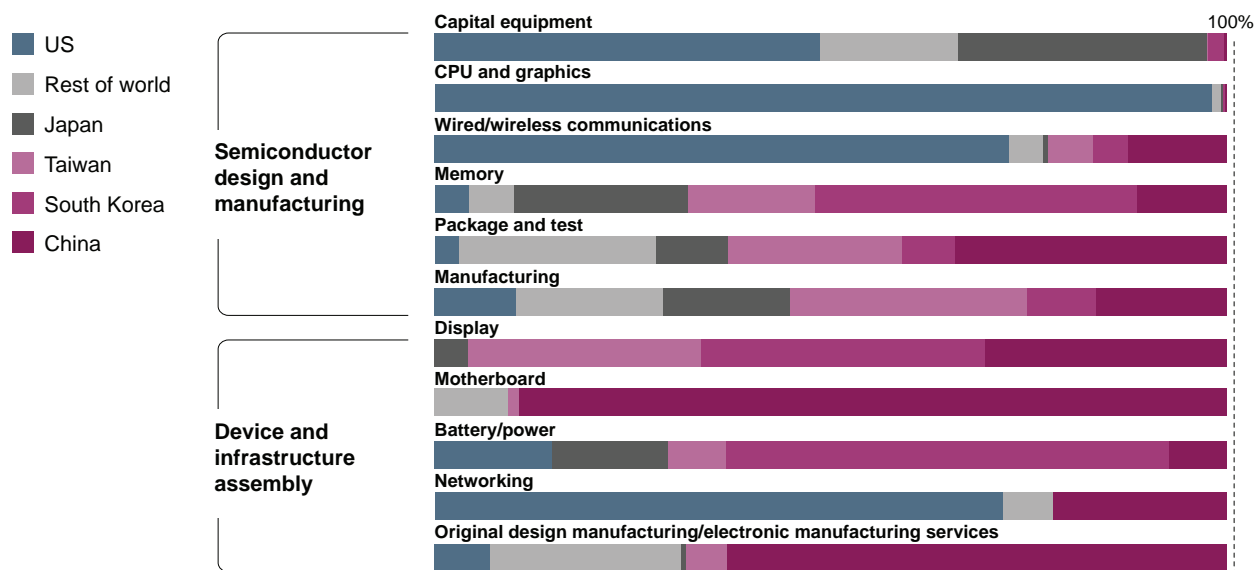
All of this has caused massive chaos for supply chains. Consider this: In February, during the height of the lockdown in China to combat the virus, the country recorded its largest one-month drop in

**Figure 22:** A series of unpredictable events have disrupted technology supply chains



Sources: News articles; research reports; Bain analysis

**Figure 23:** Geographic concentration makes technology supply chains brittle



Notes: Capital equipment, CPU and graphics, wired/wireless communications, battery/power and networking measure revenue by headquarters location; memory and manufacturing measure capacity by site location; package and test measures square footage at sites; display measures LCD area shipments; motherboard measures location of production; ODM/EMS measures number of sites and headcount by location; CPU and graphics includes PC/server CPUs and discrete graphics; networking includes Ethernet switches, enterprise/service routers and network interface controllers; manufacturing excludes memory companies  
Sources: Bain analysis, based on data from Gartner; IDC; Market Intelligence & Consulting Institute; Dell'Oro Group; analyst reports; company filings; industry participant interviews

manufacturing activity, as measured by the Purchasing Managers Index. The PMI decreased from 50 (indicating a balance between expansion and contraction) in January to a record low of 35.7.

How did we get here? For the last 30 years, technology firms have wrung out supply chain costs and trimmed as much fat as possible by disaggregating the various steps of the value chain, concentrating each step with a limited number of companies and geographies to improve economies of scale, and reducing inventory across the journey.

This has made technology supply chains extremely efficient in a normal economic climate. When disaster strikes, they break down. The geographic concentration of production has created single points of failure, such as a reliance on China for motherboards and electronics manufacturing services, and a dependence on the US for semiconductor equipment, central processing units and graphics cards (see Figure 23).

In 2011, terrible flooding temporarily crippled supplier operations for hard-disk drives in Thailand, the largest producer behind China. That caused a global shortage of hard-disk drives that created ripple effects throughout the computer industry.

Making supply chains more resilient is challenging because many technology components have single suppliers due in part to high capital expenditures and R&D requirements. The rapid pace of innovation

further weakens supply chains because inventory quickly becomes obsolete and a “winner-takes-most” model winnows the number of suppliers.

The writing is on the wall now. The pandemic, combined with growing trade tensions, spell continued volatility for technology supply chains for years to come. Deutsche Bank estimates the US–China trade war could result in companies spending about \$1 trillion over a five-year period to move supply chains out of China. Rising global trade tensions have affected specific companies, including Huawei Technologies, Taiwan Semiconductor Manufacturing Co. (TSMC) and Apple. The tensions have also impeded entire industries, such as Japan cutting off South Korean memory chip companies’ access to fluorinated polyimides, photoresists and hydrogen fluoride, three materials critical to production.

What’s become obvious is the frequency and scale of these disruptions to supply chains will only continue to grow. That calls for striking a new strategic balance in technology supply chains. Low cost and efficiency are still crucial, of course, but resiliency has become vitally important. Leading technology companies are intently engaged in finding ways to build more flexibility into their sourcing and supply chains, recognizing both the downside risk and the upside competitive potential of maintaining product flows when the next disruption crops up.

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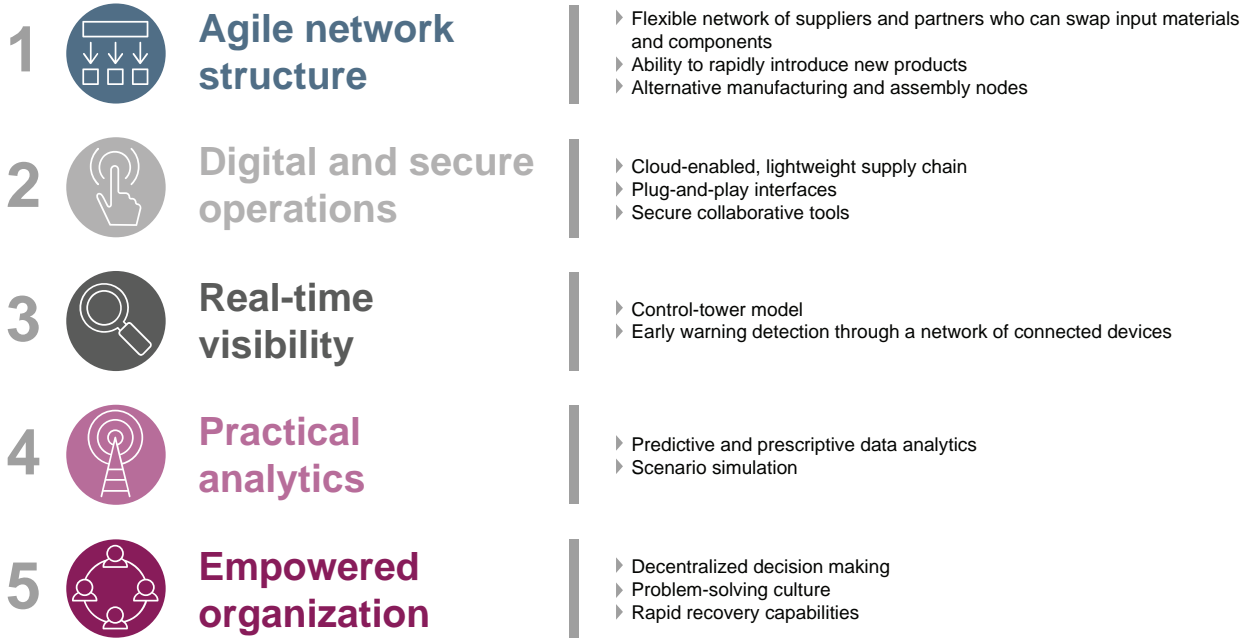
Leading technology companies are intently engaged in finding ways to build more flexibility into their sourcing and supply chains, recognizing both the downside risk and the upside competitive potential of maintaining product flows when the next disruption crops up.

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A good starting point for executives committed to revamping their supply chain is to look at it through their customers’ eyes: What do customers really want? What would make us indispensable to them? What operational capabilities differentiate us from the competition? How can we build those things into our supply chain to make it more resilient and effective? Companies that customize their supply chain, say, by quickly ramping up local production to improve turnaround time, can improve resiliency and turn the supply chain into a competitive advantage.

Looking at successful strategies across the technology industry, Bain has identified five common attributes of resilient supply chains: an agile network structure, digital and secure operations, real-time visibility, practical analytics and an empowered organization (see *Figure 24*).

**Figure 24:** Resilient supply chains feature five common attributes



Source: Bain & Company

For example, an agile network of contract manufacturers can help original equipment manufacturers navigate changing tariffs. For many companies, a “China-plus-one” strategy that sources supplies from China and a second location makes sense, but where and how to manage the “plus one” is challenging.

Trade tensions and other destabilizing events are forcing manufacturers in China to make significant adjustments to their businesses as well. Many multinational corporations have relocated some of their production out of China in recent years, in part due to rising labor costs. These companies’ share of China’s overall manufacturing revenue dropped from 29% in 2008 to 22% in 2019, according to the National Bureau of Statistics of China. Covid-19 and the escalating trade war are accelerating that exodus. Many China-based manufacturers have responded by focusing more on supporting demand from the country’s local businesses and consumers. At the same time, new trade restrictions have forced some Chinese manufacturers to find alternative sources of equipment and materials they previously imported from the US.

Some companies have weathered crises better than others because they took steps beforehand to make their supply chains more resilient. The Bosch Group, a German-based global supplier of technology and services for automotive, consumer goods and other sectors, has used its agile network structure during the Covid-19 crisis to seamlessly reallocate production to facilities less affected by labor shortages and other repercussions of the pandemic. This structure also enabled Bosch to nimbly adjust output to match reduced demand from auto manufacturing customers that had cut their production in

response to the pandemic. Similarly, Bosch used a system of sensors and software to more effectively monitor inbound supplier shipments and quickly source components as it identified shortages or shipment delays. Digital tools have also helped workers, especially equipment technicians and other service personnel, stay connected and keep facilities running as smoothly as possible.

The final piece of a successful supply chain strategy is quantifying it. Leading companies establish clear metrics for assessing resiliency and adaptability, and they track those as rigorously as unit costs and inventory. That helps them monitor the return on investment and compare their efforts with competitors. The leaders pursue resiliency measures likely to deliver the most value, while still balancing those investments against the company's risk profile.

The leaders also use thorough scenario planning to stress test their strategy and make sure they're as ready as possible for the next crisis. It might sound excessive, but imagining and preparing for a worst-case disaster that seems inconceivable today could pay off down the road. What if a single event wiped out a huge chunk of the business overnight? That's the kind of shock TSMC faced this year, when new US export controls pushed the company to stop taking product orders from China-based Huawei, which accounted for about 15% of TSMC's annual revenue. TSMC executives have said they expect demand from other customers to make up for it, but that's still a massive change that requires adjustments on the fly.

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Executives embarking on a supply chain transformation should go into this journey with clear eyes: Putting resiliency above efficiency will come at a cost. It will likely be more expensive to buy some components from a second supplier outside of Asia or to move supplier operations closer to manufacturing and assembly facilities so they're a truck drive away instead of a plane ride.

Nevertheless, when the next disaster strikes, executives will be glad they built more resiliency and adaptability into their supply chain. That goes for their customers, too.





# A New Dawn for Automation

It's no longer just about saving money. It's about resilience and gaining an edge.

**By Michael Heric and Purna Doddapaneni**

In a matter of weeks, automation has gone from a low priority to mission-critical for many executives. With all the attention on automation that has resulted from the business shock caused by the Covid-19 pandemic, one crucial realization has struck many leadership teams: It’s about resilience.

Companies that invested more in automation before the pandemic have weathered the crisis better than others. They’ve generated higher revenues and experienced fewer disruptions to the supply chain, workforce productivity and demand, according to a recent automation survey conducted by Bain & Company.

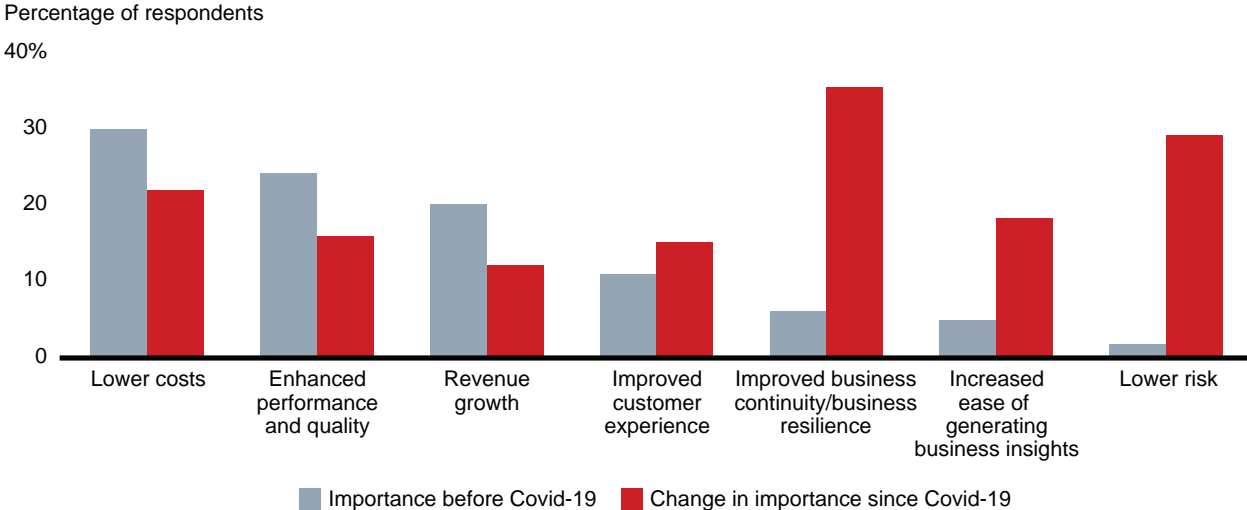
Suddenly, automation has climbed much higher on the agenda for many companies.

It’s no longer primarily about lowering costs. Companies are increasingly deploying automation to strengthen business resilience, reduce risk and generate useful business insights more easily (see Figure 25).

Even though most companies in the survey are accelerating their automation initiatives and traditional barriers are shrinking, today’s automation leaders have a significant head start and aren’t slowing down. Before Covid-19 hit, many leaders planned to automate 30% or more of their manual processes—two to five times more than companies with low automation-adoption rates (see Figure 26).

**Figure 25:** Companies’ automation priorities now extend beyond saving money

**Which automation goal was the most important prior to Covid-19 for your organization?  
How has that changed?**

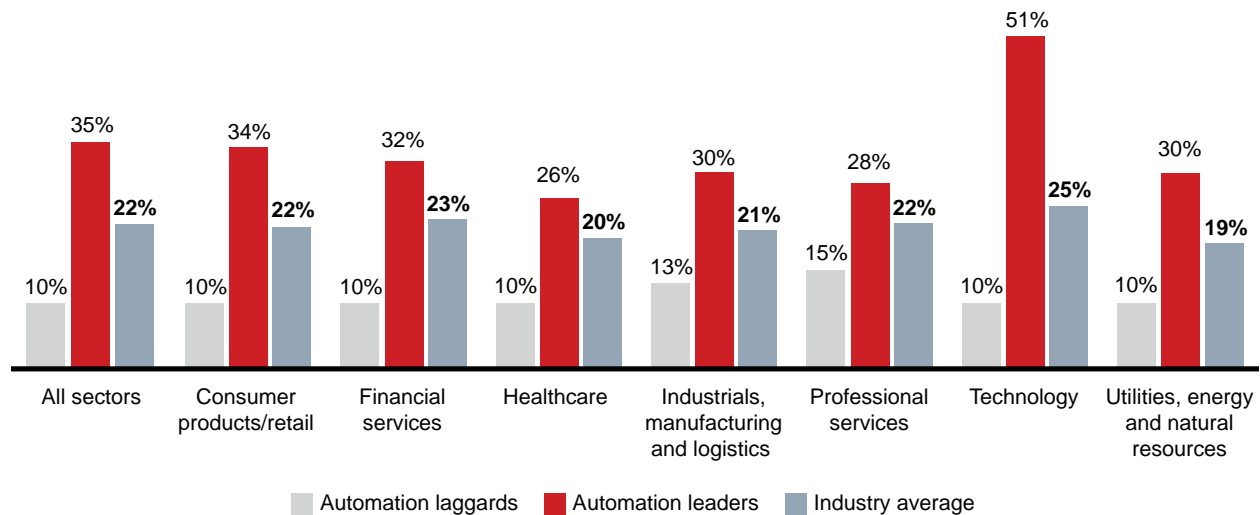


Notes: Change in importance equals the number of respondents who find it more important minus the number of respondents who find it less important, divided by the total number of respondents; other automation goals not included  
Source: Bain Automation Survey 2020 (n=500)

**Figure 26:** Automation leaders planned to automate two to five times more work than laggards, even before the pandemic

**Before Covid-19, what percentage of your work did you plan to automate over the next two years?**

Percentage of total work, by industry



Notes: Automation leaders defined as companies that invested more than 20% of their IT budget in automation within the last 12 months; automation laggards are the bottom quartile of companies based on the amount of work respondents had planned before Covid-19 to automate over the next two years  
Source: Bain Automation Survey 2020 (n=500)

Over the next year, 38% of the leaders intend to invest significantly more in automation, compared with just 22% of other companies.

What does that mean? Automation leaders are pressing what they see as a competitive advantage, and when the next business shock hits, it will likely put even more stress on companies that haven't followed through with a bold automation agenda.

It's no surprise that technology business leaders are among the most optimistic about the potential benefits of automation. Many processes within technology organizations lend themselves to automation, from software testing to managing cloud infrastructure. Plus, technology companies often have more employees with automation expertise who are open to exploring its capabilities. As a result, technology companies have been deploying automation longer than other industries and across more tasks, according to the survey. Technology leaders have seen automation help them adapt to their sector's rapid pace of change, and they're ready to expand their efforts.

Before Covid-19, technology companies on average planned to automate more work than any other industry surveyed, and the sector's most aggressive companies intended to automate a whopping 51% of manual processes. Coming out of the pandemic, around 60% of technology companies plan to automate more offshore activities, the highest rate of any sector surveyed. On average, technology companies plan to have 38% of their employees continue working remotely, even after on-site work

resumes, tied with financial services for the highest rate among industries surveyed. Companies are comfortable making that shift in part because they recognize automation can help people work more effectively from home, particularly in minimizing errors and hassle in tasks involving a series of hand-offs among dispersed people, such as the finance team closing the books on the quarter.

Technology companies are also more willing to embrace advanced automation technologies such as machine learning and conversational artificial intelligence (AI), according to the survey.

Add it all up, and the technology sector is well-positioned to shape the emerging landscape of automation.

## **Spreading automation to all corners of the business**

Automation can make a difference across the whole organization. While back-office support and customer service have traditionally had the highest potential, automation can also deliver benefits in R&D, supply chain, operations, and sales and marketing.

In software, automation is helping accelerate product development; deliver professional services at a lower cost; resolve customer issues faster, cheaper and more effectively; and increase selling time for field salespeople and channel partners (see *Figure 27*).

Some of the most compelling trend lines in recent months reflect how automation has improved the competitive position of technology companies in the midst of the pandemic.

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Covid-19 pushed one large technology company, a leader in deploying automation for years, to apply it in new or less mature areas, such as sales and the order-to-cash process. If all goes as planned, the new automation initiatives could help the company—which generates billions of dollars in annual revenue—save hundreds of millions over the next two years.

The changes include making online selection and ordering easier; automating billing; switching to targeted customer communications that require less oversight; and offering clients more self-service tools for resolving issues. The company has also identified ways to streamline and automate back-office sales support tasks and allow salespeople to spend more time on high-value, revenue-generating activities.

**Figure 27:** Automation can benefit a software company’s whole organization, but some functions and processes have more potential

Automation potential for processes within business functions

	Low	Moderate	High
<b>Product</b>			
<b>Product management</b>	<ul style="list-style-type: none"> <li>Portfolio strategy</li> <li>Life cycle management</li> <li>Offering design and architecture</li> </ul>	<ul style="list-style-type: none"> <li>Pricing</li> <li>Field and channel support</li> </ul>	<ul style="list-style-type: none"> <li>Portfolio planning</li> </ul>
<b>Development</b>	<ul style="list-style-type: none"> <li>Ideation and design</li> <li>Development and engineering</li> </ul>	<ul style="list-style-type: none"> <li>Market and customer analysis</li> <li>Launch</li> </ul>	<ul style="list-style-type: none"> <li>Testing</li> </ul>
<b>Operations (SaaS)</b>	<ul style="list-style-type: none"> <li>Architecture</li> <li>Governance and compliance</li> </ul>	<ul style="list-style-type: none"> <li>Security</li> <li>Disaster recovery</li> </ul>	<ul style="list-style-type: none"> <li>Operations/hosting</li> </ul>
<b>Services</b>			
<b>Professional services</b>	<ul style="list-style-type: none"> <li>Advisory</li> </ul>	<ul style="list-style-type: none"> <li>Education</li> </ul>	<ul style="list-style-type: none"> <li>Managed services</li> <li>Deployment</li> <li>Migration and upgrading</li> </ul>
<b>Customer success</b>		<ul style="list-style-type: none"> <li>Product experience</li> <li>Retention and expansion</li> </ul>	<ul style="list-style-type: none"> <li>Installation and deployment</li> <li>Support</li> </ul>
<b>Sales and marketing</b>			
<b>Sales</b>	<ul style="list-style-type: none"> <li>Direct sales/field force management</li> <li>Digital commerce</li> <li>Sales enablement</li> </ul>	<ul style="list-style-type: none"> <li>Customer segmentation and strategy</li> <li>Channel/partner management</li> <li>Next-best-action planning</li> <li>Sales compensation administration</li> </ul>	<ul style="list-style-type: none"> <li>Pipeline management/prospect monitoring</li> <li>Proposal development</li> <li>Account planning</li> </ul>
<b>Marketing</b>	<ul style="list-style-type: none"> <li>Front-end innovation</li> <li>Creative services</li> <li>Marketing spending management</li> <li>PR and communications</li> <li>Licenser management</li> </ul>	<ul style="list-style-type: none"> <li>Portfolio optimization and brand equity</li> <li>Media monitoring and marketing</li> </ul>	<ul style="list-style-type: none"> <li>Email marketing</li> <li>Lead generation, qualification and management</li> <li>Drip and nurture campaigns</li> </ul>
<b>Support</b>			
<b>Order to cash</b>	<ul style="list-style-type: none"> <li>Order fulfillment</li> </ul>	<ul style="list-style-type: none"> <li>Configure/price/quote</li> <li>Credit</li> </ul>	<ul style="list-style-type: none"> <li>Order entry and order management</li> <li>Billing</li> <li>Collections</li> <li>Receivables</li> </ul>
<b>Finance and procurement</b>	<ul style="list-style-type: none"> <li>Decision support</li> <li>Investor relations</li> </ul>	<ul style="list-style-type: none"> <li>Budgeting and forecasting</li> <li>Treasury</li> <li>Entitlement</li> <li>Procurement</li> </ul>	<ul style="list-style-type: none"> <li>Internal audit</li> <li>Tax</li> <li>Record to report</li> <li>Accounts payable</li> </ul>
<b>Human resources</b>	<ul style="list-style-type: none"> <li>Talent strategy</li> <li>Diversity and inclusion</li> <li>Labor relations</li> <li>Total rewards</li> </ul>	<ul style="list-style-type: none"> <li>Workforce planning</li> <li>Performance management</li> <li>Talent development/succession plan</li> <li>Learning delivery</li> </ul>	<ul style="list-style-type: none"> <li>Talent acquisition</li> <li>Payroll</li> <li>Talent onboarding and staffing</li> <li>Time and attendance</li> <li>Learning scheduling</li> </ul>
<b>Internal IT</b>	<ul style="list-style-type: none"> <li>Enterprise architecture</li> <li>IT security</li> </ul>	<ul style="list-style-type: none"> <li>Application development and management</li> <li>Network configuration</li> <li>End user services</li> <li>Infrastructure operations</li> <li>Database development</li> </ul>	<ul style="list-style-type: none"> <li>Provisioning</li> <li>IT service management</li> <li>Service desk</li> </ul>
<b>Legal</b>	<ul style="list-style-type: none"> <li>Intellectual property</li> <li>Risk management</li> <li>Labor and employment</li> <li>Governance</li> </ul>	<ul style="list-style-type: none"> <li>Litigation</li> <li>M&amp;A</li> <li>Regulatory compliance</li> </ul>	<ul style="list-style-type: none"> <li>Contract management/terms</li> </ul>
<b>Real estate and facilities management</b>	<ul style="list-style-type: none"> <li>Brokerage services</li> <li>Delivery of facilities management services</li> </ul>	<ul style="list-style-type: none"> <li>Document management</li> <li>Reconciliation and dispute management</li> <li>Compliance/FAS 13 reporting</li> <li>Facilities management scheduling</li> <li>Workforce optimization</li> <li>Security access management</li> </ul>	<ul style="list-style-type: none"> <li>Lease administration</li> <li>Utility billing processing</li> <li>Utility consumption monitoring</li> <li>Space/occupancy data management</li> </ul>

- **Data management** has moderate automation potential across all business functions
- **Reporting and analytics** have high automation potential across all business functions

Source: Bain & Company

These automation moves have a lot of upside beyond saving money. They're expected to increase revenue, worker productivity and customer loyalty.

Technology companies are also using automation to help solve specific, intractable problems such as moderating content on social media platforms and in other digital forums. When the pandemic hit, some companies weren't prepared to transition their contractors to working from home, so their moderation operations have been running at reduced capacity. At the same time, traffic has spiked on many of these platforms.

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In response, some digital forums are partially automating content moderation with artificial intelligence technologies from developers such as San Francisco-based Hive. Hive has added dozens of clients since March, when many stay-at-home orders went into effect around the world. The company is now processing more than 1 billion posts a month that previously were reviewed by humans or not at all.

In addition to increased efficiency, the product has made content-moderation operations more effective. One client who used to field thousands of user complaints of inappropriate content each week is now reporting fewer than one incident per week after integrating Hive's AI models. Another client, French social video-chatting app Yubo, which started using Hive's services before the pandemic, has been able to handle a 200% increase in the number of livestreams on its platform without needing to hire additional human moderators.

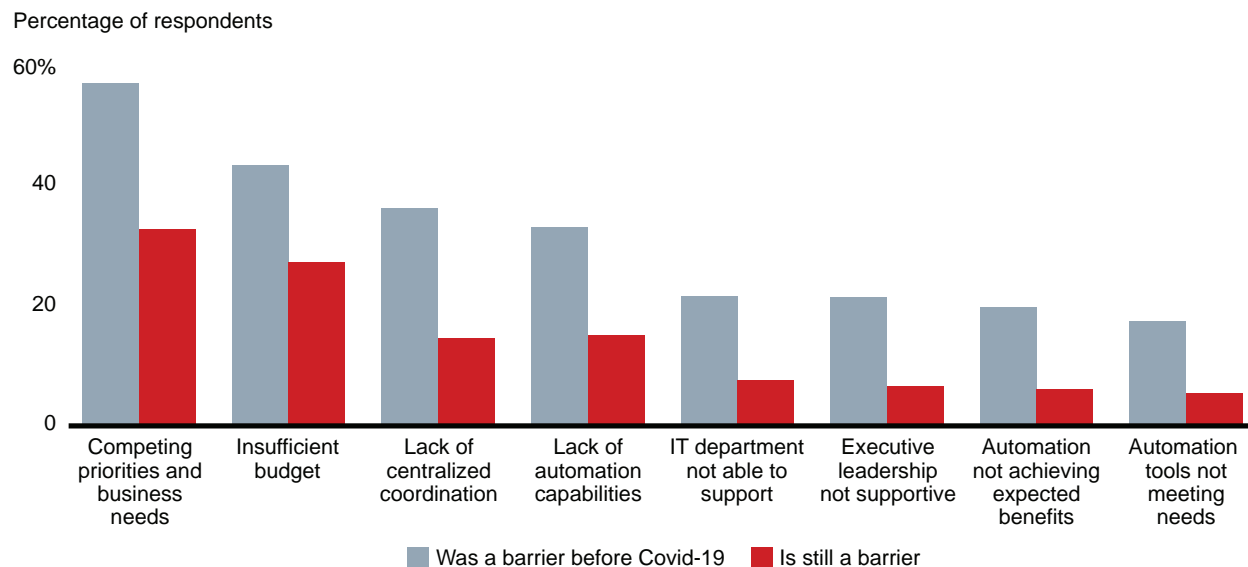
Offshore IT and business-process outsourcers were among the technology sectors hit hardest by Covid-19 because many companies' business-continuity plans weren't designed for a pandemic. India-based Tata Consultancy Services has held up better than most and is poised to recover faster, thanks in part to automating critical processes before the crisis. When the pandemic forced the company to shift the vast majority of its employees to working from home, it continued to operate effectively and responded nimbly to urgent customer needs. The company plans to have 75% of its employees permanently work from home by 2025; it believes it can maintain or even improve productivity with a mostly distributed workforce, according to news articles.

## Removing the roadblocks

The good news for companies investing more in automation is historical barriers are coming down in the wake of the pandemic, according to the Bain survey (see *Figure 28*). In addition to increased

**Figure 28:** Barriers to automation are coming down due to the pandemic

***Before the pandemic, what were the barriers preventing your organization from investing in automation? How have these changed?***



Source: Bain Automation Survey 2020 (n=500)

support from executives, companies across industries are reporting dramatic improvements in coordination of automation projects and support from IT departments, among other roadblocks getting removed. These developments could speed up deployment of automation, improve its performance and bring a larger return on investment.

It's unclear whether the favorable conditions on the ground will change once companies recover from the pandemic. What is clear is businesses have an opening now to accelerate their automation programs.

The problem: Many say they aren't ready for it. Only 10% of surveyed companies believe they're highly prepared to address the HR and change management challenges that automation will create; 11% say they aren't prepared at all to respond to those workforce issues. For their part, technology companies say they're better-prepared than most sectors, but that doesn't mean they won't encounter difficulties.

Our analysis of the survey responses and the characteristics of successful automation programs suggests three key principles to take full advantage of automation:

**First, think big about how automation can deliver a competitive edge.** Many companies deploy automation one use case at a time, and many projects are required to quickly pay for themselves through cost savings or new revenue, often within the first year of deployment. Cautious testing and learning,

followed by rapid scaling, works well during stable times. But the Covid-19 crisis has created a rare opening for executives to think big about what can be automated and the value it could bring. Leading firms are challenging their long-held beliefs about why automation may or may not work in their organization. They're automating more complex activities than just back-office processes and customer service desks.

**Second, treat automation as a major change to manage actively from the start.** The barriers to automation are falling, but that doesn't mean companies can cut corners in planning and executing their automation strategy. Success in automation requires more than great technology. It starts with strong C-level sponsorship, so that automation remains a priority and everyone is held accountable for achieving the company's ambitious targets.

The most effective change programs engage the key stakeholders, including IT, in early, open and direct communication. The senior team must demonstrate beforehand and in detail how automation will change the experience of employees and customers for the better; otherwise, many employees naturally will resist. Good communication, together with retraining programs, can help people start moving toward new career paths, including those within the same company.

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The economic downturn will constrain budgets, so choosing the wrong funding model could stifle adoption. Asking business units to fund their own investments works well when a company's automation capabilities are mature, demand from the businesses is high, and accountability for the return on investment is essential.

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The economic downturn will constrain budgets, so choosing the wrong funding model could stifle adoption. Asking business units to fund their own investments works well when a company's automation capabilities are mature, demand from the businesses is high, and accountability for the return on investment is essential. Conversely, a centrally funded model might make more sense if a company doesn't have a proven track record or healthy demand for automation.

**Third, spend as much, if not more, time on what comes after automation.** Beyond developing, testing, deploying and maintaining the technology, what really matters is achieving the expected business outcomes from the automation. In this respect, it's similar to outsourcing. Beyond selecting the right partner, negotiating a competitive contract and transitioning the work to the provider, the organization left behind must be sized correctly and fit for purpose, or else the savings from outsourcing won't materialize.



The risk is even higher for automation because much of the work automated consumes only a fraction of each employee's time. Companies have to redesign the jobs affected by automation, or they won't be able to achieve their goals.

## **What comes next**

After the events of this year, many executives see automation as a critical asset that can strengthen their businesses and give them a strategic advantage.

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After the events of this year, many executives see automation as a critical asset that can strengthen their businesses and give them a strategic advantage.

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Now comes the hard part. Before the pandemic, nearly half of automation projects failed to deliver the expected savings, according to a 2019 Bain survey. Although the situation on the ground has changed and traditional barriers to automation are coming down, companies still have their work cut out to turn its promise into reality. But the rewards could be substantial.



## The One-Two Punch: Virtual Selling and Sales Playbooks

Technology companies don't need to hit the streets to hit their quotas.

**By Mark Kovac and Dianne Ledingham**

Covid-19 has profoundly affected the sales and marketing organizations of technology companies. Every sales representative became a remote, virtual seller overnight, just as the normal stream of customer requests went haywire.

Some software-as-a-service (SaaS) providers, for example, fielded requests from up to one-third of their customers to skip payments or extend terms. Renewals in software and managed-services businesses suddenly experienced higher levels of risk. Decision making within many buyer organizations seized up for a while, which stalled activity for frontline reps. As a result, productivity took a hit among many sellers. Those fortunate to be in markets where demand spiked had to learn new motions to enable virtual selling and create surge capacity.

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With so many people still working from home, the pandemic highlights two capabilities that have gained importance over the past few years and are poised to continue: prescriptive sales playbooks and virtual selling—even for complex buying cycles.

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With so many people still working from home, the pandemic highlights two capabilities that have gained importance over the past few years and are poised to continue: prescriptive sales playbooks and virtual selling—even for complex buying cycles. While many technology executives recognize these capabilities can boost revenues, misconceptions about both abound and prevent companies from using them to full advantage.

## **Come in and play**

Many technology companies believe they run sales plays, but few reap the full potential value from this approach, because it requires rigorous, consistent execution. A sales play consists of a prescriptive, coordinated set of sales and marketing actions orchestrated to create and then win an opportunity with a specific customer or prospect. For example, a cross-sell play could target customers who have a specific product configuration with a managed-service offering.

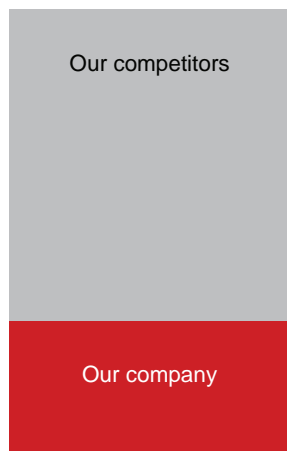
Each play can specify up to 20 elements to support execution, including the activities of each role on the sales team, marketing messages, promotional pricing, customer testimonials, call scripts and key performance indicators. This level of specificity, in our experience, raises the odds of success on each play.

In the early weeks of the pandemic, an information management provider created a detailed sales play for its offering of a digital mail room, which had gained a new relevance in the market. This play

**Figure 29:** A money map reveals the best revenue opportunities so a company can choose which sales plays to run

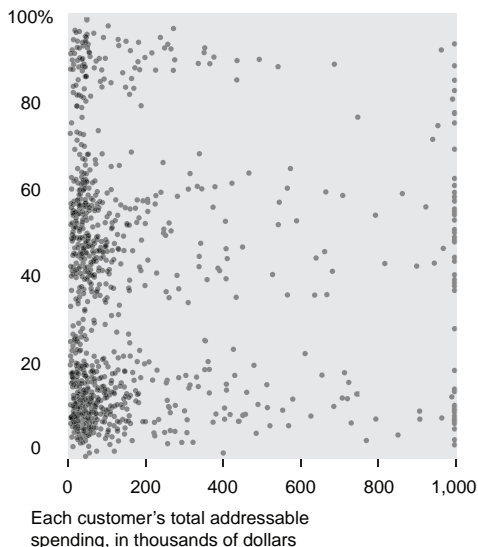
**Combine a macro view of market share...**

Share of addressable market








**...with a bottom-up view of the company's share of each customer's spending...**

Our current share of wallet



**...to deploy sales resources**

-  New customer
-  Upsell
-  Cross-sell
-  Renewal
-  Win back

Source: Bain & Company

has spurred nearly \$30 million of opportunities in the pipeline at a time when customers had frozen their decisions on many of the company's other offerings.

The most sophisticated organizations have moved beyond plays that simply include sales collateral and steps to orchestrate an account team. They're building a full-fledged capability with the play serving as the linchpin of a go-to-market system behind everything from marketing campaigns to coaching to pipeline reviews. Based on our work with technology companies, those that reap the most value from sales plays share a few characteristics that other companies can cultivate to their advantage:

**Money map.** Effective selling organizations maintain a map of how much each customer spends across major categories in their product portfolio (see Figure 29). This allows providers to quantify where and how much customers can increase spending in these categories, as well as potential spending by prospects. A map of spending by individual customer and category is far more useful than a rough sense of market size. Such a map helped one fiber technology company more than double the size of its addressable market, by evaluating how much each current and prospective customer *could* spend in each category.

**Win room.** Companies that get a return from sales plays invest in a clearinghouse to orchestrate and track play execution. A cross-functional team in the win room takes the money map analysis, adds

the latest intelligence from field reps, rapidly reorients sales capacity to critical areas, and measures how effectively each play has expanded the pipeline and converted opportunities into closed deals.

The team also ranks the backlog of sales plays, and prompts sales support resources to develop market-ready plays. The plays themselves are developed in a sales play “factory” by teams typically composed of subject-matter experts from product management, marketing, sales enablement and frontline reps.

One infrastructure software provider relied on a money map and a win room to improve customer renewals. The team was able to identify high-priority, at-risk renewals. This new approach led to the immediate retention of more than \$5 million of accounts previously deemed lost, putting the company on a path to improve renewal rates by 15 percentage points.

**One-on-one.** A third attribute of companies that excel in play-based selling is the discipline they bring to frontline management and coaching. They rigorously track play deployment, progress and performance. And they take full advantage of weekly one-on-one meetings between sales managers and reps to steer the execution of plays.

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Our recent survey of 260 sales reps in the US, Canada and the UK finds that reps at companies that sustainably grow revenue and market share are 50% more likely than lagging firms to have a consistent weekly meeting with their manager.

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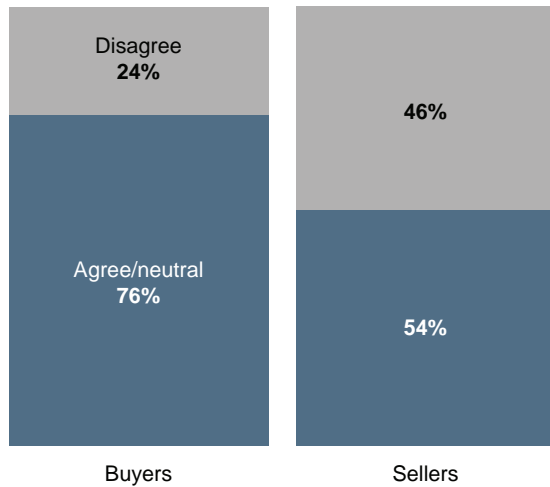
Our recent survey of 260 sales reps in the US, Canada and the UK finds that reps at companies that sustainably grow revenue and market share are 50% more likely than lagging firms to have a consistent weekly meeting with their manager. Reps that get the most value from these meetings report that their managers spend more time on deal strategy and coaching. By contrast, those at lagging firms said their managers focus on process and administrative topics. In the current moment of great uncertainty, there is a premium on clear, practical guidance to the front line, which prescriptive sales plays can provide.

## **We're all virtual now**

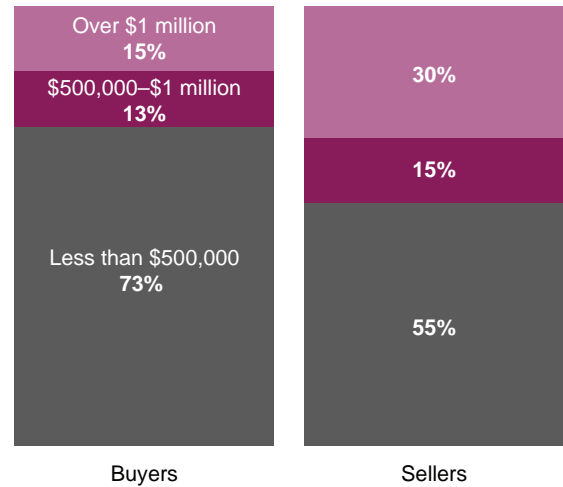
Covid-19 instantly accelerated a longer-term trend of B2B companies shifting their sales capacity from field-based to virtual models. Sometimes unwittingly, companies are discovering the advantages of virtual selling. It can provide customers with a better experience, with self-serve options for simple interactions, on-demand support or ready access to expertise. Virtual channels, whether for leads or

**Figure 30:** Many buyers and sellers believe virtual sales are as effective as in-person sales

**Is virtual as effective as in-person for complex products?**



**What is the highest-priced product you have bought or sold 100% virtually?**



Note: Percentages are rounded  
 Source: Bain survey, conducted with Dynata, of B2B sales in the US, UK and Canada, May 2020 (buyers n=240, sellers n=67)

end-to-end sales, raise productivity and lower selling costs. And win rates rise and sales cycles shorten with well-orchestrated virtual channels.

A recent survey, conducted with Dynata, of more than 300 B2B buyers and sellers in the US, UK and Canada found that half of sales transactions already were taking place virtually before the pandemic. The reason: Many buyers believe virtual channels are just as effective as face-to-face for large, complex purchases (see Figure 30).

Indeed, more than one-fourth of buyer respondents have virtually purchased products priced over \$500,000. Moreover, most buyers and sellers expect a sustained increase in virtual interactions. In Bain’s recent survey of 153 software buyers in Europe and the US, 54% said they prefer all-virtual purchases, with another 37% preferring largely virtual with select on-site visits.

One telecommunications provider, for example, has migrated important aspects of its B2B sales to virtual channels, using marketing automation to create leads and installing an online self-service portal. After the first year of this migration, the new model increased revenues by 5% and reduced selling, general and administrative costs by 10%, at the same level of customer service. It cut the time to deliver a quote from days to minutes, all while sharply improving the company’s overall customer loyalty score.

A global technology company has seen more customer interactions during the pandemic and plans to keep a sizable share of sales operating virtually. Much of its field force will employ virtual selling practices between one-quarter to three-quarters of the time, depending on the nature of the role and opportunity. The company is investing in new digital tools, upgrading its digital purchase experience and introducing new recruiting and training methods.

Getting virtual sales right involves far more than using digital tools. You have to deploy the right people and other resources through the right channels at different points in the buying process. This implies that you understand the experience and information your customers need at each step, which channel they want to engage in, and how to provide the best support. It also requires the right operating model, with the right roles, metrics, sales motions, talent strategy, experience sharing and location strategy. Ultimately, the tech company mentioned above anticipates a marked improvement in sales productivity through greater use of virtual.

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Granted, building a successful virtual sales engine hinges on winning over a sometimes skeptical sales team. In our recent survey, 55% of respondents said field reps would be demoralized or quit if asked to change to a primarily virtual model, while only 25% said they would be excited. Fortunately, reps and managers have a rich set of tools available, including voice analytics that can enable virtual coaching to platforms that can get the right collateral in front of the right sellers and customers.

### **What cannot be sold virtually?**

Commercial executives can scope out an effective virtual sales engine by answering a set of questions:

- Where should we focus—which products, customer segments and steps of the “discover, try, buy, expand, renew” sequence?
- Which roles, metrics and processes should be standardized across regions? What skills are required?

- What is our digital hub strategy and how does it relate to the rest of the organization?
  - What technology infrastructure and digital tools will best enable our mission?
  - How should we stage our remix of direct channels and foster the required changes in behavior?
  - What are the major risks that could slow or derail our effort?
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Combining virtual selling with a strong sales playbook will allow companies to adapt and keep generating revenues no matter what twists and turns lie ahead.

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The salient question overall now becomes, what *cannot* be sold virtually? For a major new prospective account, or a complex sales cycle with multiple influencers, it may still be important to hold a collaborative workshop on-site at critical points. But as the recovery from the pandemic and economic recession keeps getting pushed back, commercial leaders in technology companies should assume that everything can be sold virtually, then design a model that accommodates the specific opportunities that demand a face-to-face visit during the process. Combining virtual selling with a strong sales playbook will allow companies to adapt and keep generating revenues no matter what twists and turns lie ahead.





## Buying Boosts Building in Tech M&A

Companies are increasingly using scope deals to add capabilities and supplement organic innovation.

**By Adam Haller and Chris Johnson**

Over the past five years, the fundamental thesis for technology mergers and acquisitions has changed. Now, the vast majority are geared toward one thing: expanding the scope of the business.

In 2019, 82% of technology mergers and acquisitions were scope deals, through which the buyer enters faster-growing business segments or acquires new capabilities, intellectual property or talent to generate future growth. The rest were scale deals typically aimed at strengthening the company's market position and reducing costs.

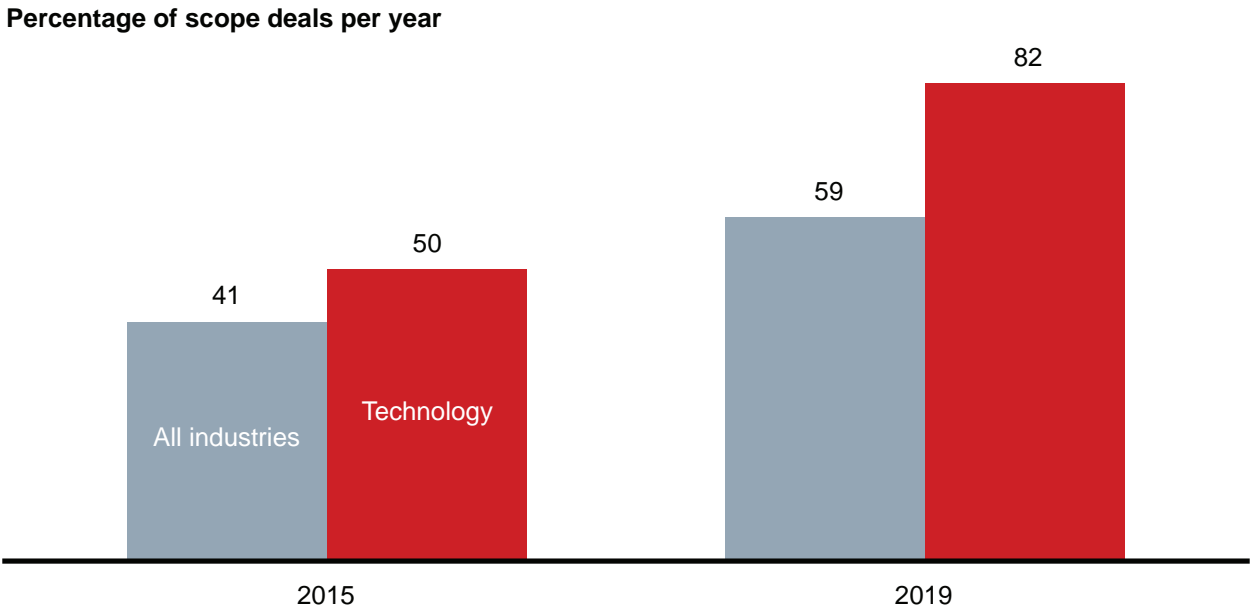
Just five years ago, there was an even split between scope and scale deals in the technology industry (see Figure 31).

This growing pursuit of scope acquisitions is happening in all sectors, but it's much more pronounced in technology. Scope transactions for all industries grew from 41% in 2015 to 59% in 2019.

The emphatic swing toward scope deals in technology is one way that companies are positioning themselves to keep up with unprecedented rates of technology transitions, shifting boundaries of competition, expanding customer expectations and a fierce talent war.

A key to successful scope deals is adding capabilities that improve the value proposition of a company's existing business. Salesforce's \$16.3 billion purchase of Tableau Software last year gave customers

**Figure 31:** Scope deals now make up the vast majority of technology M&A



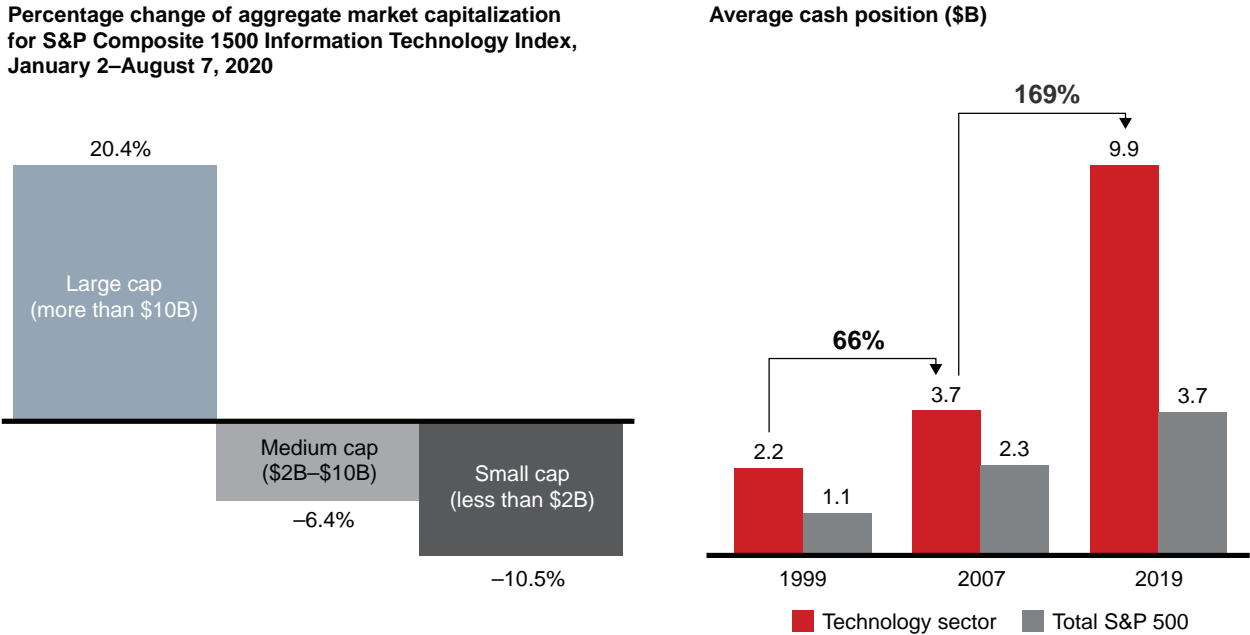
Notes: Includes only strategic deals valued at more than \$1 billion; share of nontechnology scope deals in the fourth quarter of 2019 was extrapolated from the year's first three quarters  
Source: Bain analysis, based on data from Dealogic and Gartner

access to Tableau’s data visualization platform, which strengthened the analytics capabilities of Salesforce’s customer relationship management offering. Scope M&A can also help companies diversify revenue sources and expand into new markets. This year, Infineon Technologies acquired Cypress Semiconductor for \$10 billion to add microcontrollers and connectivity products to its lineup of offerings. This broadened Infineon’s customer base and gave it new cross-selling opportunities. Analysts expect the deal to achieve €750 million of annual revenue synergies by 2025. And some scope deals accomplish both aims: They add capabilities and move the company into faster-growing segments.

The other reason for the shift toward scope deals is structural. Simply put, there are fewer opportunities for scale acquisitions these days because the technology sector has become highly concentrated. Segments such as semiconductors and software have gone through years of consolidation. Other areas, such as cloud services, are inherently prone to a small number of winners.

This scope M&A bent will likely accelerate. Technology deals came to a standstill in the second quarter of this year, due to the Covid-19 pandemic and tightening credit markets. But the landscape is ripe for renewed M&A activity. Many technology companies’ share prices have been resilient during the recent economic downturn, and they’re sitting on large cash reserves that could fund deals (see Figure 32). Those with the means will use this opportunity to add new capabilities and reposition their organizations for the postpandemic world.

**Figure 32:** Large technology companies thrived through the pandemic, and they have large cash reserves that could fund deals



Notes: Cash position includes cash and short-term investments, inflation-adjusted to 2019 dollars using the US Consumer Price Index; numbers are rounded  
 Source: Bain analysis, based on data from S&P Capital IQ

This was the case during the Great Recession. Technology deal volume increased 9% from 2007 to 2010. Several technology companies inked strategic scope acquisitions during the downturn. For example, Adobe laid the foundation for its transition to a cloud-enabled business with its 2009 acquisition of web analytics company Omniture for \$1.8 billion.

## How to get the most out of the deal

The powerful benefits of scope deals come with a price, of course. They're typically more expensive than scale deals and deliver fewer cost benefits. From 2015 through 2019, technology scope deal premiums were 51% higher than scale acquisitions, and cost synergies were 42% lower than for scale deals during that period. Once again, this trend is true across all sectors, but is more pronounced in technology. Part of the reason for the disparity is that synergies in scope deals are typically more revenue-based, often less controllable for the buyer than concrete cost synergies frequently targeted in scale acquisitions. In addition, scope deals tend to target innovative companies working in rapidly growing sectors, so the acquired company has more leverage to demand a higher premium.

In addition, scrutiny of technology deals is intensifying as regulatory oversight evolves beyond issues of market concentration to include consumer data and privacy, national interest and security, and future competition. All of this places greater demands on preparing for consultations with regulators and broader stakeholder communications during the deal diligence and negotiation phases.

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The most successful scope deals start with proper screening. Once the target is in sight, they develop a bespoke integration strategy that articulates precisely what should—and, just as important, should not—be integrated in order to realize the expected deal value. There must be alignment among the leadership team for the plan to work.

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The most successful scope deals start with proper screening. Leading companies proactively and frequently scan sectors for companies that fit their strategy. Once the target is in sight, they develop a bespoke integration strategy that articulates precisely what should—and, just as important, should not—be integrated in order to realize the expected deal value. There must be alignment among the leadership team for the plan to work.

This is where many scope deals go wrong. Buyers have a tendency to overintegrate the acquired company. Some purchasers apply their well-honed processes, operating model and overhead levels on what is often a very different business model, which can have the unintended consequences of squashing the acquired company's capabilities or even putting its business at risk.

Business integration teams typically don't have extensive experience with scope M&A. So, once a deal closes, leading companies assign senior general managers to provide extra oversight and assistance to ensure the integration goes as planned.

Lastly, don't forget about the people. Culture clashes between the two organizations can lead to business stagnation, loss of focus and talent defection. All of a sudden, acquirers can find they have unwittingly diminished the value of the new asset.

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The most successful scope buyers spend as much time and effort on retaining talent and smoothly combining teams with different cultures as they do on hitting financial targets. Getting this right can be the difference between a bad deal and a good one—or even a massive success.

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