

#BusinessFutures2021

BUSINESS FUTURES 2021

Signals of Change

The essential radar that leaders need
to see and seize the future

Contents

| | | | |
|----|-------------------------------|-----|---|
| 03 | Introduction | 110 | What else is on our Business Futures radar? |
| 08 | 01. Learning From the Future | 113 | About the authors |
| 23 | 02. Pushed to the Edge | 115 | Acknowledgments |
| 40 | 03. Sustainable Purpose | 116 | About the research |
| 57 | 04. Supply Unbounded | 125 | Survey demographics |
| 75 | 05. Real Virtualities | 128 | References |
| 91 | 06. The New Scientific Method | | |

Choose to change

Out of global crisis comes a new world of opportunities.

This past year, business models have been reinvented. Supply chains have been restructured. Work that we assumed required being in an office has been reimagined. Productivity, we now know, can thrive virtually.

Meanwhile, promises of new scientific breakthroughs—from synthetic biology to machine learning—are suddenly realized. In 2020, an AI-developed drug reached clinical trial in just 12 months compared to the typical four and a half years.¹

In the process of tackling global challenges that even the most forward-thinking leaders never fathomed, organizations once resistant to change have transformed. Sixty-three percent of high-growth companies have moved away from focusing on where people physically work and have adopted “productivity anywhere” workforce models.²

How do we capitalize on this new momentum? How do we accelerate the innovation we have tapped? How do we optimize for the new global reality?



Making sense of a new reality

As the world recovers from a global pandemic, leaders face an unprecedented challenge: to identify what works for a new and evolving today and what will be required to thrive tomorrow.

Longstanding trends like the increasing importance of experiences, greater adoption of cloud, and dramatic changes in buying patterns have been interrupted, accelerated, or reversed during the global COVID-19 pandemic. Now is the time to capitalize on changes and seize the future.

Companies stand to benefit from being forward-thinking. [Accenture research](#) has shown that organizations that invest in sustainability and digital transformation are 2.5x more likely to be among tomorrow's strongest-performing businesses.

Decisions made over the next 12 to 18 months could determine the difference between thriving and struggling to survive in the next five years.

We give you the Signals.

Business Futures is Accenture's structured approach to identify Signals of business change that are most critical for organizations to understand in order to shape their successful futures. We highlight the Signals that are reshaping organizations globally and will be critically important as these organizations reinvent for a profoundly different tomorrow. In presenting these Signals, we aim to help leaders chart their best courses to profitable growth. (See About the Research on page 116 for details about how we identified the Signals.)



Signals that will shape your future

Six Signals stood out as essential to the future success of organizations.

Learning From the Future

See change before it happens

Rather than focus on the past for insights, leading organizations use data analytics and artificial intelligence (AI) to make decisions and define strategies that anticipate the future.

Pushed to the Edge

Decentralize decision-making

Leaders are responding to change and challenge by pushing decision-making authority to people at the “edges,” relying on highly networked teams to act with speed and agility.

Sustainable Purpose

Move from purpose-focused to purpose-run

Responding to the call for businesses to serve stakeholders broadly, organizations are building sustainability into the fabric of their operations—and making social responsibility sustainable.

Supply Unbounded

Break physical limits of fulfillment

To meet growing customer needs for fast, flexible, cost effective, and sustainable order fulfillment, companies are restructuring their supply chains and moving production to the point of demand.

Real Virtualities

Redefine reality and place

As virtual environments enhance our physical worlds and redefine our sense of place, innovative organizations create new ways for people to work, consume, and socialize.

The New Scientific Method

Become a scientific company

As scientific disruption enables the creation of better, cheaper, and more sustainable products and services, leading companies will become scientific companies—and apply science to tackle the world’s fundamental challenges.

All six Signals present opportunities—and incentives—to embrace change and find new ways to grow.

In the following pages, we explain these Signals—their evolution, their impact, and our perspective on how organizations best respond and are already responding. We make sense of the new global reality and chart ideal paths toward a better future.



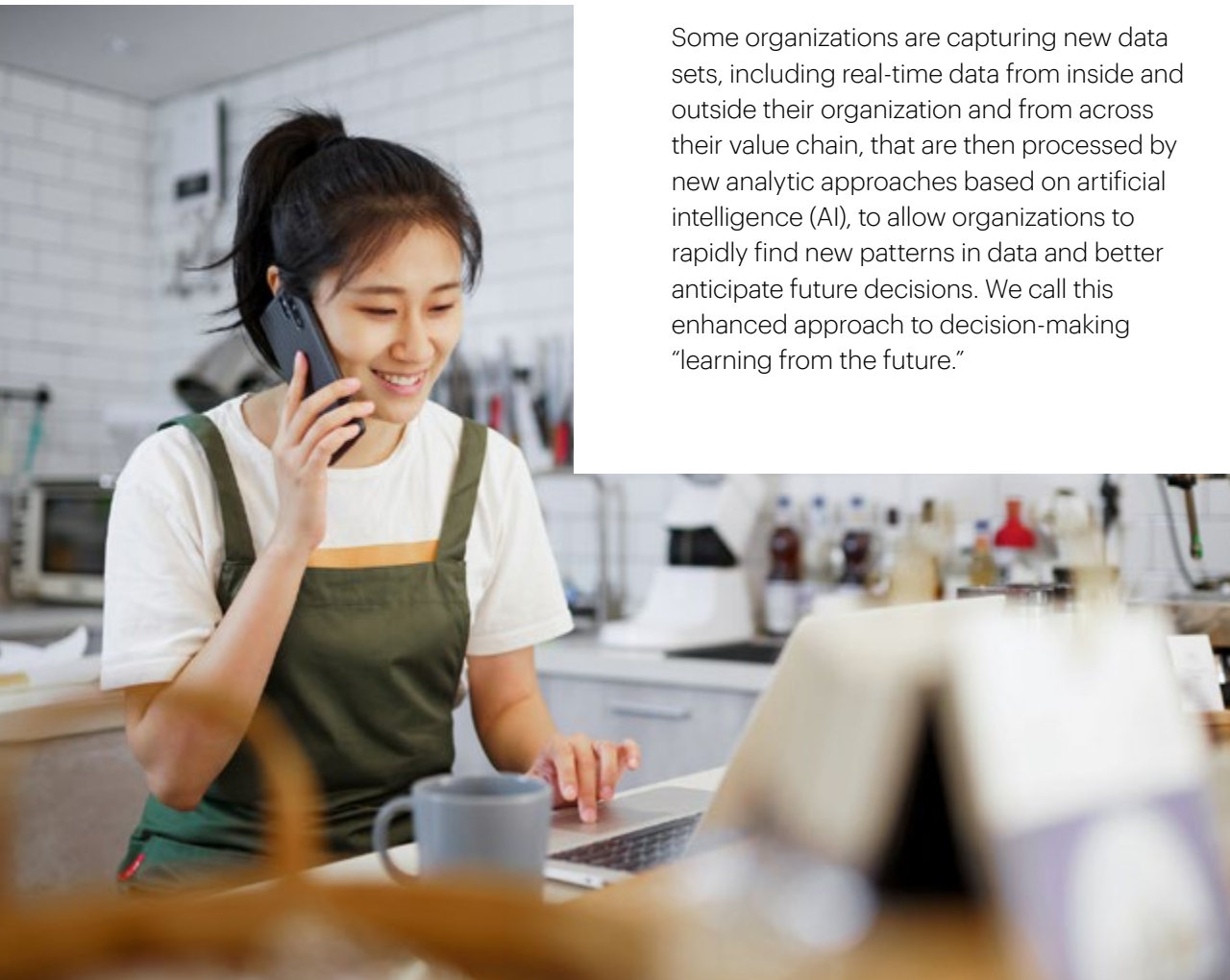
Signal 1: Learning From the Future

Rather than focus on the past for insights, leading organizations use data analytics and artificial intelligence (AI) to make decisions and define strategies that better anticipate the future.

What's going on?

Rapid shifts in the operating environment and people's behavior mean that the historical correlations some analytical models rely on have been challenged.





Some organizations are capturing new data sets, including real-time data from inside and outside their organization and from across their value chain, that are then processed by new analytic approaches based on artificial intelligence (AI), to allow organizations to rapidly find new patterns in data and better anticipate future decisions. We call this enhanced approach to decision-making “learning from the future.”

China’s MYbank thrives by using AI to scrutinize real-time data. The online lender makes collateral-free loans to small and medium-sized enterprises (SMEs).

To guide its lending decisions, MYbank uses an algorithm with more than 3,000 variables—with data drawn from the ecosystem of Ant Group, MYbank’s parent company, such as the value of an SME’s receivables and its customer feedback on the Taobao e-commerce platform—that predicts an applicant’s credit worthiness.

The algorithm also allows MYbank to make spectacularly fast lending decisions: an application takes less than three minutes to submit on a mobile phone and less than one second to approve or reject.

The upshot?

MYbank has a default rate of just 1%, in comparison to the average of 2.75%, and has had the patronage of more than one-third of Chinese SMEs, addressing financing gaps in the process: 80% of MYbank’s SME clients had previously never obtained a loan.¹

Why does it matter?

Organizations that develop superior forward-looking capabilities create a more expansive view of the risks and opportunities they face. This allows them to make decisions faster and with greater confidence, and to tackle previously intractable challenges reshaping the future of their own organizations and the communities they serve.



Capturing opportunities that would otherwise be unseen

Learning from the future can open up new growth opportunities—an area companies often struggle to get right. We found, for instance, that only 31% of the executives in our survey said they are completely confident in their ability to foresee, and respond to, behavioral changes that affect demand.

New sources of data and AI-driven models can be applied across companies' product development and sales lifecycles to give them greater confidence that they are on the right path to growth.

The COO of a media conglomerate told us that, in the past, the conglomerate's record labels would pay for the production of a new music video, with executives relying on gut instinct to predict whether the song would be a hit. Now, the company uses consumer-driven leading indicators, from social media, streaming

platforms, and consumer playlists, to forecast a six-month performance outlook for the song before deciding whether to invest in a video.

Analytics can similarly help sales organizations invest in the right opportunities. Traditional pipeline management relies heavily on a sales representative's input; if a rep deems a deal to be high value and high probability, they will aggressively work that deal. By contrast, analytics embedded into lead generation can agnostically identify leads with the best conversion potential.

Conversational chatbots can reach out to those leads, using AI to understand the contact's response and further assess their willingness to buy. When there is clear buying interest, sales reps can step in, using a recommendation engine to determine the appropriate offer and communication cadence, based on

the characteristics of the specific customer and opportunity. During discussions, AI can provide insights into whether customers' responses are positive or negative based on their tone and emotional state. Once the sale is complete, AI can provide next-product-to-buy recommendations so reps can better cross-sell or upsell.

Univar Solutions, a US chemicals company, uses AI to identify potential customers for its product lines. It leverages these insights to form new strategies and product distribution.²





Preparing for risks that would otherwise be unexpected

BlueDot, a Canadian health-monitoring company, foresaw the gravity of COVID-19 before most other organizations did. On December 31, 2019—a week before the World Health Organization released its first report on the virus—BlueDot published a warning about COVID-19 and its potentially devastating impact. The company’s prescience has continued throughout the pandemic, allowing users of its platform to be one step ahead of breaking developments. BlueDot has achieved this by feeding its algorithm with real-time, wide-ranging data—from government healthcare sources to airline ticket data to livestock health reports to news reports in 65 languages—updated every 15 minutes.³

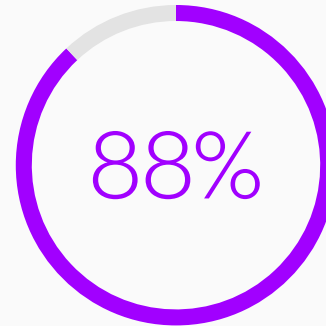
Realizing the role AI can play in supporting their survival, businesses are increasingly using similar methods to shape their paths out of, and beyond, the crisis. Rolls-Royce, for instance, led a cross-industry alliance, “Emer²gent,” to pool standard economic, travel and retail data with less conventional data to provide insights on the

global recovery, including when firms should ramp up investment.⁴

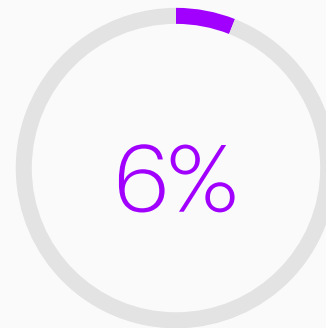
The benefits of learning from the future will extend far beyond today’s crisis. Engineers, for instance, are applying AI to leading indicators to make infrastructure more resilient against climate change.⁵ In the United Kingdom, the Thames Estuary 2100 Project was one of the first major engineering projects to incorporate climate-change risk throughout the planning process, providing London and its 9 million people greater protection against future floods.⁶ Generali France, an insurance company, set up Climate Lab. The initiative brings together multidisciplinary teams of climatologists and geographers that leverage big data and AI to develop risk mapping and modeling tools. This helps customers identify the types of natural risks they are susceptible to and take appropriate measures to mitigate their impact. Generali can then alert customers in real time when their property is at risk.⁷

What to do?

Organizations understand the importance of learning from the future, even as they struggle to do it well.



of C-suite respondents to our survey said that using more forward-looking data sets and analytic approaches to better predict and respond to future events will be important to their organization's success.



of respondents were completely confident in their organization's ability to foresee and respond to future events—from shifts in customer sentiment to supply-chain bottlenecks.⁸

What is holding organizations back is not technology—at least not in the near-term. Improved access to large, granular data sources and advances in AI modeling techniques mean that the right predictive tools are increasingly available to businesses. Indeed, of respondents to our survey who are not yet confident in their ability to foresee critical events, 41% said that technology will make it possible for them to become completely confident within just the next three years.⁹

The constraint organizations face in learning from the future is instead more fundamentally how they approach decision-making, with mindset, cultural and organizational challenges holding them back.



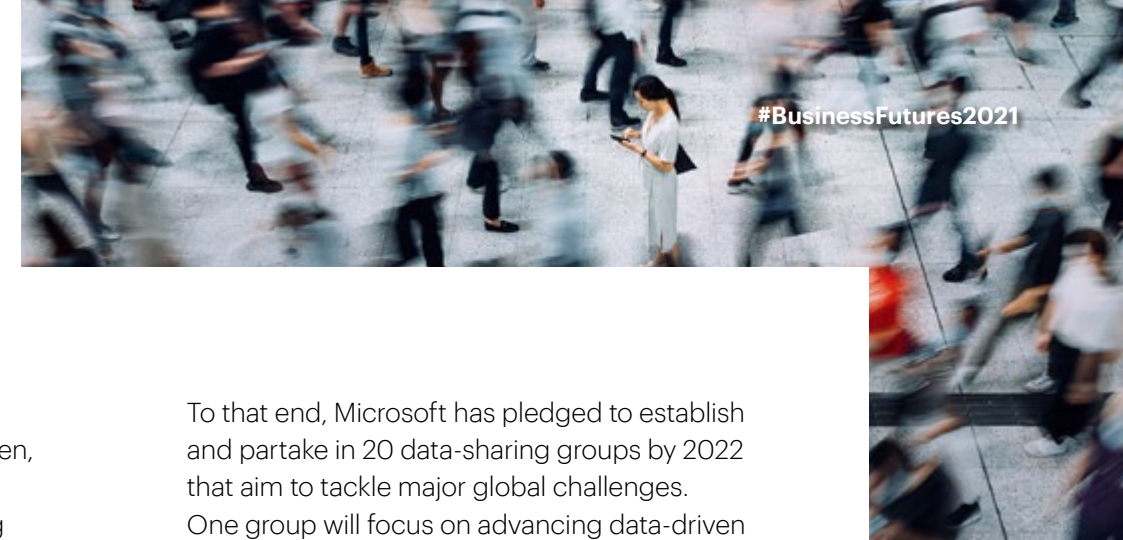
Breaking out of these constraints will enable organizations to better learn from the future. Three interventions can help:

1. Plan for a broader range of future possibilities.

To learn from the future, organizations need to be open to considering even the unlikeliest of events. Yet too often, companies are limited by past experiences and deep-seated beliefs.¹⁰ They draw on information that is readily accessible and focus on trends within their own industry or geography, but rarely consider the counterintuitive. This leaves companies vulnerable when the unexpected becomes a reality.

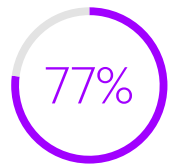
To better anticipate a range of future possibilities, organizations can take a clean-sheet approach to dynamic planning, drawing on inductive, AI-driven insights, as well as creative thinking about what the future may hold. Instead of asking, say, “What would we do if our servers went down?”, firms should ask, “What would we do if there were no servers at all?”.

The British Armed Forces’ UK Strategic Command is applying such a clean-sheet approach to explore the interplay of low-probability social, demographic, political and economic events. It is working with innovative technology companies, such as Adarga, an AI analytics platform, to help build a digital replica of the entire United Kingdom to simulate the country’s resilience to future pandemics, natural disasters and attacks by hostile states. Adarga’s AI Knowledge Platform brings together data from millions of diverse sources to identify unfolding real-world events, which are then used as dynamic, real-time inputs to build highly granular simulation scenarios. These scenarios, in turn, allow military planners and decision-makers, as well as the government more broadly, to test and rehearse policy choices and military actions in a data-driven way.¹¹



2. Take a wide-angle approach to data use.

Because no one knows what particular pieces of data will ultimately turn out to be important for predicting different events, there is no such thing as valueless data. Organizations that take a wide-lens approach to data use—from tracking a handful of variables, as many firms do now, to tracking hundreds or more—can better inform their algorithms. With the value of data becoming more temporal than ever, given fast-changing circumstances on the ground, it is important that such data is used swiftly (or discarded if not used) and continuously updated. In fact, most organizations have taken steps in this direction.



of survey respondents have increased their use of both internal and external real-time data over the last twelve months.

Taking a wide-angle approach to data use also requires organizations to foster an open, collaborative data ecosystem. This can bring faster access to scarce data, helping organizations develop both new insights into their business and into the world's biggest challenges more quickly.

Successful data partnerships, even between competitors, have proliferated during the pandemic, accelerating global understanding of COVID-19. Geotab, a provider of telematics data intelligence, partnered with Webfleet Solutions, a rival, to create a combined data set based on three million commercial vehicles. By combining their data, the two companies provided a level of insight into the state of economic recovery that would not otherwise have been possible.¹² By making these partnerships open, organizations of all sizes can begin to realize the benefits of data.

To that end, Microsoft has pledged to establish and partake in 20 data-sharing groups by 2022 that aim to tackle major global challenges. One group will focus on advancing data-driven healthcare. Microsoft is working with the Novartis Foundation, based in Switzerland, to consolidate their respective cardiovascular data sets from hospitals and primary-care centers around the world. The collaboration seeks to use big data analytics to build AI models to respond to the burning use cases in the field of cardiovascular population health. This way, the data collaborative aims to accelerate the use of data-driven decisions for tackling heart disease and informing health policy. Microsoft is also developing software, licenses and rules to let firms trade data, or provide access to it, without losing control of their data.¹³

3. Make learning from the future a core capability.

Organizations that shift from experience-based, top-down decision-making to data-driven, bottom-up decision-making, where employees augment their judgment and intuition with algorithms' recommendations, will excel at learning from the future.

Existing practices hinder organizations' ability to make learning from the future a pervasive capability that drives competitive advantage. Only 25% of executives we surveyed told us that their organizations give employees closest to customers, partners and communities autonomy to make significant decisions.



Further, only 38% said that employees across the organization consistently use real-time data in their day-to-day work. To overcome such obstacles, organizations need to break down silos—both technical and organizational.

For decades, organizations have used enterprise systems (large-scale software packages) to enhance the performance of specific functions or business units. Today, organizations that are learning from the future leverage a data-mesh architecture and a consistent software code base. To replicate this approach, organizations can consider adopting data integration and sharing tools—such as capabilities for data extraction, ingestion, tagging and discovery—to bring together internal and external data. Forward-thinking organizations will also consider moving to open architectures, cloud-based capabilities and open-source tooling.

After establishing common tools for working, organizations can encourage employees to

collaborate in an interdisciplinary manner, with core business, operational and data-science units working side by side. The goal: to bring diverse perspectives to the table to ensure initiatives address strategic priorities, as well as to highlight users' needs and quickly pinpoint any needed operational fixes.

Organizations that are confident in their ability to learn from the future are 25% more likely than other organizations to break down divisional siloes.

When Google, for example, ran an internal study to identify its most innovative and productive groups, it found that its top teams were not those dominated by data scientists, but were instead interdisciplinary groups whose members also brought other non-technical skills to the table, such as good communication skills and empathetic leadership.¹⁴

Such inter-company collaboration, in turn, requires broader comfort with AI-guided decision-making. Many organizations recognize this need and are working to upskill existing employees, including those in leadership roles, as well as set the expectation that future recruits are data literate. Engineering giant Bosch is training 16,000 executives in the business of AI.¹⁵ To help it become a data-driven enterprise, BMW is training up to 5,000 employees to make better use of the company's cloud data hub.

“[We] want to switch from gut-driven decisions to data-driven decisions,” said Kai Demtroder, the carmaker's vice president of data transformation. “We have a few hundred data scientists at BMW, but the aim is to make the data accessible to everyone.”¹⁶

Accenture analysis of data from Burning Glass, an analytics company that provides real-time data on the labor market, found that the number of job listings seeking workers with predictive skills has increased 2x faster than the overall growth in roles listed in the five years prior to the pandemic.¹⁷

The C-suite's commitment to tearing down technical and functional silos is pivotal, too. Efforts to better leverage data and AI in decision-making often have an IT-centric focus. But organizations that excel at learning from the future view it as a core pillar of their competitive advantage, tightly integrating their investments in this area into their overall business strategy, and allocating a member of the C-suite to lead the charge. Indeed, the respondents to our survey whose organizations excel at learning from the future were 35% more likely than other companies to be aligning their predictive-focused investments with their broader corporate strategy. And they were 26% more likely to have a member of the C-suite directly accountable for developing their firms' ability to learn from the future.



Where is it happening?

In each of the 18 countries we surveyed, at least 82% of executives said that the ability to learn from the future would be important to their organization's success in the years ahead. High-performing organizations in every region are already applying AI to leading indicators to better predict the future.





North America

Starbucks

Starbucks’ “digital flywheel” strategy aims to automate many elements of the coffee chain’s in-store experience without sacrificing customer satisfaction.¹⁸

One prong of this strategy is data-driven personalization. For example, Starbucks Rewards, the company’s loyalty program which boasts some 19 million users, captures data on customers’ buying patterns. Such information is then funneled to “Deep Brew,” the firm’s cloud-based machine-learning platform that further contextualizes it with leading indicators—such as time of day, weather, social media posts and

the “personality” of the individual store—to suggest drink and food options to customers who open the Starbucks app on their phones or who pull into a Starbucks drive-through.¹⁹

Deep Brew is not just used to predict what customers will want. It is also used to predict when its Internet of Things (IoT)-connected espresso machines will need preventative maintenance. The data collected from the machines is, in turn, used as an input to estimate staffing needs, predicting how many baristas are required at different points of the day.²⁰

Europe

The Bank of England

In June 2020, Andy Haldane, Chief Economist at the Bank of England, predicted that the UK economy would recover faster than any other mainstream economic forecaster had predicted.

The Bank of England's assessment was based on a set of "fast indicators," including data on payments and credit card transactions, ATM withdrawals, mobility, restaurant bookings and natural-language processing of consumer sentiment.

Unlike traditional lagging metrics such as gross domestic product (GDP), these indicators provided a real-time read on how the economy was performing. In Haldane's view, the approach "has significantly shifted the technological frontier when monitoring the economy."²¹ It also enabled policymakers to determine how to intervene. Rishi Sunak, the United Kingdom's Chancellor of the Exchequer, used real-time data on spending and footfall in shops, pubs, and restaurants to calibrate COVID-19 stimulus policies, such as reducing value added tax (VAT) for the tourism sector.²²

Asia

JD.com

In the past year, e-commerce titan JD.com invested heavily in AI models to improve its predictions of shopping patterns, as well as optimize its logistics networks across China.

At the onset of the pandemic, JD.com's algorithms, which still relied largely on historical data, struggled to make sense of new buying patterns, resulting in ineffective cross-selling.

The algorithms, for example, assumed that people buying masks were sick and recommended medicine rather than other pandemic-appropriate items, such as hand sanitizers. In response, JD retooled its algorithms to incorporate more leading indicators, such as news articles, social-media sentiment, and data from live-stream influencers, to better learn from the future. The upshot: more relevant product recommendations to consumers, leading to a 3% increase in click-through rates and increased overall sales.²³



Wildcard

Could learning from the future lead to unexplainable strategies?

“What do we do,” wondered Keith Dear, a former wing-commander in Britain’s Royal Air Force, “when AI is applied to military strategy and has calculated the probabilistic inferences of multiple interactions many moves beyond that which we can consider, and recommends a course of action that we don’t understand?”²⁴

Over time, as AI increasingly informs business strategy, some leaders worry that they will be unable to explain their decisions to stakeholders—or worse, cede control over those decisions entirely to computers.

This is a reasonable fear, for even the most autonomous algorithms need humans to provide contextual understanding, as well as guard against poor judgment and biases (yes, even machines make mistakes). In financial services, regulators, say, may need to know why a company is making certain investment decisions. In healthcare, patients will want to know why a doctor is recommending a specific treatment. In policing, judges will want to know why a prosecutor is proposing a particular sentence.

Making AI explainable is not only important in understanding how decisions are made, it’s also vital in making sure models are fair and ethical. Both public and private organizations, such as the U.S. Department of Defense and Google Cloud, are developing tools and frameworks to better understand and interpret the predictions made by AI technologies.²⁵ Some AI researchers are collaborating with philosophers to invent ways to program ethics into machines.²⁶ The goal is to encourage adoption of such technologies by building peoples’ trust in them, as well as to make the technologies themselves perform better.

Signal 2: Pushed to the Edge

Leaders are responding to change and challenge by pushing decision-making authority to people at the “edges,” relying on highly networked teams to act with speed and agility.

What's going on?

In 2020, the Spanish-language thriller “La Casa de Papel,” also known as “Money Heist,” was the most watched show on Netflix globally.¹ A few months later, the French-language series Lupin cracked Netflix’s top ten shows in the United States. These feats testify to the success of Netflix’s local-first, international expansion strategy—one that has enabled the company to surmount the many regulatory and cultural challenges that come with creating a global streaming platform.²



Ever since it set its eyes on international expansion, Netflix has gradually pushed decision-making authority to the edges of its organization—learning from, experimenting in and creating content for local markets. Netflix forged partnerships with local studios to produce content in local languages, built its own studios and invested in translating and dubbing content, enabling shows to travel globally.³ Crucially, Netflix grounded its expansion on a highly entrepreneurial culture of “radical candor and transparency” that has allowed it to stay close to fast-changing customer preferences by testing, experimenting and pushing the boundaries of streaming. The company gives employees access to information that most businesses would never share with rank-and-file staff, and empowers them to seal multimillion-dollar deals without sign-off from the C-suite, allowing production to move fast.⁴

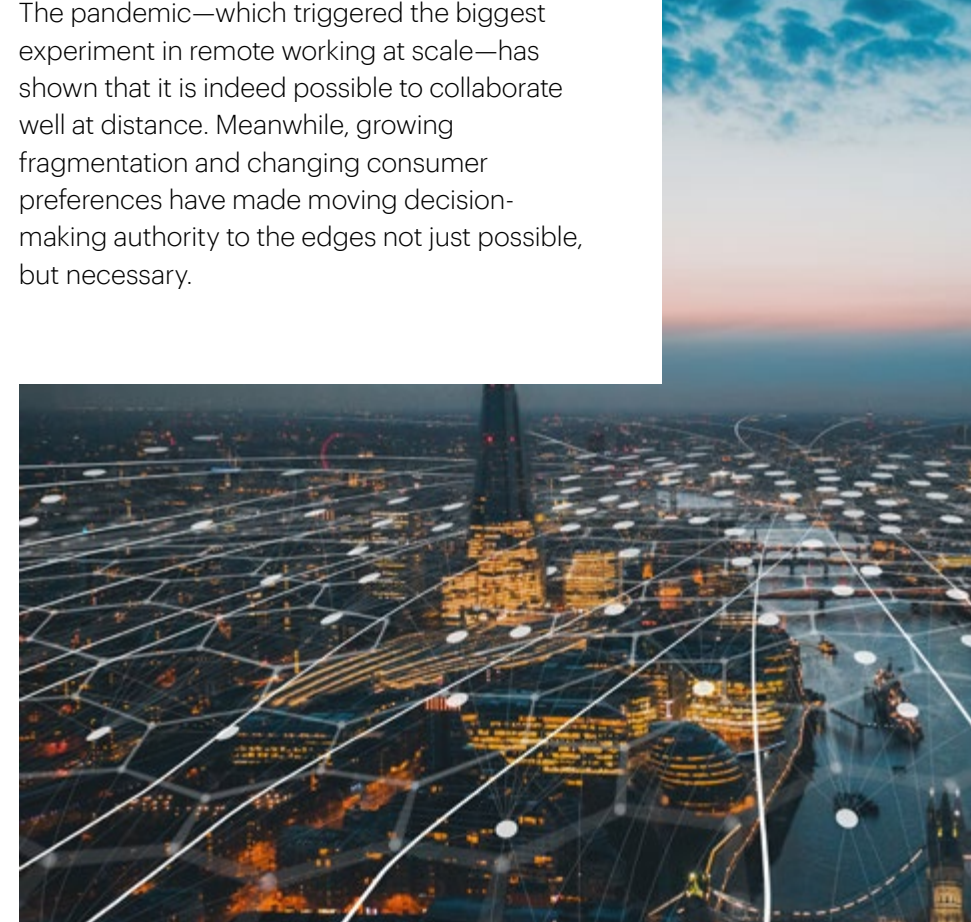
All this has enabled Netflix to both develop an unparalleled sensitivity for local preferences and the flexibility to adapt swiftly to customers’ tastes.

This ability has paid off handsomely—in 2020, 83% of new subscriptions were from outside the United States and Canada.⁵

Netflix is one example of what we call an “edge organization.” Edge organizations leverage the principles of “edge” computing, a decentralized form of computation and data storage that speeds up processing by moving intelligence closer to the point of use. Edge organizations are formed by moving decision-making to the edge, where teams are connected by networks. These teams are empowered to decide how to organize, work, meet corporate goals, and deliver on the mission, while optimizing for local performance.

Although many organizations have long strived to become edge organizations, seeking to “think globally but act locally,” several factors have aligned to make edge a growing reality today. Vast improvements in technologies have enabled greater connectivity and securely managed information flows, helping organizations overcome the constraints of distance.

The pandemic—which triggered the biggest experiment in remote working at scale—has shown that it is indeed possible to collaborate well at distance. Meanwhile, growing fragmentation and changing consumer preferences have made moving decision-making authority to the edges not just possible, but necessary.



Why does it matter?

Applying the logic of edge computing to their operating models offers two valuable opportunities for businesses.

First, edge computing reduces latency—the time it takes for data to travel between the point of creation and the point of processing—by processing data at the point of collection. When companies push decision-making to the edges of their organizations, they are better placed to respond to fast-changing business environments.

Second, edge computing saves bandwidth, by sending only data that is critical for additional processing to the cloud.⁶



When companies empower their edges to make most day-to-day operational decisions, they free up their headquarters to focus on key strategic decisions.



Edge organizations can better manage the risks associated with fragmenting markets

Trade is becoming less global and more regional. For example, China's exports to twenty of its neighboring countries increased by 14.7% over the last decade, while exports to North America and Europe declined by 6.4% and 12.0%, respectively. The pandemic has accelerated this trend.⁷ While the global trade in services may be headed in the opposite direction—it grew 42% faster than trade in goods in the five years prior to the pandemic—it still faces considerable regulatory obstacles, such as proliferating rules on the cross-border flow of data.⁸

Organizations expect trade to become further regionalized in the years ahead. Eighty-eight percent of the C-suite executives we surveyed said that markets will become more segmented, with nations and regions emerging that operate according to their own trading rules.

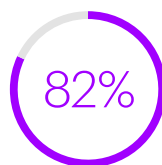
Many organizations have already shrunk the distance between their suppliers and customers: our analysis of data from FactSet, a financial information and software company, revealed that between 2010-11 and 2018-19, 62% of the 758 companies in the data set—firms with operations in North America, Latin America, Africa, Europe, Asia and the Middle East—brought suppliers closer to their customers.⁹

As markets fragment, the cost of doing international business is increasing. According to the World Trade Organization, the number of new import-restrictive measures has increased steadily over the past decade, and now affects some 10.3% of G20 imports (totaling US\$1.6 trillion).¹⁰

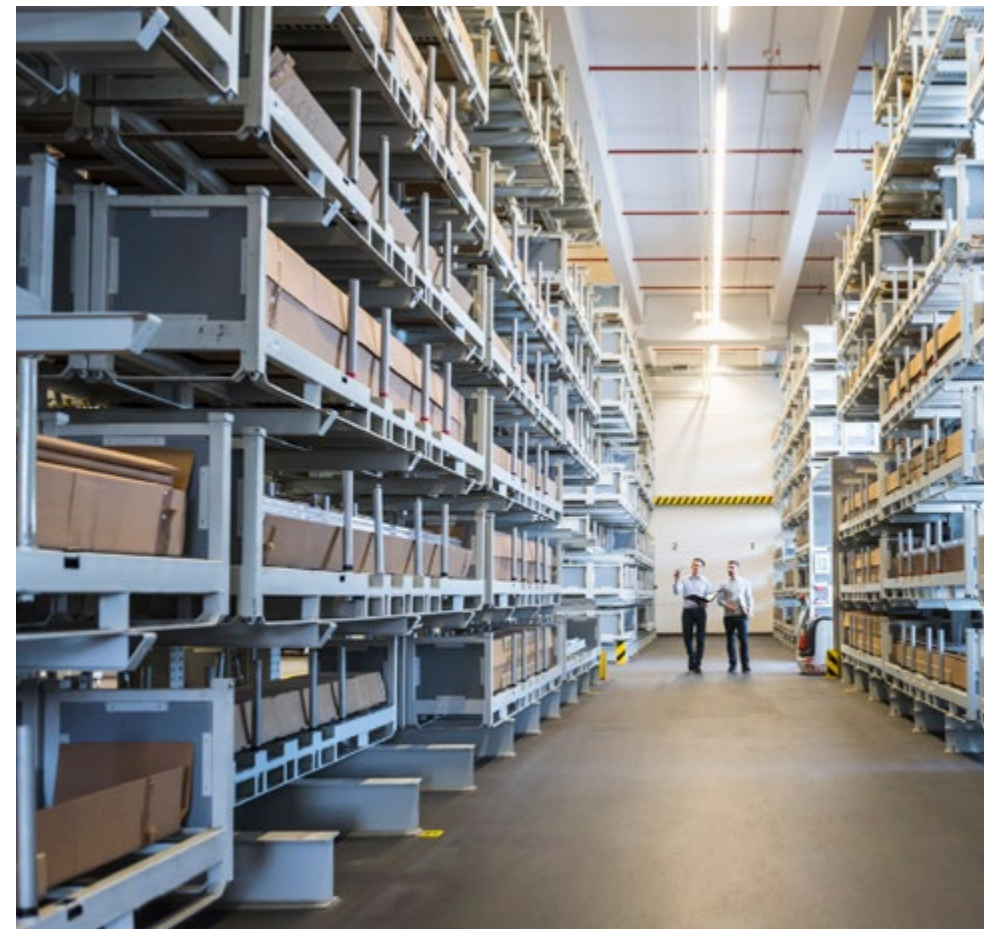
IKEA, a name synonymous with affordability, recently announced that changes to trade policies had left the Swedish furniture company little choice but to hike its prices.¹¹ Import restrictions also create a risk that capital-intensive assets—such as manufacturing facilities—become “stranded assets,” suffering premature write-downs in value.

The risks created by fragmenting markets is highest for sectors that governments deem to be strategic. As a non-executive director of one of the world’s largest high-tech companies explained to us, in these sectors there is an increasing expectation not only for goods to be produced locally—or at least in countries that share similar political and cultural norms—but for R&D and leadership teams to also be localized. This has pushed some companies to embed themselves in fewer markets, where they can be highly differentiated and where they see the greatest growth potential.

Market fragmentation and rising nationalism mean that “policy is now firmly a C-suite issue that needs to be factored into all decision-making,” according to Shannon O’Neil, Macro Advisory Partners Managing Director and Nelson and David Rockefeller Senior Fellow, Council on Foreign Relations, a think tank. By pushing decision-making authority to the edges, organizations can better manage the risks associated with shifting political tides.



of the C-suite executives we surveyed said that operating more like a broad federation of enterprises, to respond to increasingly fragmented business environments, will be important to their organization’s success.





Edge organizations can respond faster to changing local preferences

During the pandemic, consumer-loyalty dynamics have shifted, both in brands and channels, as people tried new products and ways to shop. A survey by Shopify, an e-commerce firm, found that 75% of consumers had tried different online brands.¹² Even before the pandemic, customer preferences were evolving rapidly, outpacing companies' abilities to track, anticipate and respond.

Today, the challenge for organizations is not just that customer preferences are uncertain; it is also that preferences are changing differently in different markets. Despite decades of globalization, customer attitudes remain quite local—even among younger generations, whose tastes many assumed to be homogenized by the internet and social media. Chinese consumers of all ages, for example, have taken much more quickly to “social commerce,” a blend of social media, live-streaming and traditional e-commerce. In 2021, sales from social commerce in China are estimated to be 10 times higher than in the United States.¹³

Accenture's latest COVID-19 Consumer Research Survey, fielded in February to March 2021 found that the pandemic has further shifted purchasing behavior in many product and service categories to local focus.

We found a 15% net increase in purchases of small local brands by consumers since the start of the coronavirus outbreak.¹⁴

Today, customer needs differ so much from market to market that a universal playbook will not be effective. Organizations that push decision-making authority to the edges will be best positioned to meet ongoing changes in local needs.

What to do?

The need for adaptability and speed—while remaining cost effective—will not end with the pandemic. To keep up, organizations require structures, processes, people and technology that are themselves built to change.



1. Go flat to empower the edge.

As business environments become more complex, many companies have grown similarly complex organizational structures. However, most of these structures were built for a world of uniformity and stability that no longer exists. Edge organizations, by contrast, structure themselves in ways that make them flatter and faster. They shift away from conventional hierarchies toward networked structures built around empowered, multidisciplinary teams that are centered on customer outcomes.

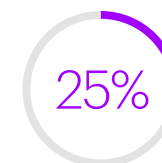
Consider W.L. Gore, the US-based material-science company known for creating the Gore-Tex fabric. The firm describes itself as an “innovation democracy” and uses a self-organizing structure. Although employees’ roles and responsibilities are well defined, they are not captured in organizational charts. The enterprise instead encourages employees to build networks through direct connection and knowledge-sharing.¹⁵ W.L. Gore credits its

non-hierarchical management for the ability to innovate at speed—a strength evident during the pandemic. In response to PPE (personal protective equipment) shortages, a multi-disciplinary team created reusable mask covers that went from product concept to prototypes in less than a week.¹⁶

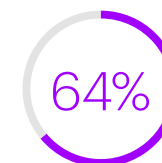
Another organization whose flat structure enabled it to operate effectively during COVID-19 is Nike. Its operating model is designed to create “a local business, on a global scale,” driving growth by focusing on twelve key cities globally, including London, New York, Tokyo and Shanghai.¹⁷ This local focus enabled Nike to quickly adapt to the outbreak of the pandemic in China. The company was able to quickly move merchandise destined for physical stores to e-commerce sites, while priming demand with Nike Training Club app workouts that helped consumers stay active when stuck at home. Digital sales jumped more than 30% in China for the quarter.

This local success was then turned into an “operational playbook” for responding to the pandemic and was deployed throughout Nike’s global network.¹⁸

An increasing number of organizations are following W.L. Gore and Nike’s lead.



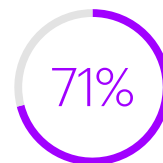
of respondents to our survey said they have already adopted a flat organizational structure;



of respondents said they are in the process of moving to a non-hierarchical model to better prepare for the possibility of a highly fragmented world.



Moving to a flatter, faster organizational structure requires a different role for the corporate center and C-suite—one focused on making cross-cutting decisions, such as defining organizational purpose, setting strategy and allocating capital for key initiatives. In this role, C-suite leaders adopt a mindset in which they serve employees, instead of the other way around. The corporate center enables, rather than manages, the edges of the organization to deliver, by providing global services and enhanced expertise in critical capabilities. This re-imagined role for the corporate center is already taking shape.



of executives told us that they have already, or are planning to, decentralize decision-making in parts of their business in response to the shifting international business environment;



said they are already using, or are planning to use, central functions as capability platforms, deploying skills, tools and talent where they are needed most.

Such actions help organizations combine the power of scale with the deep knowledge required to win locally.

2. Move decision-making closer to the edge.

The pandemic has highlighted what is possible when decisions are made quickly. Organizations now need to embed what they learned from the crisis into redesigned decision-making processes. This will help create a long-term mindset towards action.

By delegating the great majority of decisions to be taken as locally as possible, organizations will give employees at the edges agency and accountability for decisions they are equipped—and best placed—to make. When Yili Group, a leading Chinese dairy company, faced severe logistics challenges during the pandemic, regional front-line employees were authorized to take action to resolve problems, such as roadblocks, health checks for drivers and community shutdowns. This approach enabled continued deliveries to even the most remote locations across China.¹⁹

An organization's purpose—one that is authentic, clearly communicated and connected to the

organization's strategy—acts as a guide to decision-making in edge organizations. Lyft limits its layers of management, with employees directed by a core, clearly defined purpose of “improving people's lives with the world's best transportation.”

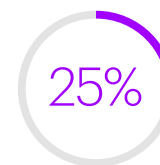
This purpose-driven culture enabled the ride-hailing company to quickly react to the pandemic by, for instance, introducing a new “essential deliveries” offering that catered to the needs of healthcare and government organizations.

Discussing the new offering, Lyft's Chief Strategy Officer commented:

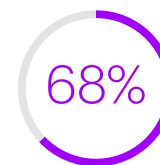
“If your culture and your DNA is mission-driven, it is actually a lot easier to get going because a lot of those questions about priorities become very clear in a crisis.”²⁰

Edge organizations also underpin decision-making with data. For example, most of Alibaba's operating decisions are made by small teams informed by insights from machine-learning applications.²¹

This flow of data provides connections between teams across the networked organization, enabling ideas and insights to be shared. Increasingly this flow of data will also be sourced at the edge.



of organizations have scaled the use of real-time, on-site data to inform decision-making at their edges;



of organizations are either scaling up or piloting their ability to do so.



3. Give range to people at the edge.

Redesigning structure and decision-making processes demands rethinking the skills of the workforce. The move to empowered, multidisciplinary teams requires people to take on more complex roles that combine tasks once performed by people in two or more traditional roles. On its latest fleet of ships, the U.S. Navy has turned away from specialists in favor of “hybrid sailors” who can acquire skills rapidly. Its class of littoral combat ships—small, agile ships for near-shore use—are designed to operate with 40 people on board—one-fifth the number of comparably-sized legacy ships. On littoral ships, each crew member must therefore be a generalist.²²

The imperative to develop a range of skills is heightened when teams are given greater autonomy. W.L. Gore focuses on recruiting individuals who are dynamic, initiative-takers and self-driven—skills that are necessary to succeed in an organization without formal structure.

The company also encourages key skills—such as knowledge-based decision-making, relationship-building and communication—to ensure employees can thrive without hierarchy.²³ Building new teams for the edge organization also means promoting a diversity of perspectives across teams, as well as among individuals. [As previous research by Accenture has shown](#), organizations with more inclusive workplaces tend to be more innovative.

Through a survey of 18,000 people in 27 countries, we found that employees’ innovation mindsets—i.e., their willingness and ability to innovate—is six times higher in the most-equal organizational cultures than in the least-equal ones.

People will not just need high IQs and EQs (emotional quotients) to succeed in hybrid roles; they will also need excellent “creativity quotients” (CQs) for ideation and problem-solving, excellent “technology quotients” (TQs) to leverage new tools and data-driven insights and excellent “sustainability quotients” (SQs) to integrate purpose-driven considerations into their work. Organizations recognize the need to build a workforce with such wide-ranging skills: When asked to reflect on their workforce skills mix in the next three years, organizations said their ideal employee had a strong balance across all five quotients.²⁴

To give people the right mix of skills at speed, organizations can take a data-driven approach to identifying and predicting new pockets of skills demand, while still empowering employees to chart their own course. Accenture recently collaborated with the World Economic Forum, Unilever, Walmart and SkyHive, to study the challenge of “reskilling” at scale. They found that when people self-identified the skills required for their roles, they pinpointed only 11 skills, on average. SkyHive’s AI-supported technology,

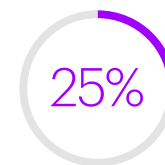
however, identified up to 34 skills—knowledge that can help both individuals and organizations better understand all the skills they need to nurture.

A technology-supported approach to identifying required skills will also need to be met with an organizational culture that empowers individuals to make choices based on their strengths, interests and other personal criteria.²⁵ In that vein, organizations can consider democratizing access to training initiatives—pushing learning to the edges of the organization and making sure that training is readily available, so that everyone in the organization has the relevant tools to chart their own course. Most organizations are moving in this direction. Ninety-four percent of respondents to our survey said their organization was working to promote a mindset of continuous learning among their people.

To broaden the range of capabilities that they have access to, organizations can also consider their partners as extensions of their edges. This means cultivating an ecosystem of co-innovators, suppliers, policymakers and civil society to

expand the range of resources at the disposal of those at the edges. Amazon, for example, built out its logistics networks by encouraging entrepreneurs to launch delivery businesses.²⁶

The pandemic has made clear that no business operates on an island—ecosystem-wide resilience can be as critical to success as a company’s internal strength. As such, an organization’s ability to successfully adapt will be limited unless its ecosystem partners adapt as well. Despite the benefits, few have extended their edges.



of survey respondents said they have scaled the integration of ecosystem partners into their systems, processes and strategies.

Where is it happening?

The shift to edge organizations is most common in industries and markets heavily impacted by economic fragmentation and changing consumer tastes.





North America

Coca-Cola

In 2020, Coca-Cola announced it was reorganizing in order to execute closer to customers, scale new products faster and drive growth in a changing marketplace. The reorganization involves creating new regional units focused on local execution, with effective ideas then scaled to other parts of the global network.

These units will, in turn, work closely with five marketing category leadership teams that span the globe, to rapidly scale

ideas from the ground up. “Platform services” will offer further support by deploying global expertise in areas such as data management, consumer analytics, digital commerce and social media hubs.²⁷ As part of the changes, Coca-Cola will eliminate some 200 drink brands—which represent just 1% of revenue—focusing on a smaller set of global, regional and local brands with the potential for greater growth. The upshot: a wider base of customers.²⁸

Europe

HSBC

Since its founding in 1865, HSBC has flourished from the flow of trade and capital between Asia and the West. With the recent slowdown in globalization, however, the bank has had to think harder about its strategic focus. In 2020, HSBC's Asia business reported US\$12.8 billion in profits, compared with a US\$4.2 billion loss for its European business.²⁹

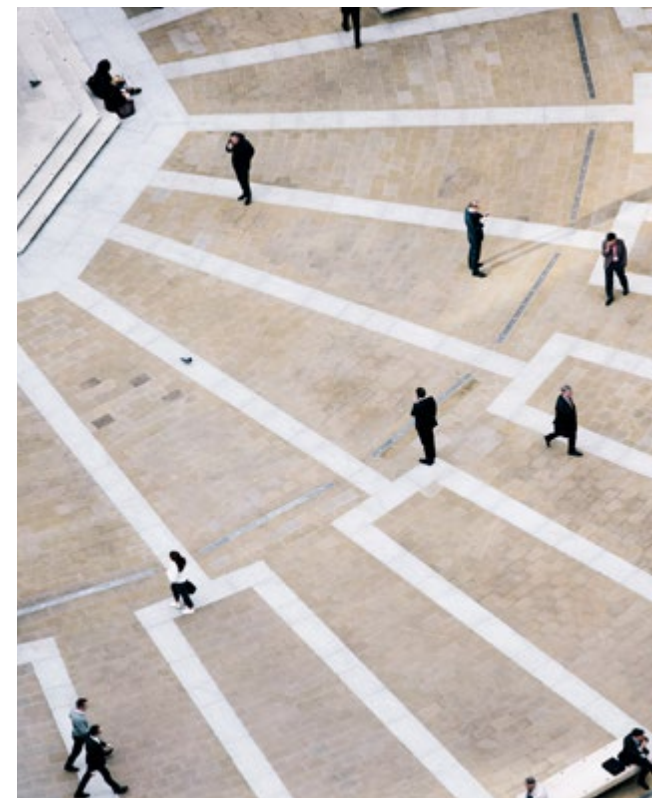
In February 2021, HSBC announced that it will prioritize its Asia operations, including shifting US\$100 billion of capital to Asia, strengthening its regional wealth-management division and moving some senior leaders to Hong Kong. "It is important for some of the executive team," explained Noel Quinn, HSBC's CEO, "to be closer to the growth opportunities, particularly those in frontline roles serving the global businesses."³⁰ As part of the strategic shift, the bank will retain its London headquarters but will reduce the footprint of its operations in Europe and the United States.³¹

Asia

Ping An

Ping An, a Chinese insurance group, spent the last decade transforming its business into an ecosystem of ventures that spans sectors, from smart-city services to healthcare. Each venture is run autonomously with its own business model.³² Ping An also flattened its organizational structure further to enable swift decision-making in its ventures, by increasing the number of employees working closest to their customers and by improving communication channels between senior executives and workers at the frontline. As the pandemic developed in different ways across regions, this structure enabled employees at the frontline—who were most familiar with local laws and conditions—to take and implement decisions in near real-time.³³

Within this context, the corporate center plays an enabling role. When Ping An sets up new ventures, for example, it regularly redeploys talent to where it is needed most across its ecosystem, equipping ventures with the finance, consulting or technology expertise they need to scale.³⁴ Taken together, this edge structure enabled Ping An to stay resilient in the face of the pandemic, beating projected profit estimates by 8%.³⁵



Wildcard

Could organizations move too far to the edge?

In theory, companies might move to the edge too quickly, restructuring in ways that fail to consider the complexities of decentralization.

For example, catering to local contexts may risk a company's overall brand identity if local values clash significantly between regions or clash with the values of the corporate core itself. Excessive, or overly rapid, decentralization may also cause headquarters to lose strategic control of the company. Not all employees feel comfortable operating in such structures, either. Workers sometimes find the ideas and intentions that underpin edge organizations to differ from their day-to-day realities.

Becoming a successful edge organization clearly involves a balancing act: knowing where, and how, to best devolve control, while sufficiently coordinating the different edges of the organization to maintain clear communication with headquarters.

To avoid some potential pitfalls, organizations might first experiment with change on a small-scale in different regions before introducing large-scale rollouts. When US-based Netflix embarked on its international expansion strategy, for example, it first made inroads in Canada, a culturally similar and adjacent market. Upon entering Canada, Netflix nurtured its ability to adapt its platform to local contexts before making the leap into sharply different markets.³⁶

Signal 3: Sustainable Purpose

Responding to the call for businesses to serve stakeholders broadly, organizations are building sustainability into the fabric of their operations—and making social responsibility sustainable.

What's going on?

In 2020, in the midst of the pandemic, Satya Nadella, CEO of Microsoft, called for a referendum on capitalism.

“We all have to ask: What is the core purpose of a corporation?”

Answering his own question, Nadella argued that the measure of corporate success should lie not in the surplus organizations create in their own enterprise, but in the surplus they create around them.¹





These were not just empty words. Microsoft has been externally assessed as being consistently among the best performing companies in creating value for the benefit of all their stakeholders, not just shareholders.²

What lies at the heart of Microsoft's success? For Nadella, the company is not just purpose-focused, it is engineered to be purpose-run. It integrates its goal to create multi-dimensional value into the core of its business model, developing profitable and sustainable products and services that make people and the planet better off; it reports on its progress, allowing stakeholders to evaluate its success in achieving its purpose; and, it embeds its commitment to purpose into its governance structures, corporate policies and processes, making it part of the "lived experience" of everyone who works for the company, not just the CEO.

Nadella's view of corporate purpose is increasingly mainstream. There is a growing consensus that the interests of both society and investors are best served by organizations

that focus on multi-dimensional value creation for the benefit of all their stakeholders, not just shareholders. Indeed, 83% of C-suite executives responding to our survey said that rethinking the management of their organization to further a multi-dimensional view of value creation will be important to their business success over the next three years.

Despite leaders' acknowledgement of the merits of a corporate purpose that aims to deliver value for the benefit of all their stakeholders, some organizations are struggling to match their rhetoric with results. We calculated that, for 43% of 521 of the world's largest companies, their ability to deliver multi-dimensional value—as measured by environmental, social and governance (ESG) indicators—does not match their intent.³ While these companies devoted an above-average share of their earnings calls to ESG topics, their actual performance on ESG indicators was consistently below average over the past three years.

Why does it matter?

Among advocates of an authentic stakeholder-centric purpose, there is growing frustration that many organizations are struggling to hit their targets. Companies that fail to close the “intention-delivery gap” will face inevitable blowback, while those that succeed will reap the benefits.



Stakeholders are increasingly holding companies accountable for their failure to deliver on purpose

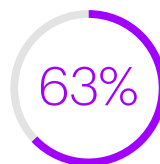
More than ever, workers and customers are taking action when they are dissatisfied with corporate behavior. Over the past two years, employees have staged protests over issues ranging from climate change to racial justice. In the technology sector alone, there were 233 collective actions taken by workers during 2019-20, more than double the total for the previous ten years combined.⁴ Customers have similarly responded passionately to a company's actions. Liverpool Football Club, for example, reversed its decision to furlough employees during the COVID-19 pandemic after receiving criticism from fans.⁵

A third of US-domiciled assets under management today are screened for ESG considerations and institutional investors are taking increasingly activist stances in favor of responsible corporate practices that generate multi-dimensional value.⁶ This includes traditionally passive funds.

For example, Larry Fink, CEO of BlackRock, the world's largest asset manager, has stated that it "does not see itself as a passive observer in the low-carbon transition," and has asked companies to disclose a plan for how their business model will be compatible with a net-zero economy.⁷

Similarly, Norway's trillion-dollar sovereign wealth fund excluded 19 companies from its investment universe in 2020 for breaching the fund's expectations on human rights, environmental damage and other areas of responsible business behavior.⁸

Looking forward, Cevian Capital, Europe's largest activist investor, has said that it will use its vote at annual meetings to call out groups that do not include ESG metrics in executive pay packages by 2022, a move it believes will deter "ESG box checking."⁹ C-suite executives recognize this increasing pressure.

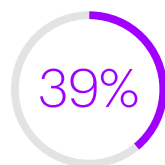


of C-suite respondents to our survey said their investors would **not** be happy if their company cut investment in ESG initiatives to avoid missing earnings guidance.

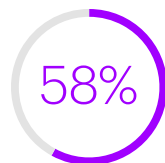
Pressure on organizations to close the intention-delivery gap will only intensify

The pandemic has highlighted and exacerbated long-standing inequities. Workers who are younger, poorer, female, from minority groups or lack a secondary education have disproportionately lost their sources of income and face a more difficult path back into the formal labor market.¹⁰ In the United Kingdom, for instance, mothers were 47% more likely than fathers to have permanently lost or quit their jobs. Likewise, individuals from ethnic-minority backgrounds were more vulnerable to redundancies, given their disproportionate employment in sectors that were closed.¹¹ With the pandemic having exacerbated existing inequalities, organizations that simply revert to pre-pandemic initiatives risk building in further inequities.

To help create more equitable organizations and societies, firms will need to be more deliberate than ever about diversity and inclusion, carefully reassessing the foundations on which they stand. That means doing more than setting targets. It means embedding diversity and inclusion into their core offerings.



While just 39% of organizations today offer products and services that address social challenges, including diversity and inclusion,



a further 58% of executives we surveyed said that their organizations plan to offer such products and services over the next three years.

Gaps are not only widening between individuals, but also between industries and countries. Sectors that were experiencing a decline before the crisis have suffered even greater declines because of it—and they will likely be slower to recover. Through our assessment of corporate resilience, we found that the three weakest industries pre-crisis will take almost twice as long to recover their 2019 revenues than will the three strongest industries.¹² Gaps between the economic performance of countries are widening, too: The distribution of growth rates across the world's 50 largest economies is wider now than at any point in the past ten years.¹³

As our previous research argues, high-performing companies and industries can help mitigate such trends, by leveraging ongoing fiscal support from governments to be responsible corporate citizens, supporting their stakeholders and transforming society for the better in the post-pandemic recovery.

Organizations that close the intention-delivery gap will reap significant rewards

Adopting an authentic stakeholder-centric purpose is not a choice between doing well and doing good. Before the pandemic, our research on responsible leadership showed that companies that consider the impact of their actions beyond their balance sheets exhibit stronger financial performance. This finding has stood the test of the pandemic-induced downturn—we continue to find a strong, positive correlation between a company's ESG performance, based on Arabesque's S-Ray scores, and its financial performance.

Companies with consistently high ratings for ESG performance had operating margins 3.7x higher, on average, than those of lower ESG performers. These strong ESG performers also generated higher annual total returns to shareholders, outperforming lower ESG performers by 2.6x.¹⁴

In the years ahead, the relationship between financial performance and sustainability is expected to grow. As we highlight in [Supply Unbounded](#), [Real Virtualities](#), and [The New Scientific Method](#), sustainability sits at the heart of new pathways to growth, from circular business models to virtual environments to innovation in the natural sciences. Indeed, 97% of respondents to our survey said that they have re-designed or created (or plan to do so) goods and services that address sustainability issues. Companies that embed sustainability into their business can also reduce capital costs, as loans linked to ESG criteria become more popular. In 2020, the value of ESG-linked loans totaled US\$200 billion.¹⁵ In February 2021, AB InBev, a global brewer, announced the largest-ever such loan, a US\$10.1 billion revolving credit facility that incentivizes improvement in areas aligned with the company's 2025 sustainability goals.¹⁶



What to do?

How do organizations better meet society's expectations, and go from having good intentions to delivering on them?

A playbook is starting to emerge. A group of "purpose-run" organizations are closing the gap by engineering purpose into the core of their operations, aligning what they measure and manage to what they effect. Three steps can help organizations replicate their approach.



1. Clarify—Find a purpose and commit to it.

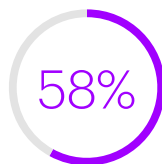
Stakeholders' expectations about the role of enterprises are wide-ranging. By attempting to satisfy everyone, organizations may stray too far beyond their core mandate and lose focus. As one executive told us: "It [stakeholder-centric purpose] should not become an excuse to do things that actually deprive the capitalist system of the vigor that makes it special. There is something about the clarity of shareholder value which encourages innovation and tough decisions."

Clarity of purpose, however, can also come from defining a purpose that is unique—and then committing to it. This may mean changing governance guidelines to clearly assert stakeholder primacy. For instance, the independent directors of Anglian Water Services rewrote the English utility's Articles of Association, to legally enshrine the company's stakeholder-centric purpose.

To help with the task, Anglian used "Purposely", a digital tool supported by the United Kingdom Department for Digital, Culture, Media and Sport, that advises companies on ways to embed purpose into their legal structures.¹⁷ To be sure, such formal commitment to an authentic stakeholder-centric purpose is rare today, and it is not even legally possible in some jurisdictions. Yet times are changing.



While only 40% of organizations have their mission to create value for their stakeholders written into their corporate bylaws,



a further 58% plan to do so over the next three years.



Clarity also comes from connecting purpose with an organization's ability to create value for others. JPMorgan Chase's US\$30 billion commitment to addressing wealth inequality in the United States is based on expanded provision of the bank's core product lines to underserved communities: mortgages, as well as loans and investments for affordable rental units. The bank has pledged to hold managers accountable by incorporating the targets into compensation decisions.¹⁸

2. Measure—Put a value on your purpose.

Putting a value on purpose requires looking beyond shareholder return to measure stakeholder return. This means infusing sustainable thinking into how business success is defined, by disclosing key stakeholders and how they are impacted by the organization's decisions. Standard reporting frameworks—such as the World Economic Forum's Stakeholder Capitalism Metrics (developed within the International Business Council), to which Accenture is a signatory—can provide a useful touchstone. Yet because purpose is unique, the way in which it is measured should be tailored to reflect the goals organizations are trying to meet for their stakeholders.

Chemical company BASF, for example, has historically used return on capital employed as its key management indicator. In 2020, it added two purpose-focused indicators: CO2-neutral growth and sales generated from products that contribute to the environmental sustainability needs of its customers' value chains.¹⁹

PayPal, meanwhile, created an indicator measuring the net disposable income of its employees, as part of the firm's goal to improve the financial health of its workforce.²⁰

These tracking initiatives help stakeholders evaluate a company's success in achieving its purpose. They can also be used to shape stakeholder behavior, thereby reinforcing the company's purpose. Independent businesses, such as Dutch grocery store De Aanzet, are helping to pioneer this approach. It worked with True Price, a non-profit, to fully incorporate

the social and environmental externalities associated with its products into their final prices.

Price cards in the store break down the extra costs. Added to the price of, say, a cauliflower is €0.03 for underpaid wages, €0.06 for climate tax, €0.18 for land use and €0.01 for water. On a customer's receipt, the extra amount is labelled "hidden costs," and is included in the final price, with the surcharge donated to NGOs working to tackle the related issues.²¹ De Aanzet's approach also shows how organizations are going beyond net-zero emissions' targets to adopt a broader perspective to managing potential negative effects that their operations have on society—an approach that 82% of C-suite executives said would be important to their organization's future success.

3. Manage—Engineer accountability across your ecosystem.

The challenge for companies is to move beyond merely drafting a purpose statement and associated targets, to embedding purpose into the core of their organizations. This embedding starts with the board. While different stakeholder groups may require different levels of engagement, key ones should have, at the very least, a meaningful voice in shaping governance. One approach is for companies to ensure their most critical stakeholders are also shareholders. Companies can provide equity to all employees—and could broaden equity grants to include others as well. Deliveroo, an online food delivery company, made shares in its initial public offering available to its delivery riders, as well as to customers, restaurants and grocers that use the platform, as part of a “Community Offer.”²²

Companies can also use their capital structures to increase the influence of these special stakeholder-shareholders, through, for example, a single class of common shares with differentiated voting rights.

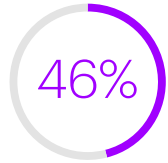
Another approach is to appoint board members who can reflect the concerns and priorities of a wider range of stakeholders than shareholders alone. That might mean having board members with relevant direct experience, such as non-profit leaders; designating directors to consult with, and represent, the perspective of a specific group of stakeholders; or creating more formal fiduciary representation, in which a stakeholder group creates a trust with a representative that holds a board seat. Such approaches are already required in some European countries. Companies in other markets are making progress.

Airbnb, for example, now has a stakeholder committee on its board.²³



of survey respondents have set up a board-level committee or equivalent to monitor their companies' impact on their stakeholders.

Beyond the board, accountability for delivering on purpose can be embedded into processes, policies and incentive structures. Ninety-six percent of respondents to our survey said their business processes and their corporate policies incorporate responsible business practices, or will do so within the next three years.



Purpose-run companies are 46% more likely to measure and track their impact on their stakeholders systematically throughout the organization, rather than just at the corporate center or at the business-unit level.²⁴

Seventh Generation, a maker of cleaning and personal-care products, built its environmental and social targets into its annual incentive program for its workforce, in service of the firm's goal of being a zero-waste company by 2025.²⁵

Society now holds companies responsible for their entire ecosystem. Unilever is an example of an organization that has adapted accordingly. The company has pledged to equip 10 million young people by 2030 with the essential skills needed to prepare them for future job opportunities.²⁶

Unilever is also holding its suppliers accountable—by 2030, it will refuse to do business with any firm that does not pay at least a “living wage” to employees.²⁷ To turn this commitment into results, Unilever is working with partners to review rates of pay in the 190 countries where it operates. Unilever already audits its suppliers over climate-change commitments and will use these existing arrangements to make sure workers are paid a living wage.²⁸

In addition, Unilever has committed to creating opportunity through inclusivity, by spending over US\$2 billion annually by 2025 with suppliers that are owned and managed by people from under-represented groups.²⁹ When embedding purpose, it is therefore vital to set expectations for subcontractors and suppliers too—and lend support as needed. By collaborating in this way, organizations can amplify the impact of their purpose to drive more systemic change.



Where is it happening?

In Asia, the prevalence of state-owned enterprises and family-owned, publicly listed companies creates an environment where companies are often focused on a broader set of objectives than maximizing total shareholder return.

In continental Europe, companies have long subscribed to the “stakeholder model,” in which employee, community and environmental interests are considered alongside shareholder interests.



The business culture in Europe has its roots in an industrial structure dominated by family-owned enterprises, as well as a regulatory environment for large companies that is more alert to balancing stakeholder interests than in the United States.

That said, businesses in the United States think that managing to a multi-dimensional view of value creation is important—83% of our US survey respondents said that it will be important to their organization's future success. But this view has only become more widespread in American companies in recent years.



North America

Airbnb

In 2020, Airbnb set out how it planned to institutionalize its previously stated goal of benefitting all its stakeholders in the long-term. Core to this are a series of quantifiable principles for how the company will serve different stakeholder groups. To turn words into action, a dedicated team of employees now leads Airbnb's work to meet those principles; a "Stakeholder Committee" on its

board is responsible for reviewing the company's progress, as well as directly engaging with stakeholders; and the compensation of employees is directly linked to the company's adherence to its stakeholder principles. In 2020, the company also announced that it would create a "Stakeholder Day" to report on its firm-wide progress.³⁰

Europe

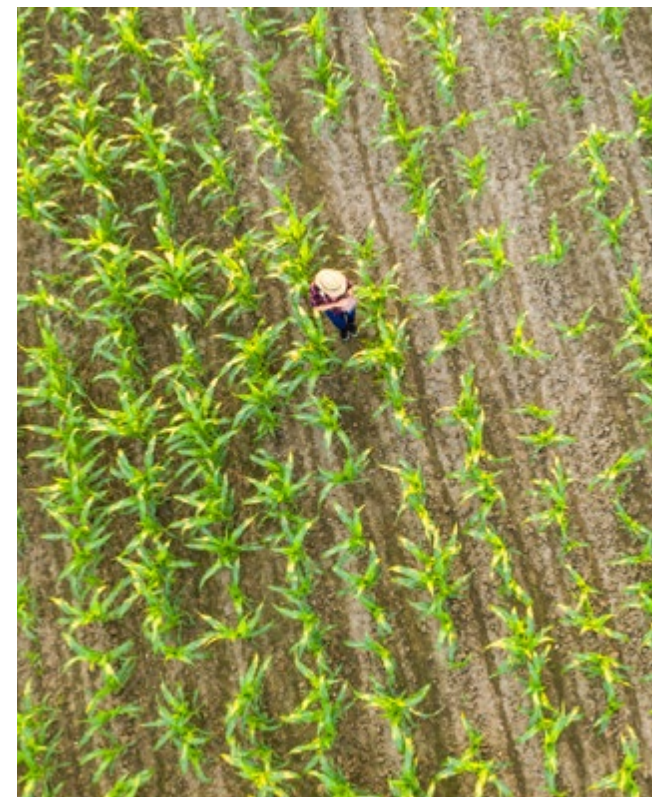
SAP

SAP's vision and purpose to "help the world run better and improve people's lives" inform its approach to its stakeholders, clients and products. Integrated reporting of financial and non-financial performance has become central to making this vision and purpose tangible for its stakeholders. The integrated report not only assesses SAP's performance on non-financial measures—it also puts a monetary value on their impact on the company's operating profit. The most recent set of measures was selected based on a 2020 materiality assessment, which considered the importance of each measure to SAP's stakeholders and SAP's business success, as well as its broader importance to society. The approach accounts not only for SAP's own operations, but the societal impact of its entire value chain, too. According to SAP, the approach "helped us shift the conversation for managers, investors, employees, and other key stakeholders, and firmly establish non-financial indicators as playing a crucial role in our financial success. As a result, engaging employees or reducing our emissions is no longer seen as a nice-to-have, but rather as essential to carrying out a successful business strategy."³¹

South America

Natura

Natura & Co, a global cosmetics group, was an early adopter of the "triple bottom line," publishing its performance on social and environmental metrics alongside financial performance. Natura also became the first South American public company to be certified as a "B Corporation," meaning it is legally required to consider the impact of its decisions on its workers, customers, suppliers, community and the environment. To support its purpose "to nurture beauty and relationships for a better way of living and doing business," the company, long considered a leader in sustainability, has a comprehensive plan built around three pillars: climate change, human rights and circularity. Each pillar, in turn, has a performance timeline and is underpinned by specific initiatives, such as increasing use of bio-ingredients and investing in regenerative agriculture. Natura & Co plans to report progress to both its board and to the public, via its annual reports.³²



Wildcard

Could stakeholder capitalism lead to “conflict capitalism”?

Stakeholder capitalism is often characterized as a revolt against so-called shareholder capitalism—a view of business perhaps best articulated by Milton Friedman’s influential essay, “The Social Responsibility of Business Is to Increase Its Profits.”³³

Profits obtained legally and under conditions of open competition, Friedman argued, reflect the value a company creates for society; only by serving others can a business become profitable.

To celebrate the half-centenary of Friedman’s essay, the University of Chicago, the Nobel-winning economist’s alma mater, held an online forum in September 2020, where advocates of shareholder capitalism argued that making executives responsible for delivering on multiple dimensions of value may actually make things worse for many stakeholders, not better.³⁴ A core problem, the speakers noted, is the considerable challenge of balancing the competing needs of different stakeholders: customers call for lower prices while employees want higher compensation; shareholders demand dividends while local communities want philanthropy. Could this ultimately lead to a world where the needs of stakeholders are set off against one another, in a form of “conflict capitalism”?

Greg Mankiw, a professor of economics at Harvard and former chairman of the Council of Economic Advisers under President George W. Bush, has argued that “[a stakeholder-centric] approach to corporate management expects executives to be broadly competent social planners rather than narrowly focused profit maximizers”—a role Mankiw doubted executives are qualified to perform.³⁵

Wildcard

Respondents to our survey recognize the challenge of this balancing act. Balancing the competing interests of their different stakeholders was selected as the biggest obstacle to successfully embedding an approach that delivers value to all their stakeholders. Other respondents—56%—saw either themselves, or their colleagues in the C-suite, as among the biggest barriers because they were not personally committed to delivering value for the benefit of all their stakeholders.

Growing political, cultural and economic divides may exacerbate the challenge of managing the tensions and trade-offs between, or even within, stakeholder groups. A number of companies, for instance, have taken stances on a range of issues—from immigration to LGBTQ+ rights to climate change. While such stances are popular amongst some, typically left-leaning, consumer groups, they have also led to calls for boycotts by consumers from the opposing side of the political spectrum.

In aligning their purpose with social goals, companies are becoming a vanguard for social change. This means that in some cases, their purpose may not be consistent with the social values and economic norms of some of their stakeholder groups, and, potentially, entire geographic markets. Stakeholder engagement is the key to managing this risk. This involves companies taking the time to understand, and constantly review, the issues that matter most to different stakeholders, while considering how these views vary across markets. At present, not enough organizations do this. We found that 60% of our survey respondents do not regularly consult with their stakeholders on how to create value for them. Addressing this engagement gap will be critical to ensuring stakeholder capitalism does not descend into conflict capitalism.



Signal 4: Supply Unbounded

To meet growing customer needs for fast, flexible, cost-effective, and sustainable order fulfillment, companies are restructuring their supply chains and moving production to the point of demand.

What's going on?

2020 saw supply chains stretched like never before. As trade routes seized up due to the pandemic, many firms were caught short; some even sent their engineers to China so they could fill their suitcases with critical components and then fly home.



As the home front became the storefront, certain e-commerce sites experienced such a surge in traffic that they thought they were under cyberattack.¹ The growth of online shopping led to cardboard shortages; prices for a metric ton increased tenfold between January 2020 and March 2021.² The challenges have continued into 2021. A cargo ship that blocked the Suez Canal held up some US\$9.6 billion worth of trade each day that it was stuck.³

Organizations have taken drastic steps to keep goods moving and customer orders fulfilled throughout the pandemic. Large consumer-goods companies cut the number of items they offered in their product lines in half, to simplify their supply chains and focus on critical goods. Between them, Walmart, Amazon and Instacart hired over 1 million workers in the United States in 2020.⁴ Some companies rolled out new business models to meet shifting sources of demand. Sysco, a foodservice distribution firm, built a new supply chain in less than a week to serve grocery stores.⁵

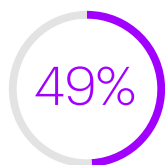
Some changes to order fulfillment proved their value.

Expanded use of curbside pickup—nearly 100,000 brands worldwide began offering curbside pickup during the pandemic—enabled many retailers to earn a margin on what were often loss-making order fulfillment channels prior to the pandemic.⁶

After years of hype, 3D printing proved its promise. Numerous companies, from small start-ups producing dental molds to industrial and tech giants, deployed their printer farms to tackle shortages of medical equipment, from ventilators to nasal swabs. Additive software maker 3YOURMIND's COVID-19 response platform matched requests from hospitals to both a digital inventory of 3D files and to local producers equipped to print the equipment.⁷



At the same time, many pandemic-induced changes have increased the cost of serving customers. Yet despite increased costs, customer expectations are still often not met.



of the executives we surveyed agreed that their organizations are currently meeting customer expectations for order fulfillment.

Deficiencies in cost, local sourcing and sustainability were all highlighted as gaps to address. Customers have been voicing their dissatisfaction, too. Sentiment toward delivery turned sharply negative through 2020—based on our analysis of posts on digital media. Local sourcing and more sustainable options were particular areas of demand.⁸



Our Fjord Trends 2021 report notes that customers increasingly expect the same delight from an e-commerce delivery experience that they experienced—and took for granted—in stores.

In our survey, executives pointed to physical constraints—such as bottlenecks in ground infrastructure, length of supply chains and geographic distribution of customers—as the top three barriers to meeting customers' shifting expectations. In response, organizations are conducting a range of experiments that break these physical limits, decoupling their supply chains from distance, ground infrastructure, and packaging and inventory waste. Many of these interventions are rightly focused on boosting

the efficiency and sustainability of the last mile of delivery—which accounts for 53% of total shipping costs.⁹ Eighty-four percent of survey respondents said they scaled up their last-mile initiatives, investing in drones, autonomous vehicles and other technologies.

The organizations that are closest to meeting customer expectations for order fulfillment are taking a holistic approach to their experiments, by making interventions across their supply chains. In the process, these organizations are moving from centralized, linear models of supply to decentralized networks that use on-demand production. We call this new type of supply chain “supply unbounded.”

Why does it matter?

Breaking the physical limits of their supply chains enables organizations to do more with less, and thereby meet customers' growing expectations for order fulfillment in a cost-efficient way.



Decouple fulfillment from distance

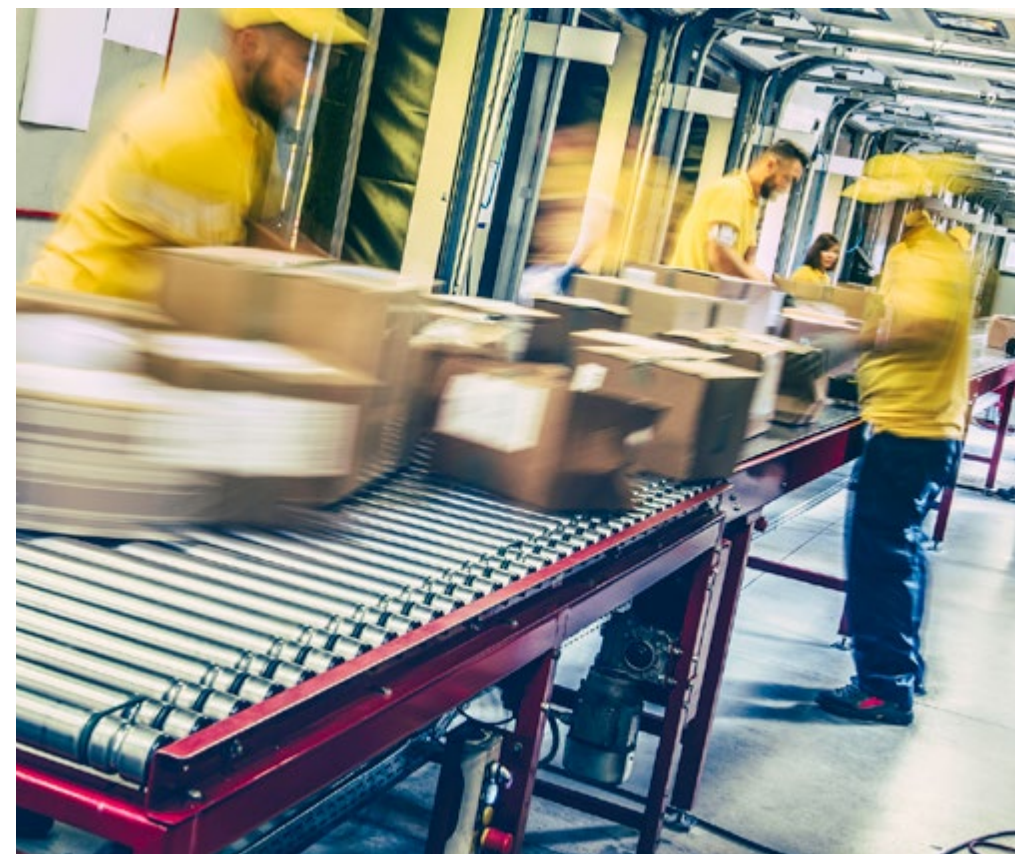
Fulfilling more orders traditionally requires covering more miles—and crossing more borders. However, the pandemic has proven the ability of new technologies—and the business models they enable—to minimize the impact of distance and borders on business.

Overcoming the physical limits of distance through new technologies could add 9.2% in trade growth in 2030 across ten economies we studied.¹⁰

Take the construction industry, where distance has long been a key limitation on international expansion—moving employees and heavy machinery from country to country is just too expensive. Winsun, a Chinese tech-construction company, overcame this barrier with the help of 3D printing technologies, which enable the firm to print building components and then assemble buildings—ranging from 10 square

meter COVID-19 isolation units to 1,000 square meter houses—on location. Winsun's approach enables up to a 60% reduction in materials and up to an 80% reduction in labor hours. Due to the ease of transporting its technology, the company has been able to rapidly expand into more than 10 countries.¹¹ The approach can help address critical supply shortages. 14Trees, a joint venture between LafargeHolcim and CDC Group, is using 3D printing to build schools in Malawi, filling a 36,000-classroom shortage in 10 years rather than the 70 years it would have previously taken.¹²

Some companies put shrinking distance at the core of their business strategies, such as Tennessee-based SmileDirectClub. Rather than requiring customers to make multiple trips to the dentist to have molds of their teeth made, the tele-dentistry company mails easy-to-use kits directly to customers' homes.



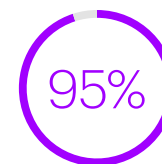


Customers then make an impression of their teeth in the mold and mail their kits to the nearest 3D printing facility, where their molds are used to create custom teeth-straightening “aligners.”¹³ SmileDirectClub has already served 1 million customers worldwide.¹⁴ Aerospace manufacturer SpaceX is testing a satellite internet service, Starlink, that could expand internet access in rural areas more cheaply and effectively than traditional broadband internet, which requires companies to painstakingly lay fiber-optic cables. To gain access to Starlink’s internet, customers would only need to install small dish receivers on their rooftops.¹⁵

Where distance cannot be eliminated, it can be reduced. Route-optimization algorithms are helping reduce mileage and improve on-time delivery rates. Quantum routing, which is being piloted by car manufacturers, can take such progress to the next level.¹⁶ This approach uses cloud-based, quantum computing to calculate the fastest route for each vehicle. It is different from traditional approaches, which show drivers

the routes that are less congested while giving the same information to all vehicles in the area. Instead, quantum routing creates individualized routes, taking into account millions of real-time data points about traffic congestion, and then calculating in milliseconds what a classical computer would take dozens of minutes to tally.

Respondents to our survey recognize the potential of reducing the constraints of distance.



of survey respondents are either testing or scaling approaches that will help them separate supply from ground infrastructure or bring production close to the point of demand.

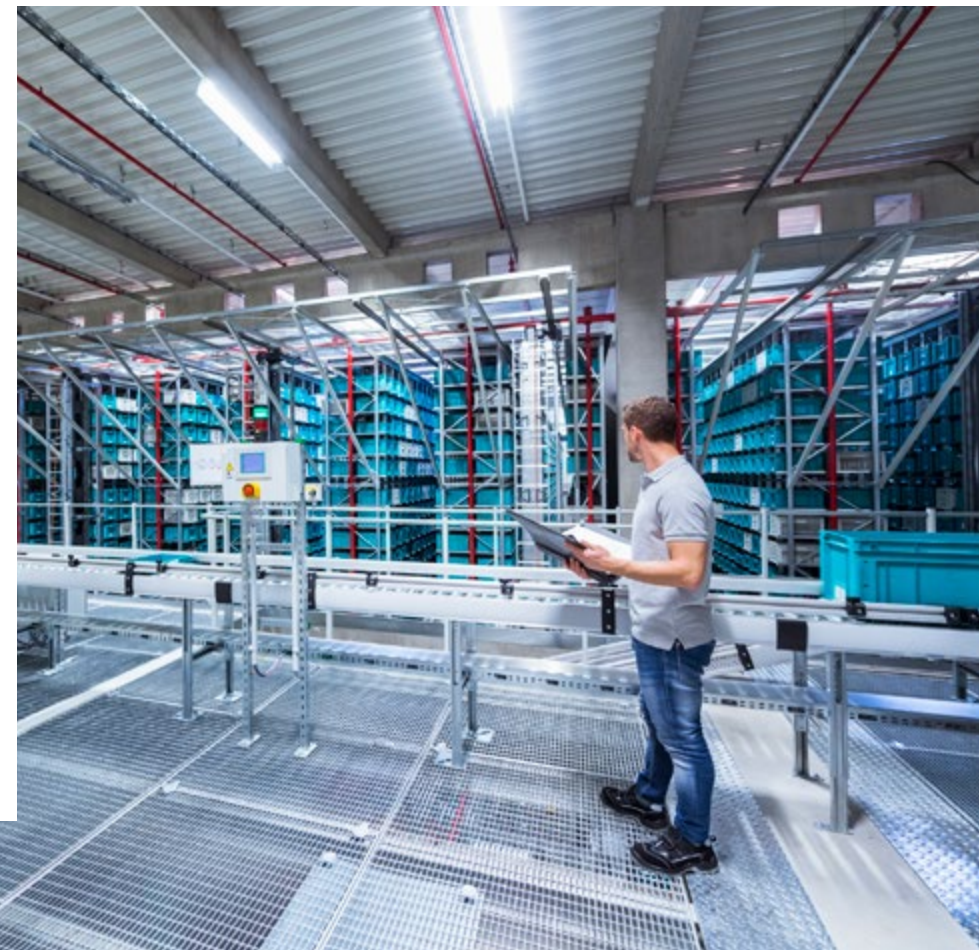
Fulfill more orders from a smaller footprint

In the past, delivering more orders required expanding the footprint of fulfillment centers. Indeed, 27% of survey respondents said that the limited capacity of their fulfillment network is a primary barrier to meeting customers' expectations for order fulfillment. But by "atomizing" their supply chains into micro-fulfillment centers, organizations can serve more customers from a smaller footprint.

Walmart, for instance, has been scaling its use of micro-fulfillment centers, with highly automated, modular warehouses that are 20,000 square feet—as opposed to the typical range of 400,000 to 1 million square feet—and are built within, or added to, existing stores. Instead of a staff member walking the store to fulfill an order from shelves, automated bots retrieve most items from within the fulfillment center—at 10 times the speed—while staff handpick perishable items.

Walmart is also adding automated pickup points, so customers can drive up to the center, scan a code and then grab their order. These smaller warehouses are less expensive to build and take advantage of Walmart's existing real estate, keeping fulfillment as close to customers as possible while minimizing last-mile costs.¹⁷

A shift to micro-fulfillment enables extraordinarily quick delivery times. Walmart now offers customers the ability to place orders to within an hour of their pickup or delivery time. Berlin-based start-up Flink, which means "quick" in German, offers fresh food deliveries in less than ten minutes from its network of micro-fulfillment locations spread across large German cities, like Hamburg and Munich.¹⁸



Decouple fulfillment from waste

Fulfilling more orders has traditionally required more inventory and, as a result, more waste. But companies can now eliminate waste and excess inventory by shipping and producing what they know customers want—and re-using what they do not want.

Returns cost retailers more than US\$1 trillion globally each year.¹⁹ For the clothing sector, the reason for returns is most often incorrect sizing. The return rate for shoe retailers, for example, is around 27%.²⁰ Machine learning, virtual try-on apps and body-scanning technologies are helping customers find the right size on the first order. US-based BodyBlock AI uses data gathered from 2,000-plus scanners installed in gyms around the world to help athleticwear brands integrate sizing technologies into their design processes.²¹

Neatsy AI, another start-up, uses 3D foot scans and machine-learning models to offer personalized predictions about fit for people's sneakers; a pilot test demonstrated a 2.7x reduction in return rates due to faulty sizes.²²

Some firms are taking such efforts one step further by only producing what they know is going to be sold. "Made for You" is an Amazon service that snaps a front and side photo of an individual in form-fitting clothes to produce a custom-fitted t-shirt, removing the step of selecting a size.²³ Eyewear firm Topology's augmented reality app measures and builds a 3D model of a customer's face, connects the customer with an optician to select a lens, previews how a pair of glasses will look and then converts the design into code for an automated machining tool.²⁴

A further development of these approaches is the consumer-to-manufacturer (C2M) business model pioneered by Chinese technology platforms. In essence, C2M makes use of big data and AI to identify the latest shopping trends. Manufacturers then make specialized products directly for consumers, cutting out traditional intermediaries. With more direct insights about customer demands, there is less need to create excess-inventory buffers, improving margins and reducing waste. Since adopting a C2M model, technology platform Pinduoduo has worked with 1,500 manufacturers, making about 4,000 types of products and generating 460 million accumulated orders.²⁵ For example, when Pinduoduo identified demand for a more affordable version of the robotic vacuum-cleaners it stocked, it approached a manufacturer to produce one. The company is now extending the model to the agricultural sector, providing small-scale farmers with insights on consumer preferences so they can better plan and market their crops.



Where product returns cannot be avoided, they can be used more effectively. For IKEA, roughly one out of every twenty items the furniture company sells at its US stores is returned; 15% of returned items are not fully recovered. To cut costs on returns, IKEA recently unveiled an AI platform that helps determine the best destinations for returned items, such as putting them back in stock or selling them to a third-party wholesaler at a discount.²⁶ IKEA is also one of a growing number of companies testing product-as-a-service business models. Customers buy access to furniture on a subscription basis, while companies retain ownership of the products and raw materials for future use. Seventy-one percent of survey respondents said they have either scaled, or are scaling, such circular business models for their organizations. These circular business models present enormous opportunities to generate additional value, with up to US\$4.5 trillion in value at stake by 2030, according to the Circular Economy Handbook, co-authored by Accenture Chief Responsibility Officer and Global Sustainability Services lead Peter Lacy.

Circular business models can also help decouple fulfillment from packaging waste. Chile-based start-up Algramo (“by the gram”) offers customers the ability to refill plastic bottles with dish soap or detergent from vending machines mounted on electric tricycles that travel around cities. Customers are incentivized to bring the same package back, assisted by an RFID (radio-frequency identification) code on the bottle that offers a “sustainable consumption credit” for discounts on future purchases. Because Algramo’s overhead is less than that of a store and each tricycle only has a single employee, the detergent or dish soap is sold for 30% less than in stores—in addition to the 11% discount consumers receive each time they return the package. The company has also expanded its RFID system to retail stores. The units drive further efficiencies, as the bulk containers used to re-fill them take up less pallet space when shipped than do individual bottles.²⁷

What to do?

Three steps can help companies break the physical limits of their supply chains and enable more effective order fulfillment.





1. Redefine the purpose of physical infrastructure.

Organizations should think critically about the role of each node in their fulfillment network. For example, retailers have tended to carry less inventory in their distribution centers by pushing products to stores, resulting in unsold inventory. Inventory could be more effectively managed “upstream,” pooled in port warehouses and pushed out on demand. Alternatively, stores could be used as fulfillment nodes themselves. Indeed, most retailers have started leveraging store footprints for fulfillment enabling faster delivery. At Hema, Alibaba’s supermarket chain, about half of each of its locations is dedicated to fulfillment, while the other half of each location is split into regular retail space and in-store dining experiences. Customers who live within a 3km radius receive free 30-minute delivery on in-store items; they can also get next-day delivery for an expanded range of 20,000+ products from a traditional distribution center. Hema uses real-time data to inform what, and where, it stocks its goods.²⁸

The future of supply infrastructure will be built on this foundation of flexibility—assets designed for adaptable, multipurpose use. This flexibility will have a powerful impact on how we receive our goods, as well as on how we redesign our cities. Expect town centers to become a mix of “dark stores,” focused on curbside fulfillment and experience hubs that offer services and encourage purchases across channels.

Off-White’s flagship store in Miami is one such example. Opened in August 2020, it is designed with adaptation in mind, accommodating everything from a runway show to a concert to a café to a fulfillment center. “It will be what the environment needs it to be,” says Virgil Abloh, Off-White’s CEO, “rather than betting on: hey, this square footage needs to be used for retail 24/7.”²⁹

2. Rethink supply networks.

As organizations review their fulfillment networks, they should consider not just new demand profiles for the nodes they own, but also reflect on how best to work with potential partners, such as local couriers and on-demand delivery firms, to improve their overall supply-chain performance. Historically, many organizations viewed the ability to control their supply chains as a core competitive advantage. Today, however, any purported advantage is rarely worth the cost. Moreover, new technologies and business models mean organizations enjoy more visibility—and control—over outsourced logistics than they had when running everything themselves. Even the smallest businesses can take advantage of such conditions.

In Indonesia, GudangAda runs an online marketplace that connects small retailers to brands and wholesalers across 500 cities;

Waresix provides on-demand warehouses; and Kargo, which provides on-demand access to trucking, streamlines bulk delivery and helps e-commerce extend into distant parts of the country. Platforms do not just give small businesses a foothold in local markets, they also open up global markets by managing the complexity of doing business across borders, in a process of “artisanal globalization.”

By building an agile network of suppliers and partners, organizations can create collective resilience, better respond to changing government regulations and offer customers services they would not otherwise have been able to offer.

In an agile network, organizations could enter into a consortium-like partnership to use each other’s distribution nodes; or they could use a common third-party logistics provider to achieve wider reach with little additional capital expenditure, helping companies deleverage their balance sheets while improving service and lowering costs.

Darkstore, which operates in 283 US cities, provides 170 brands with same-day delivery service to customers by storing the brands’ products in Darkstore’s urban fulfillment centers. Darkstore, in turn, partners with still other companies to handle deliveries and returns.³⁰ Cainiao, a Chinese logistics company, is creating a single ecosystem for logistics firms across the world—to operate and share labelling standards, customs information and more—to tackle cross-border supply problems. The goal is to allow merchants to choose the most cost- and time-efficient delivery option, based on real-time data.³¹

3. Redesign products and services.

Breaking the limits of supply also requires organizations to look differently at the products they send through their networks. In many cases, the design of products needs to be reimagined to make them more amenable to unbounded supply chains. Relativity Space manufactures rockets using 3D printers; by mass, 95% of its rockets are printed—only electronics, cables and a handful of moving parts and rubber gaskets are not printed.

To make a rocket printable, Relativity had to rethink how rockets are designed. As a result, its Terran-1 rocket has 100x fewer parts than a comparable rocket. This innovation could potentially allow components to be manufactured in orbit—or even on Mars.³²

Equally, to take advantage of circular business models, goods need to be designed with reuse and remanufacturing in mind at the outset—making use of simpler, recyclable material as much as possible.

Where is it happening?

Different industries and regions face significant differences in customer behavior and logistical challenges. How organizations are breaking the physical limits of their supply chains can therefore vary widely.



For example, in countries like the United Kingdom, with denser populations and where e-commerce is prevalent, the focus is on last-mile initiatives, such as expanding the use of micro-fulfillment centers—something that 95% of respondents to our survey said they were already scaling up.

In markets that are more geographically dispersed, there is a greater focus on initiatives further up the supply chain, such as bringing production to the point of sale—87% of our survey respondents in North America, for example, say their organizations are piloting such approaches.

North America Safeway

Food supply chains are based on building large farms outside cities and then distributing the produce. All produce thus comes with transport costs and has an environmental footprint.

Safeway, a North American supermarket chain, partnered with Infarm, a Berlin-based start-up, to deliver a range of fresh produce grown and harvested in store—in effect, distributing farms throughout cities. Infarm’s technology combines vertical farming units with Internet of Things (IoT) and machine-learning capabilities to optimize light, air and nutrients. Each in-store farm unit is remotely controlled via a platform that learns and adjusts. A unit uses 95% less water, requires 90% less transportation and uses 75% less fertilizer than a comparably sized, soil-based plot.

A unit is also capable of producing the equivalent of 400 square meters of farmland, resulting in more sustainable use of natural resources, including no pesticides.³³ To expand the range of produce that it can offer Safeway and other supermarkets, Infarm is establishing “Growing Centers” in Toronto and Vancouver—multipurpose farm and distribution centers that can generate the crop equivalent of up to 10,000 square meters of farmland, with up to 400 times more efficient food production than soil-based agriculture.³⁴



Europe

Unilever

Unilever, the consumer goods giant, tested new production methods to (1) produce goods—such as seasonal variants of ice cream or bouillon—more cost effectively at smaller volumes; and (2) test a market with a product before launching at scale. Unilever’s solution? A “nano factory”—a fully functioning, small production line that fits entirely into a 40-foot shipping container. A nano factory can be transported on the back of a truck and needs only electricity and water access to operate. This means it is quick to deliver, set up, and can provide additional capacity where, and when, required. Production can be incrementally increased as well, by hooking units up side by side. A nano factory also produces very little waste because much less product is left in the pipes when the production line is stopped to be cleaned and switched to a different product.

A nano factory is fully digitized too, allowing it to be controlled remotely. Sensors on the line send data back to a remote-control center continuously, so adjustments can be made quickly. Since all the control systems are managed remotely, the unit only requires three on-site operators. Using nano factories at scale could ultimately enable Unilever to have a highly dynamic manufacturing model, with thousands of local production lines all over the world instead of one big one.³⁵

Asia

Alibaba

Xunxi Digital Factory is part of Alibaba’s “new manufacturing” strategy, which aims to create a user-centric approach to production. Powered by Alibaba’s cloud-computing infrastructure and IoT, Xunxi offers small and medium-sized enterprises a digitized, end-to-end, manufacturing supply chain that allows for customized, demand-driven production. Xunxi takes a “made-to-sell” approach (i.e., one informed by consumer insights and real-time market trends aggregated from e-commerce platforms), rather than a traditional approach of “made-to-stock.”

At an early stage, apparel—an industry where lengthy production cycles and high inventory levels have long been a problem—was identified as the starting point for Xunxi. Real-time resourcing, process- and cost-planning, automated in-house logistics and a manufacturing operating system enabled Xunxi to produce small-batch orders at reasonable costs and with shorter delivery times. In the process, Xunxi’s manufacturing efficiency has risen by 20%, while its need to hold inventory has declined by 30%.³⁶

Wildcard

Will decentralized supply chains destabilize emerging economies?

If production is moved closer to the point of demand, and e-commerce becomes a bigger component of overall sales, demand will shift for the types, and location, of workers' skills. In advanced economies, jobs in warehousing and transportation may increase as a result of the growth in the delivery economy. But the number of customer service and food service jobs may fall.

Emerging economies may experience even more profound changes. For example, some clothing retailers are deploying automated technology for finishing their products. By doing so, they can eventually stock just a small number of styles of basic items around the world, and then customize them into different finishes near end markets. These automated finishing processes, which previously would have been completed manually, might disrupt some of the jobs of the approximately 60 million workers in Asia-Pacific's garment supply chain.³⁷

The impact of shifting supply has been felt keenly during the pandemic in Bangladesh, where ready-made garments comprised 83% of the country's exports before the crisis. In the first half of 2020, the global garment trade virtually collapsed, as buyers cancelled orders. A total of 1,150 factories reported US\$3.1 billion worth of order cancellations.

Factories were still not operating at their pre-pandemic capacity at the start of the third quarter of 2020: 43% of suppliers operated with less than 50% of their pre-pandemic workforce; and only 3.9% of suppliers retained their entire workforce.³⁸

As companies consider how to break the limits of their supply chains, they will need to work with other stakeholders to identify and mitigate risks to the livelihoods of vulnerable people, as well as support long-term skills development in partnership with governments and local industry associations. US-based Shimmy Technologies, for instance, piloted the use of a browser-based tool that uses "gamification" to teach factory workers in Bangladesh in-demand skills, such as digital pattern-making and 3D modeling, to create clothes and accessories.³⁹

Signal 5: Real Virtualities

As virtual environments enhance our physical worlds and redefine our sense of place, innovative organizations create new ways for people to work, consume, and socialize.

What's going on?

The COVID-19 pandemic has forced many everyday interactions online: working, learning, socializing, shopping, medical appointments and more. The pandemic has also encouraged experimentation in experiences that have commonly been considered physical.



Some physical experiences did not translate smoothly to a digital-only setting.

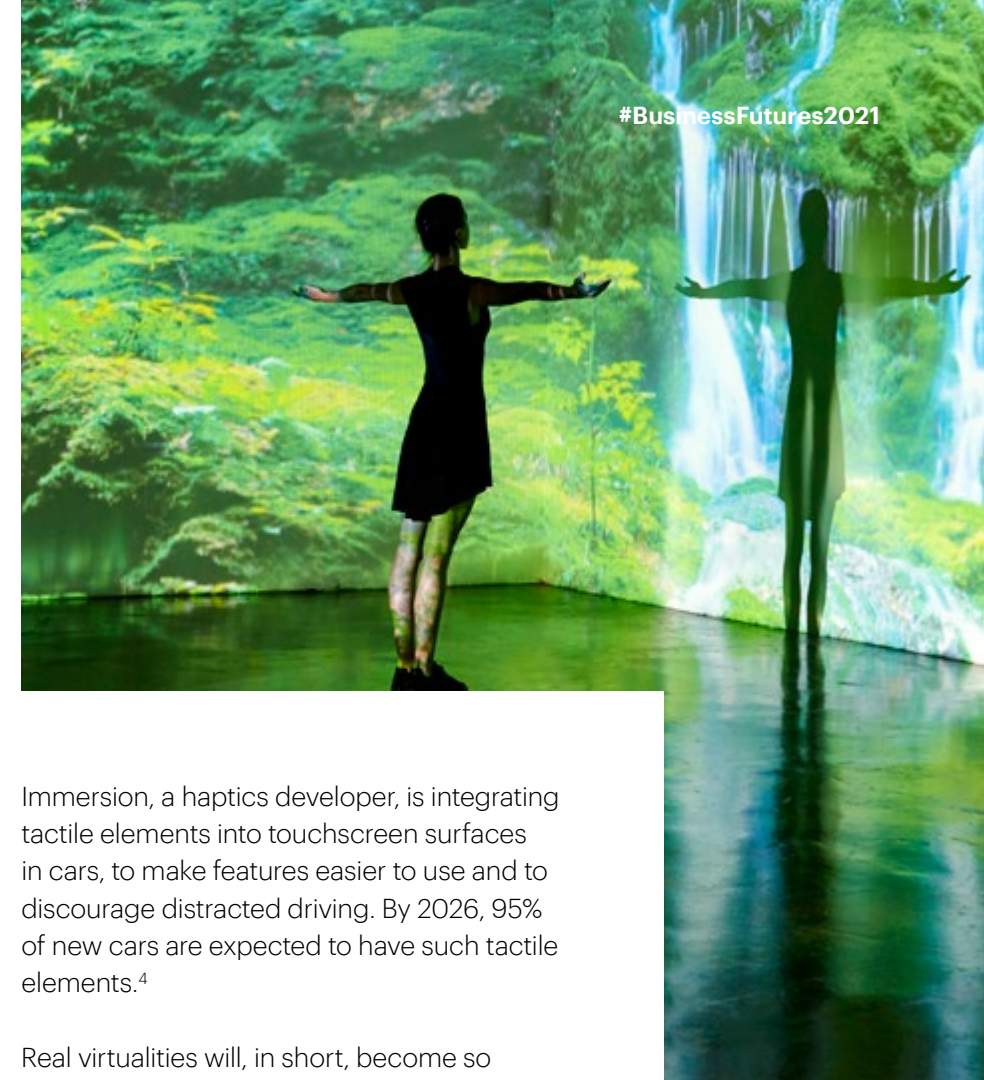
London's Victoria and Albert Museum, for instance, put its entire collection online to enable virtual visits; but seeing static images of objects on a phone screen still came nowhere close to the in-person experience. That does not mean that physical and virtual worlds cannot mix. The Van Gogh exhibition that opened in multiple cities in early 2021 offers visitors an experience that combines the virtual and physical, including 360-degree projections of the artist's paintings and a headset-based tour that recreates a day in the painter's life.¹

More organizations are now working to blend virtual and physical worlds, to build what we call "real virtualities." As this integration happens, virtual worlds will become increasingly realistic, imbued with a greater sense of the physical.

Current virtual-reality (VR) technology mostly engages our senses of vision and hearing; over time, it will engage all our senses. US-based OVR Technology developed mask-scent devices, which emit scent particles: Users walking through, say, a virtual park with VR headsets could smell grass and flowers.²

Tel Aviv University's PepZoSkin project is researching "electronic skin": wireless patches of thin material that enable users to feel the touch of people they are connected to virtually.³ Doctors, for example, might use electronic skin to bring a tactile element to virtual examinations of patients.

Increasing bits of the physical world will, in turn, have rich virtual interfaces that create "premium" experiences. Consider how haptics—technology that uses vibration or other motion to create the sensation of touch for the user—is reshaping how the automotive industry builds vehicles.

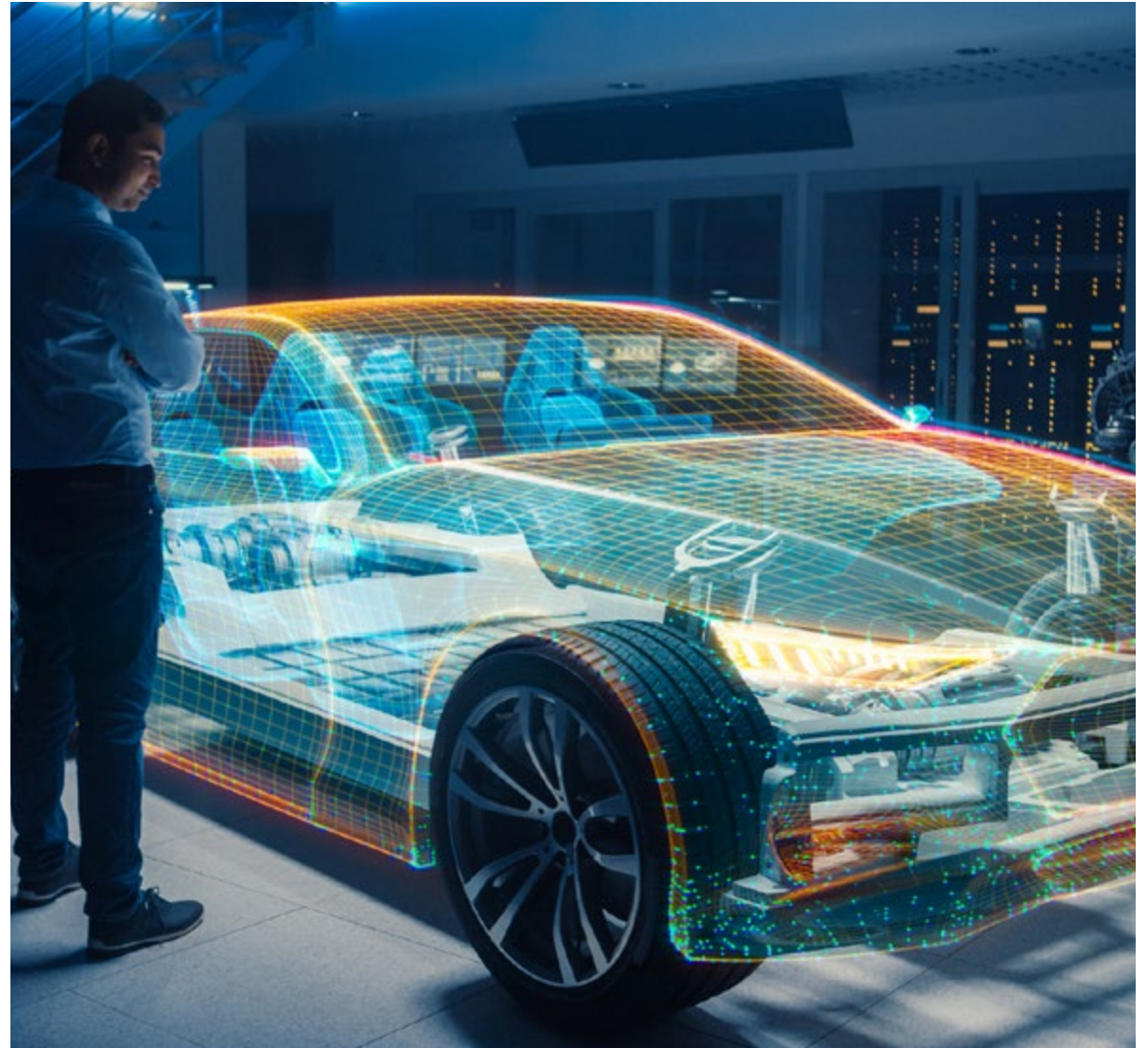


Immersion, a haptics developer, is integrating tactile elements into touchscreen surfaces in cars, to make features easier to use and to discourage distracted driving. By 2026, 95% of new cars are expected to have such tactile elements.⁴

Real virtualities will, in short, become so ubiquitous that the current distinction between the physical and virtual worlds will gradually blur.

Why does it matter?

The rise of blended physical and virtual worlds creates opportunities for organizations to create more value for their customers and employees, and open up new markets by enabling access to their products across a wider pool of people.



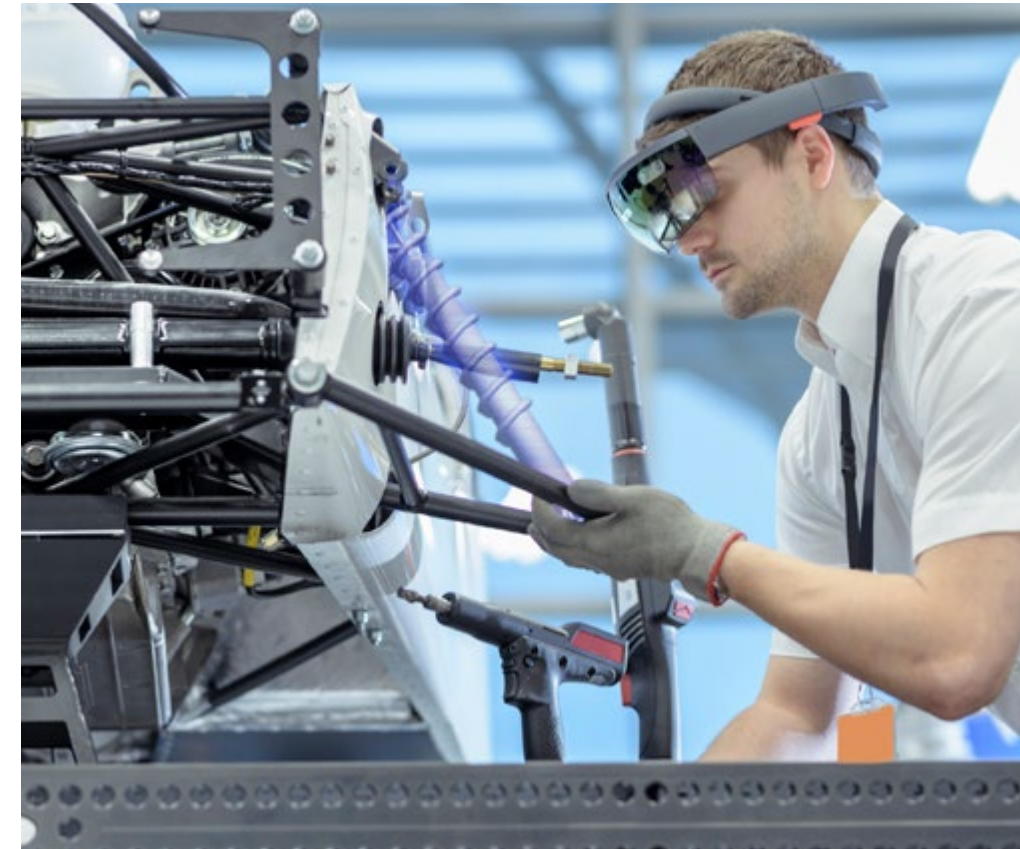
Creating wider value for organizations and individuals

Real virtualities will have multiple benefits for organizations, as it will enable them to solve some of the challenges they face. For example, being able to create realistic 3D images of virtual prototypes could eliminate lots of manufacturing waste. Being able to deliver certain experiences remotely would mean less travel, less congestion and lower carbon emissions. This would contribute to meeting the organization's sustainability targets but also have important benefits for society.

Consider the potential impact on inclusion and diversity (I&D) efforts. Many organizations have unconscious bias training, which tends to be run online, but could be made more powerful by the use of virtual reality that encourages employees to empathize with characters in the training who have been treated unfairly. Companies like Reality X Media provide virtual reality-based I&D training, using role play in safe virtual environments.

These role-play environments can help people prepare for the toughest of circumstances. Accenture, for example, has worked with child protective services agencies to develop virtual experiences that enable caseworkers to become more alert to critical child safety indicators.⁵

The technologies underpinning real virtualities, such as AI-powered computer vision and augmented reality, could also improve technical training outcomes. TechSee—which provides customer-service support to telecommunication, consumer electronics and manufacturing companies—developed technology that allows field technicians to upload their jobs and then receive back visually-based instructions on how to complete the task. This enables technicians to fix more products than would have been possible if they were trained using conventional approaches.





In other cases, “virtual-technician” robots are provided with an image of a completed job by the onsite technician; the bot then compares the image to the ideal solution to verify that the problem was fixed correctly. TechSee’s technologies reduce training time by 42%, on average, and improve the first-time fix rate—getting the job right the first time—by 89%.⁶

Yet another benefit is the power of real virtualities to help businesses smooth out current frictions associated with remote work. For example, technology-enabled worlds could help companies onboard new employees or conduct more lively brainstorming meetings. Reducing hurdles to remote work will allow many more employees to relocate without leaving their employers.

Reducing hurdles will also liberate companies to scour the entire world for talent, rather than only recruiting people who can live near companies’ offices.

The power of real virtualities to encourage remote work could also mitigate problems connected to “brain drain,” providing certain countries, regions and cities with greater economic opportunity.

For example, to attract remote workers, countries as diverse as South Africa, Barbados and Greece have launched “digital nomad visas” and reduced income tax rates.

Opening up new markets

Virtual goods are becoming a real source of economic value. Indeed, much of the virtual economy is already situated on massive, multi-participant gaming platforms. Many of these platforms have internal economies, with proprietary currencies used to buy and sell virtual goods and services. These virtual gaming and simulation platforms are growing rapidly, with revenue totaling about US\$130 billion globally in 2020, up from US\$62 billion in 2015.⁷ The global film industry, in contrast, earned US\$101 billion in revenues in 2019 and lost US\$32 billion in 2020.⁸

Gaming platforms are no longer just about gaming, either. Instead, they have become cultural hubs where people convene for entertainment, community and work. When the pandemic prevented an in-person event, South by Southwest—an annual festival of film, music and technology—“virtualized” its 2021 edition.

Attendees were hosted in a VR recreation of Austin, Texas, allowing them to join sessions in iconic venues and visit virtual popular landmarks.⁹ One ticketed event—an interactive play produced by the Royal Shakespeare Company—blended the physical and the virtual. Actors in motion-capture suits were animated in real-time, appearing to the audience as digital avatars in a virtual world. Audience participation, in turn, influenced the actors. The set was designed using the same production platform that Epic Games uses for Fortnite, one of the world’s most popular video games.¹⁰

In addition, a range of companies are working to apply the technologies developed for the gaming industry to business conferences and corporate events. The shift to real virtualities could transform the global business-conference industry, which is estimated to be worth US\$1.1 trillion.¹¹





Prior to the pandemic approximately 1.5 billion people attended conferences globally.

The continued expansion of virtual business conferences would allow more people to join such events, which would bring up to an additional US\$74 billion of revenue.¹²

Professional sports offer another example of real virtualities opening opportunities. The Deutsche Fußball Liga, which operates Germany's Bundesliga, partnered with Vodafone to develop a new augmented reality app for fans at the stadium, overlaying statistics and match analysis in real time. The ambition is to provide fans going to see the match live with an even richer experience than those watching at home.

Thanks to real virtualities, fans not in attendance will still be able to get the sights, sounds, smells and feel of the stadium from their homes.¹³

Sony's spatial reality display, showcased at the Consumer Electronics Show 2021, recreates 3D imagery without the need for glasses or headsets and has the potential to be used in all forms of home entertainment.¹⁴ In the United Kingdom, Southampton Football Club partnered with Sportsbet.io to create virtual, customizable, VIP experiences, such as behind-the-scenes stadium tours and penalty kick masterclasses, paid for with bitcoin.¹⁵ Virtual advertising could also expand revenue streams for clubs. Supponor, a virtual-advertising company, overlays virtual ads onto the telecasts of live soccer, hockey, motor racing and basketball.

Video games, concerts, conferences and sporting events are just a few of the industries that stand to be transformed by real virtualities. The upshot will be lucrative new markets for companies, as well as expanded entertainment options for consumers.

Improving customer interactions

Real virtualities will also facilitate more effective and pleasurable customer experiences. Consider several examples from the retail sector, where companies are blending physical and virtual elements. At its first flagship store, launched in 2020, Japanese beauty company Shiseido allows customers to test cosmetics on a mirror-like touch screen that simulates how colors will look on their skin. Wristbands then enable customers to add the products they like to a virtual cart, rather than having to carry them round as they browse.¹⁶ MAC Cosmetics, meanwhile, allows shoppers to use their phones to “try” different makeup shades, something they previously could do only in stores: those that do are three times more likely to buy an item, and they also spend 10% more, on average.¹⁷

In China, in-app purchases are given an immersive element through “shoppable” livestreams conducted by influencers. This has become a fast-growing segment of the

country’s US\$1 trillion e-commerce spend.¹⁸ On Taobao’s 2020 annual “singles day” shopping festival, livestreams accounted for US\$6 billion worth of purchases, double the total of 2019.¹⁹

The impact of real virtualities in the retail sector points to a significant financial opportunity for companies. Retailers, for instance, could improve the efficiency of their operations by inviting customers to skip the line to try on clothes, using in-store virtual dressing rooms instead, or allowing them to skip paying at the cash register using sensors that automatically debit customers’ credit cards as they walk out of the store with merchandise.

Retailers could also increase their sales. Adopting augmented reality (AR) and VR technologies would enable customers to find the right fit when shopping online, or to personalize and customize their purchases. Previous research by Accenture found that 47% of consumers are willing to pay extra for a product they could customize using immersive technologies.²⁰

Just a one percentage point increase in the number of retailers using such technologies to improve the customer experience could translate into an estimated additional sales growth of US\$66 billion.²¹



What to do?

Organizations have only scratched the surface of the potential of real virtualities. To make the most of them, organizations can do several things.

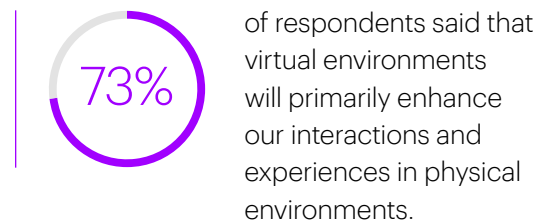




1. Rethink competitive advantage.

Organizations will be forced to rethink their existing business models to better blend their virtual and physical offerings.

The increased importance of virtual environments was evident in our survey:



This was also reflected in their investment plans, as 88% said that they are investing in technologies that would enable their organizations to create virtual environments.

To maximize their investment in these technologies, it will be essential to design them in ways that are user-friendly and enhance the customer experience.

The shift to the virtual could change a company's source of competitive advantage. In the future, a vehicle manufacturer will not just be building cars, it will also be creating new experiences based on the quality of its virtual interfaces. Jaguar Land Rover's new corporate strategy—to "create beautiful automotive experiences that leave its customers feeling unique," as CEO Thierry Bolloré puts it—indicates a step in that direction.²²

2. Activate new opportunities.

To deliver on their new business models, organizations will need to adapt their people, processes, technology and operations. Our own analysis of job-listings data indicates that some enterprises are already focusing on how to reorganize their talent. In the five years prior to the pandemic, the number of US job listings requiring VR-related skills increased by 65%. Although this increase was primarily led by a 77% rise in listings for software and design roles, listings for roles with VR skill requirements outside the technology sector also increased by 41% over the same period.²³

In the future, organizations will need to rethink how existing roles will adapt to new blended realities across many fields—from sales to marketing to accounting to research. Many new roles will be created, too.

For example, community managers—a job that emerged with the rise of social media—will also be required in virtual worlds. Facebook, for instance, already employs human guides (“Horizon locals”) to answer questions and otherwise assist users in its Horizon virtual world.²⁴

Some organizations are also adapting their innovation efforts and investments in technology. For example, our patents analysis indicated that, among published patents, the share that mentioned AR or VR grew by 277% over the past five years.²⁵ A seamless transition between physical and virtual worlds requires high-speed connections, increased network capacity and minimal delays, making investments in 5G networks and infrastructure a critical enabler of real virtualities.

3. Lean on ecosystem partners.

The creation of blended worlds will require collaboration with a wider set of partners to push the boundaries of what organizations can do. Those partners can bring deep expertise, the right technology or the right opportunity.

Lego, the toymaker, is partnering with haptics firm Ultraleap and London’s Westfield Stratford shopping center to test experiences that are touch free and do not require wearable gadgets, allowing customers to, say, move Lego bricks in mid-air with their hands alone, while their virtual creation is recreated on a screen.²⁶

Where is it happening?

In most of the 18 countries we surveyed, over 70% of executives said that building virtual and more immersive physical environments would be important to their organization's success in the years ahead. High-performing organizations in every region are already redefining the spaces where people work, learn, socialize, and shop. Consider a few standout examples.





North America

Microsoft

Microsoft's Mesh is a mixed-reality platform built on the company's investments in the cloud, AI, hand tracking, eye tracking and HoloLens (AR glasses). It will be compatible not just with VR headsets, but also with PCs and phones, and will allow people to interact in a shared holographic world.²⁷ In healthcare, trainee surgeons from various countries will be able to gather as holograms around virtual human bodies, as expert surgeons, located in still other countries, share their knowledge.

Microsoft is also partnering with OceanX to bring its OceanXplorer, one of the most scientifically advanced vessels, to build "holographic laboratories." Scientists that are not physically on the vessel can experience 3D representations in real time, as well as discuss what they are seeing with colleagues, to better direct the mission.

Europe

Overview Ark

Overview Ark sells tools to build virtual replicas of live shows, without the need for in-depth programming knowledge.²⁸ The London-based start-up focuses on live concerts that can be experienced in a 3D world through VR headsets. When live music events were cancelled during the pandemic, many artists took to social media platforms to livestream performances for free; but these were mostly 2D experiences. Overview Ark wants to create a new hybrid way to attend concerts that is immersive, live, has a social element and provides revenue opportunities for artists.²⁹

Asia

SenseTime

SenseTime, the first Hong Kong tech “unicorn” (a start-up valued at more than US\$1 billion), has created immersive experiences for visitors to major Chinese cities.

For example, an AR navigated journey around Hangzhou’s famous West Lake includes virtual guide signs and an embedded audio guide. One can overlay a different time of day, or season, to see how the scenery would change, or add effects such as fireworks.³⁰ The West Lake is also a popular running destination. With SenseTime’s app, a person can create a customized running route with the help of a “digital human,” who offers suggestions based on the individual’s pace, distance, stride and other running data.³¹



Wildcard

Will blended worlds encourage deception?

As virtual interactions become more sophisticated, they will be underpinned by more data and more complex partner ecosystems. This creates potential risks that organizations must prepare for.

We found, for instance, that 41% of respondents believe that security and privacy are the primary risks from adopting virtual environments. Take virtual “try-ons,” which generate a wealth of personal information that require significant protections. Leaders must be transparent about how customer information is being used (such as for targeted marketing).

The high-profile nature of new virtual product launches can also attract hackers. For example, a company that planned to unveil its latest product through a VR app canceled the plan after the app was hacked.

Leaders should start anticipating possible unintended consequences of virtualization, too. The same technologies that are used to create realistic virtual worlds could be used for digital deception to create “deepfakes.” Imagine that fake, yet realistic, AI-generated videos of a CEO spreading disinformation about a company go viral, and the damage that could inflict on a brand’s value, trust with customers and share price.³² Some organizations are already working to prevent such abuse.

Quytech is using AI computer vision for brand safety and counterfeit detection. In late 2020, Microsoft announced a new tool for Azure, the firm’s cloud service, that enables a content producer to add authentication certificates

that accompany the content across browsers.³³ Accenture’s Cyber Lab is testing different approaches for deepfake detection. All this points to an unfolding race, with AI-driven creation of “counterfeit realities” looking to outpace our existing detection capabilities. To win this race, leaders can deploy combinations of AI and quantum computing to create “truth filters” that protect their corporate brands.

Another potential example of unintended consequences would be governments that use a technology, or the data that it generates, to suppress their citizens’ freedoms. In some countries, gait recognition data from running apps is already shared with law enforcement to monitor individuals.³⁴ Such information could also plausibly be used by healthcare or insurance organizations to assess people’s fitness without their knowledge.

In response to such risks, leaders must ensure that ethical safeguards are designed into the real virtualities they create.

Signal 6: The New Scientific Method

As scientific disruption enables the creation of better, cheaper, and more sustainable products and services, leading companies will become scientific companies—and apply science to tackle the world's fundamental challenges.

What's going on?

When the COVID-19 pandemic hit, researchers were able to sequence the virus' genome within three days.¹ Armed with the virus' genome, BioNTech and Moderna were able to design a messenger ribonucleic acid (mRNA) vaccine sequence in just two days. mRNA technology could transform medicine more broadly, with work underway to create vaccines for malaria and other infectious diseases. The technology also holds the potential to help fight off cancers.²



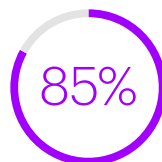
mRNA vaccines sit at the convergence of new frontiers in the sciences. They work by sending software-like code to the DNA of the cells in our body, which in turn directs them to produce disease-fighting proteins. mRNA vaccines are researched and created by using artificial intelligence (AI) to run and compare the results of thousands of experiments in parallel. Getting the vaccine from the lab to the world is accelerated by robotics. Moderna's Norwood, Massachusetts manufacturing facility uses liquid-handling robots—specialized machines that allow repetitive procedures to be executed at speed and with high accuracy.³

Beyond life sciences, the pandemic has placed scientific innovation firmly back at the top of the agenda for government and business.

In the second quarter of 2020, American companies spent more on software and R&D than on fixed assets for the first time in over a decade.⁴

Investing in scientific innovation had already become more important to early-stage capital. Our analysis of global venture-capital flows in the five years before the pandemic found that while funding for digital technologies grew at a compound annual growth rate (CAGR) of 6%, funding for technologies related to the natural sciences increased at a CAGR of 29%.⁵

Today's rising focus on science is only just beginning.



of the C-suite executives we surveyed agreed that increased scientific capability is critical to the future competitiveness of organizations.

Of those respondents, 86% said that investing in sciences outside their traditional industry boundaries will be critical to their own organization's success.


Companies will need to go beyond today's proven digital technologies to innovate at the next frontiers of science. Combining advances from across the sciences is a far harder engineering challenge than pure-play digital solutions, because the former depends on fundamental research as well as the requisite skills, knowledge and infrastructure. In the past decade, every company became a digital company. In the coming decades, every company will need to become a scientific company to profit from the next wave of innovation.



Why does it matter?

The coming together of sciences will bring about major changes to our world. As their convergence contributes to the collapse of traditional industry boundaries, the existing structures that support today's markets will see systemic change too—change that involves an entirely new approach to creating products.





For businesses, the opportunities extend beyond the opening of new markets and include making them better equipped to more sustainably meet humanity's food, health and housing needs.

Systemic change

Deep technological disruption—when technologies converge to unlock new possibilities—involves transforming how entire sectors of the economy work, rather than simply substituting certain products and services for others.

One example of deep technological disruption is visible in the food system. Food can now be designed from the molecule up, rather than breaking down and reconstituting bulk food products, as is done in food processing. US-based Impossible Foods, for example, uses genetically engineered yeast to make “heme.”

This molecule, which gives meat its distinctive taste and texture, is the core ingredient in the start-up's burgers.⁶ Producing one of their burgers uses 87% less water and 96% less land compared with conventional beef burgers.⁷

While Impossible Foods' focus is on creating plant-based alternatives, other organizations are working on developing cultured meat, which is developed by taking cells from live animals and then “feeding” the cells with plant-based nutrients in a bioreactor.

At the end of 2020, another California firm, Eat Just, became the first company to secure regulatory approval for the sale of cultured meat, when its “chicken bites” were greenlighted by the Singapore Food Agency.⁸ Funding to “protein-alternative” start-ups is growing fast: in the United States it reached US\$3.1 billion in 2020, up from US\$1 billion in 2019.⁹

Developments in the food system could go hand-in-hand with the evolution of health systems.

A combination of genomics and AI can now provide a sophisticated snapshot of an individual’s health. This insight can, in turn, be combined with the production of novel foods for significantly improved health outcomes.

A forthcoming restaurant in Tokyo, Sushi Singularity, plans to use genetic analysis to create bespoke meals. Bio samples will be collected from diners a week before their reservation to create 3D-printed “sushi” tailored to diners’ nutritional needs.¹⁰

UK-based DNANudge hopes to make this kind of genetically informed eating more accessible with the company’s wearable devices. Its DNABand analyzes a person’s cheek swab to help identify food products best suited to the person’s genetic makeup.¹¹

As diners share their biological data with companies in exchange for healthier, more personalized meals, they also place their trust in those organizations. Maintaining that trust requires strong guardrails that discourage abuse and encourage transparency.

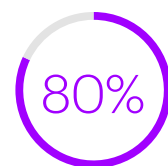


Sustainable solutions

The past decade of innovation brought digital abundance. Digital technology helped create products and services that were simultaneously better and cheaper, disrupting industries overnight—a process Accenture called “[Big Bang Disruption](#).” Consumers benefited from greater convenience and lower costs. The prices of discretionary goods and services, such as recreation, clothing and communications, fell by over 30 percentage points in the decade before the pandemic.¹²

Despite such progress, major challenges related to, among others, housing, healthcare and the environment remain. In fact, in these areas, the digital-driven wave of innovation imposed new costs on society. For instance, rises in housing prices, mental-health challenges and CO2 emissions have all been connected to the growth of digital platforms.¹³

The next wave of innovation holds the potential for a different outcome.



of the C-suite executives we surveyed said their investments in science focus on tackling fundamental global challenges.

In the years ahead, scientific-led disruption could help create products and services that will be better, cheaper and more sustainable.

Take concrete—the most consumed material in the world. Concrete’s core ingredient, cement, accounts for 8% of global CO2 emissions. US-based Biomason is using microorganisms to grow bio-cement-based construction materials that eliminate emissions. The company’s concrete is three times stronger than traditional concrete blocks and has self-healing properties:

the microorganisms in the bio-cement source nutrients from their surroundings, such as seawater, to fill cracks that develop.¹⁴

Biological materials similarly promise to replace the energy-intensive production of electronic devices. Electronic displays, printed circuit boards and semiconductors all use electronic films that are manufactured with silicon- and petroleum-based products. US-based firm Zymergen’s electronic film, “Hyaline,” is instead bio-manufactured. Hyaline is thinner and more battery-efficient than its carbon-intensive competitors; it can also be manufactured faster and at lower cost. Hyaline’s flexibility enables new design features too, such as full-screen touch sensors in foldable devices, which will enable further advances in wearable electronics. Hyaline is produced from engineered organisms, optimized using robotics to build millions of strains in parallel, with AI learning from previous failures to better design future strains of the bio-film.¹⁵

What to do?

Applying the scientific method—which involves testing a hypothesis against empirical evidence—has traditionally been a lengthy and laborious process. It has also required deep expertise about a particular field, as well as significant upfront capital investment in R&D.

In the past, materials' scientists, for instance, spent their time modifying compounds, testing additives and recording and cleaning data. They conducted experiments in a sequence, making small adjustments as they repeated the process over and over. Breakthroughs took decades.

Today, as organizations seek to commercialize opportunities at the convergence of the sciences, they will need to consider how to adapt the scientific method for changing realities.

The “new scientific method” requires organizations to apply breakthroughs to the real world much faster, by using digital technologies to accelerate the design-build-test-learn cycle. The convergent nature of the change underway will force organizations to draw on ideas across different fields and seek partners beyond their narrow disciplines. Among other benefits, more expansive partnerships will provide new sources of funding and help spread capital risk.

1. Reimagine the design-build-test-learn cycle.

Advances in the digital sciences—from machine learning to quantum computing—enable the scientific method to deliver better commercial outcomes sooner.



of respondents to our survey said they are using digital technologies to accelerate advances in other scientific areas.

AI-enabled generative design, for example, can identify an optimal product design from a set of defined requirements. Battery development for electric vehicles is one promising area. Fast-charging batteries with extended range are critical for the growth of the electric-vehicle industry. But the process of improving batteries has been hampered by slow experimentation and discovery. Slovakia-based InoBat is using

an AI-powered research platform to rapidly prototype new battery chemistries. Rather than tweaking one battery component at a time, and exhaustively testing each iteration, the platform can simulate how a battery will perform in the real world when several different variables are modified at once—a process ten times faster than the techniques used by conventional labs.¹⁶

Kebotix, a start-up that uses AI to discover and develop new chemicals and materials significantly faster and more affordably, has a fully autonomous lab. The lab combines machine-learning algorithms that model molecular structures with robotics that synthesize, test and feed the results back to the algorithms. The result is a “closed loop” for faster learning and simulation. Doing this “take[s] serendipity out of science,” says Jill Becker, CEO of Kebotix.¹⁷



In manufacturing, digital twins (i.e., virtual representations of physical objects) are reducing the need to build extensive iterations of physical prototypes, leading to reduced costs and time spent during testing phases. The more expensive a product is to physically create, the more impactful digital twins could be. German industrial giant Siemens paired up with Ansys, a US-based software firm, to virtually simulate the tests that Siemens must conduct of the trains it builds. The use of digital twins halved testing times and saved money on wind-tunnel rentals, manpower and equipment.¹⁸ Our Technology Vision 2021 report further highlights further highlights the potential to design and test new products in the virtual world long before ever constructing them physically.

Numerous R&D-intensive sectors—including pharmaceuticals, materials science, smart cities, automotive and aerospace—stand to benefit from the new scientific method. We estimate that accelerated testing and development in R&D could result in US\$276 billion of additional economic growth in 2030, across ten major economies.¹⁹

2. Open up to drive the ecosystem forward.

Few organizations will possess the full range of capabilities required to take these multidisciplinary scientific innovations to market at scale. For some companies, operating beyond the confines of digital technologies will require access to highly developed industrial design and manufacturing skills. For others, expanding beyond manufacturing will require the development of new digital capabilities.

This reality calls for new models of collaboration that span the sciences, and that draw on the expertise of a range of partners—start-ups, universities, government agencies, and other corporations. It will also require companies to continue to collaborate across industry boundaries.

Our analysis of new partnerships across more than 800 companies indicates that the share of cross-industry partnerships increased from 46% in 2010-11 to 57% in 2018-19.²⁰

Baidu, a Chinese tech giant, is one company that has promoted an open approach to innovation to scale its scientific advances. To accelerate the advent of autonomous transport, the company launched Apollo, the world's first open-source platform focused on sharing code that enables autonomous driving. The platform has engaged thousands of developers across the world, as well as more than 200 industry partners.²¹ Other innovators in the mobility ecosystem are taking an equally open approach.

The four forces reshaping mobility—connectivity, autonomous driving, electrification and shared mobility—require capabilities that are uncommon at many traditional automotive manufacturers and suppliers. As a result, new entrants are challenging the industry’s existing model of vertical integration. For example, Foxconn, the world’s largest contract-electronics manufacturer, partnered with Chinese automotive firm Geely to launch a platform to help EV manufacturers cut costs and launch models quicker, in a bid to become “the Android of EVs.”²²

Fostering open data ecosystems is particularly essential for developing insights into the world’s biggest challenges. The rapid development of COVID-19 vaccines, for instance, benefitted significantly from information sharing and open access to data.

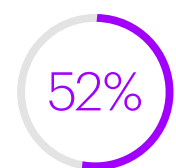
At the start of the pandemic, more than 30 scientific publishers—including Elsevier, Wiley and *The Lancet*—made their content freely accessible in machine-readable formats, allowing unprecedented collaboration in the effort to fight the virus.²³ Continued open access and sharing of data can accelerate learning and help drive future scientific breakthroughs.



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3. De-risk through alternative investment vehicles.

In addition to helping accelerate scientific breakthroughs, being open to partners can provide a much-needed source of capital. The infrastructure, skills and resources required for the next wave of innovation demands substantial funding capacity over an extended period. Not only is the capital intensity higher than for digital product development, the payback periods are also typically longer. To reduce risk, companies will need to broaden the investment vehicles they use beyond their internal R&D efforts.



of executives surveyed who plan to increase their investments across the sciences are using a combination of mergers and acquisitions, partnerships, alliances and corporate venturing to accelerate their capabilities.

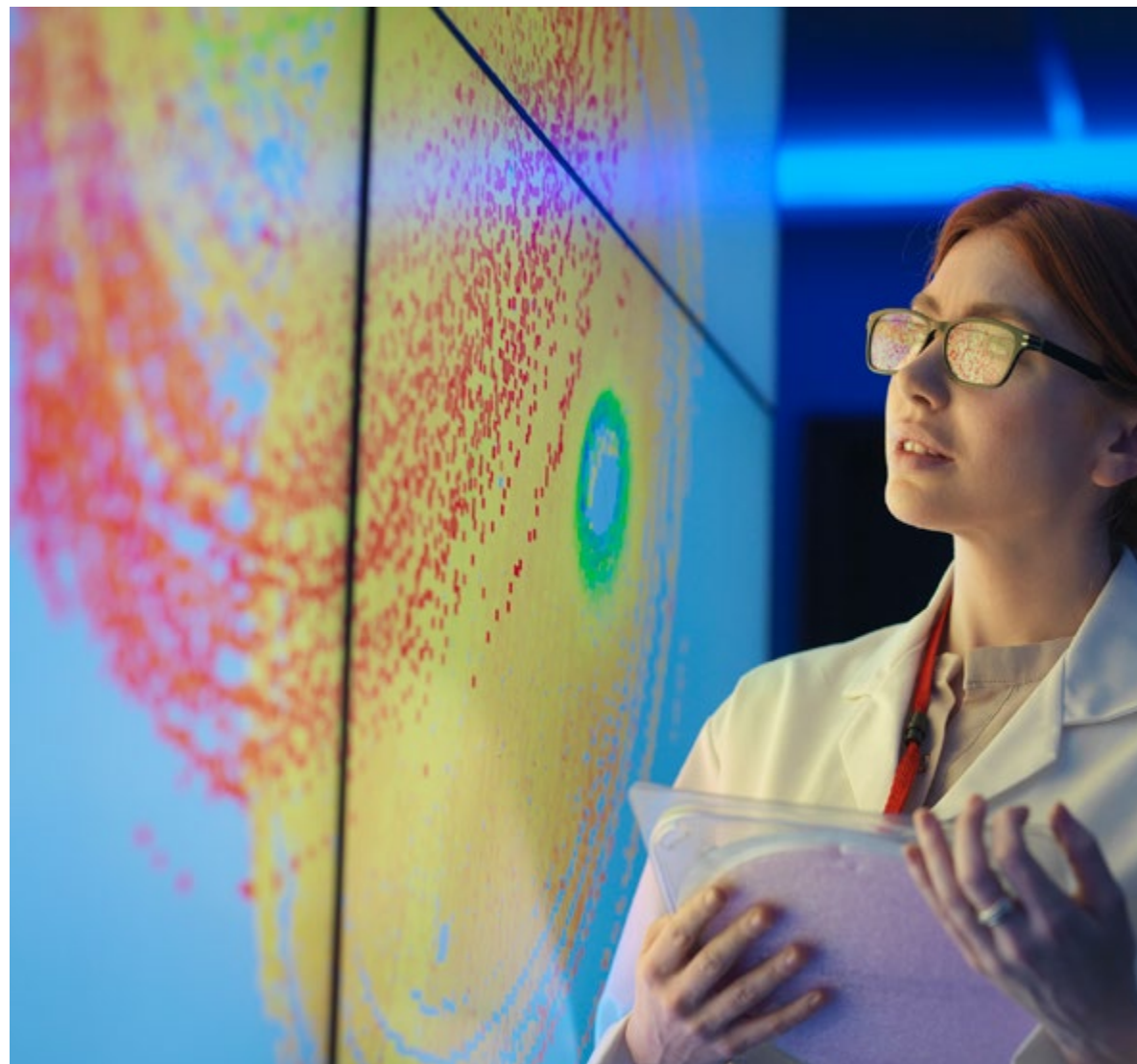
German life sciences company Bayer is developing partnerships with start-ups through its corporate-venture arm, Bayer Leaps. The business unit has invested over US\$1 billion in initiatives tackling 10 “leaps” that Bayer believes could have lasting impact on humanity, from on-demand organ replacement to eradicating insect-borne infections. Aside from return on investment, Bayer’s key metric for success is “return for humanity,” as measured by “wellbeing adjusted life years.” Bayer actively incubates the start-ups it invests in by providing access to its own patents and technical expertise.²⁴

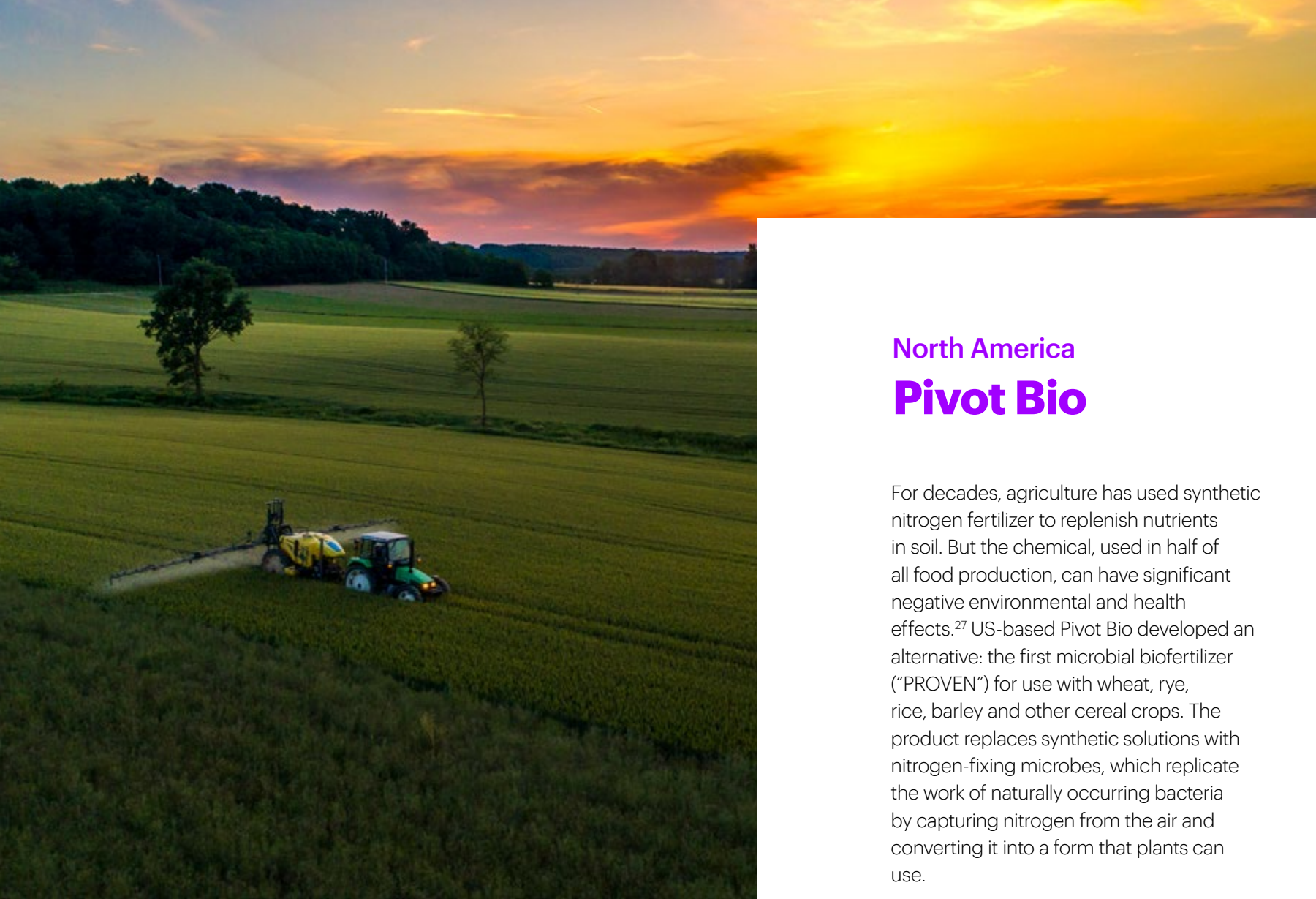
Public-private partnerships provide further opportunities to de-risk long-term capital, particularly with governments doubling down on efforts to drive scientific innovation in their economies.

Government agencies have often acted as a catalyst for innovation. The United States’ Defense Advanced Research Projects Agency (DARPA) funded the development of prototypes that underpin many of today’s ubiquitous technologies, from Microsoft Windows to Google Maps.²⁵ South Korea accelerated its transformation from an agriculture-based economy to a high-tech innovation leader by heavily investing in R&D and promoting collaboration between industry and academia. More recently, in 2021 the UK government launched the Advanced Research and Invention Agency to allocate £800 million to high-risk, high-reward, scientific projects. The European Union also announced plans for a €3 billion investment fund for early-stage companies focused on emerging technologies.²⁶

Where is it happening?

In all of the 18 countries we surveyed, at least 70% of executives said that adopting a more scientific approach to innovation would be important to their organization's success in the years ahead. High-performing organizations in every region are already combining advances from across the sciences to drive systemic change. Consider a few standout examples.





North America

Pivot Bio

For decades, agriculture has used synthetic nitrogen fertilizer to replenish nutrients in soil. But the chemical, used in half of all food production, can have significant negative environmental and health effects.²⁷ US-based Pivot Bio developed an alternative: the first microbial biofertilizer (“PROVEN”) for use with wheat, rye, rice, barley and other cereal crops. The product replaces synthetic solutions with nitrogen-fixing microbes, which replicate the work of naturally occurring bacteria by capturing nitrogen from the air and converting it into a form that plants can use.

For US\$20 per acre, compared with nearly US\$100 per acre for existing fertilizers, farmers gain a more consistent harvest while eliminating 1 gigaton worth of CO₂-equivalent emissions. Use of PROVEN could also help reduce some US\$4.1 billion in spending on water purification across the United States.²⁸ The thesis supporting the use of microbes in agriculture dates back at least 50 years. However, DNA sequencing, machine learning and gene editing have only now made it possible to develop products that can fulfill the promise of microbial soil enrichment.

Europe

Ferrovial

Ferrovial, a Spanish infrastructure construction company, is working to build “infrastructure of the future.” To do this, the firm’s multidisciplinary innovation project teams focus on exploratory research that brings together developments from different fields. One project focuses on capturing energy from airport noise and transforming it into electricity that can then be used to power parts of an airport facility itself, such as sensors. To complement its internal R&D efforts, Ferrovial deploys a “Venture Lab” that is focused on designing the business models that will enable the company to monetize its innovations.²⁹

Given the scale and cross-industry nature of its projects, Ferrovial is also using partnerships extensively. In early 2021, the company announced a collaboration that brings together Microsoft’s AI and Internet of Things cloud-based solutions, and 3M’s innovations in materials to build “smart roads”—roads equipped with advanced monitoring and simulation technology to facilitate a future of autonomous vehicles.³⁰

Asia

Spiber

Polyester is the most commonly used fiber in clothing. Made from petrochemicals, the synthetic plastic material is not biodegradable, with each wash of polyester releasing microfibers into waterways. Spiber, a Japanese synthetic biology company, is taking inspiration from spider silk to develop alternatives to polyester. Its “Brewed Protein” materials are not only sustainable but also outperform today’s materials, offering better tensile strength, elasticity, durability and softness, while made from bioengineering instead of fossil fuels.

The North Face, the US-based outdoor apparel company, was Spiber’s first customer. The two companies collaborated on the “moon parka,” a biodegradable jacket suitable for Antarctic weather conditions. Spiber is not just tackling fashion, either. Brewed Protein is a biological building block that can be sculpted for different applications. The material can be engineered to have different strengths, just as different types of spider silk do. This will enable Spiber to make automobile parts and medical devices based on variants of the material. The company is partnering with US-based food-processing giant, ADM, to scale its production capacity.³¹

Wildcard

Will an anti-science wave lead to public mistrust of scientific companies?

In the sci-fi film “Gattaca,” the protagonist is prevented by the authorities from choosing his desired job or traveling freely. His imperfect eyesight makes him a second-class citizen, along with other people who were conceived outside the state-approved genetic-selection reproduction program.

Released in 1997, the film illustrates the fears that arise whenever science makes a genetic leap forward. For instance, after the invention of CRISPR, a technology that can be used to edit genes, articles proclaiming the dawning of an era of designer babies filled the papers.³²

With the pandemic putting science back at the forefront of public debate, there will be a renewed focus on scientific ethics and how they are applied to everyday life. To be sure, scientific innovations can help answer factual questions like “What can we do?”; but they cannot answer ethical questions like “What should we do?”. If these ethical questions are not addressed, however, the tide of public opinion could easily turn against scientific innovation.

If, say, scientific innovation is perceived to benefit only the few, rather than the many, or that genetic data is used to exclude people from certain jobs, there could be an anti-science wave. The introduction of genetically modified (GM) crops in the 1990s illustrates how this scenario could unfold. Safety and ethical concerns led to a backlash, with GM crops dubbed “Frankenfoods,” despite significant evidence showing that GM crops can boost yields and lower pesticide use.³³

Wildcard

Today, as the scientific community is increasingly asked to advise on decisions that have a major social impact—such as genetic engineering—the community’s credentials and intentions will be closely scrutinized.

At present, scientists are still highly regarded but trends point to increasing polarization depending on country and political affiliation. According to the Pew Research Center, in Brazil only 23% of people say they trust scientists to do what is right, in France 31% do and, in the United Kingdom, 42% do. In the United States, 62% of people who identified as being “on the left” had significant trust in scientists, compared with about 20% of people who identified as being “on the right.”³⁴

As they invest more in people with scientific talent and adopt a more scientific approach to their operations, organizations may expose themselves to mounting criticism. Anticipating—and addressing—potential ethical dilemmas could help organizations pre-empt such a backlash.



How to use these Signals

Four basic steps will help you assess what the Signals mean for you and how to design your response, act quickly, and optimize change.

1. Assess

Start by understanding what the Signals mean for your business.

How strong are the Signals in your industry and geographic markets? Will they shift sources of competitive advantage? Will existing profit pools dry up and others form? Which parts of your organization face the greatest impact?

Adopt a structured approach to assess the impact on different parts of your business, from customers and competitors to your balance sheet. Distil insights into a shared perspective that properly informs the leadership team, highlighting key issues, critical uncertainties, and fundamental decisions to be made.

Openly discuss and realistically evaluate the choices available, encouraging dissenting opinions that look beyond the obvious to envision the full breadth of potential opportunities and risks the Signals create.

2. Design

Design your strategic response to the Signals, aligning on and communicating a plan for how to build your future.

How will the organization capitalize on the Signals? What future does your organization want to build toward—and at a high level, how will it get there from its current position? What, if any, broad changes in your business and operating model are necessary to support the strategy? How will you mitigate potential wildcards?

These decision points require clear choices about strategic direction that can steer and empower your teams to bring your plan to life. The choices should be reviewed against existing initiatives, determining what should be accelerated, continued as planned, or stopped.

3. Respond

Respond to the Signals through swift execution—and consistent iteration—of the strategic plan.

Identify leaders within the organization who will drive the response to the Signals and hold them accountable for delivery. Cascade strategic responses to the Signals into your planning process. Reallocate resources across business units, so teams have access to what they need to respond effectively.

Teams at the edges of your organization should then test actions that they believe will realize leadership's strategic intent. Based on their findings, teams can then adapt their actions to optimize your organization's objectives and share their insights.

4. Reinforce

Put in place clear measurements and incentives to encourage change.

Track the effectiveness of your responses to the Signals. Look constantly for indicators that the Signals are gaining or declining in strength. Tie these indicators back to specific strategies and actions—detailing how various levels of Signal strength indicate how and when certain responses should begin and end. Feed the insights that you gained into reassessments of the Signals and your organization's evolving strategies.



What else is on our Business Futures radar?

In addition to the six Signals highlighted in this report, we are currently tracking an additional 19 Signals on our radar.

Today

Signals of business change that are already reshaping business



Skilling at Speed: Organizations are building new skills among their workforces, as more traditional forms of work (e.g., cashiers) become obsolete.

From Places to Spaces: Organizations are reexamining their physical assets, as new behaviors like remote working affect when and how people use physical locations (e.g., offices, parks, stores).

Tell Me More: Organizations are more transparent about their operations (e.g., product sourcing, safety), as people increasingly seek clarity from, and confidence in, organizations that they interact with.

CEO as Statesperson: CEOs must respond to the demands of multiple stakeholders, particularly for engagement in ESG issues.

Doubling Down on Diversity: Organizations are enacting employment and leadership targets for all underrepresented groups, recognizing the interrelatedness of diversity, inclusion, and financial success.

The Return of the Problem-Solving Generalist:

To solve complex, cross-industry problems, organizations are developing more employees with flexible and broad-ranging skills rather than narrow technical competence.

Fair-Trade Data: Organizations respond to customer demands for privacy by developing new business models that restrict use of customer data and provide a clear return for the data they do use.

Company as Caregiver: Organizations are expanding ways to reward employees, catering not just to their financial needs but also to their needs around mental and physical health, life purpose, and employability.

The Zero Fixed-Cost Economy: Organizations are tapping into the benefits of digitization by using “as a service” models to reduce their fixed costs, or to replace their fixed costs with variable-cost alternatives.

The Peak Performance Workforce: To optimize productivity, organizations are investing in technologies that enhance the cognitive and physical performance of their employees.

Tomorrow

Signals of business change that will impact organizations in the next three years

From Remote Work to Virtual Presences: As remote work becomes the norm, organizations will embrace and integrate virtual work environments, modeled on reality (e.g., Digital Twins, Augmented Reality, Virtual Reality).

Rebirth of a Salesperson: Organizations will redefine the roles of salespeople, their toolkits, and their skill sets to respond to the shift to online B2B selling.

New Collectivization: Organizations will share a broader range of resources with each other—from people to infrastructure to manufacturing sites—to serve their customers better, faster, and more cost-efficiently.

Re-bundling the Unbundled: Organizations will aggregate their offerings, to tap into the growing consumer appetite for simplicity and ease.

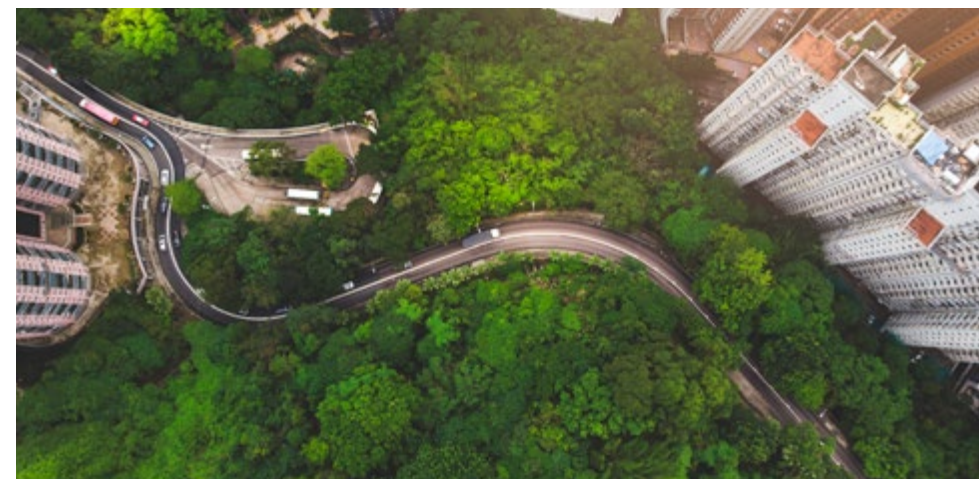
Multipurpose Infrastructure: Organizations will redesign their physical infrastructure (e.g., real estate, manufacturing plants) to use it for multiple purposes. Agility in execution will be key.

Changing of the Guard: Serving culturally and geographically diverse multi-generational workforces, organizations will reconsider their approaches to leadership development.

Capabilities are the New Industries: Organizations will redefine their competitive landscapes around core capabilities and services, rather than historical industry affiliations.

Remaking the Gig Economy: Organizations will tap the gig economy (e.g., ridesharing platform workers, independent contractors) to employ more people with creative and technical skills.

The Externality-less Company: Organizations will go beyond eliminating their carbon emissions, intentionally managing the impacts that their operations have on society and the world, especially related to biodiversity, mental health, and social justice.



About the authors

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Annette Rippert is Accenture's Group Chief Executive, Strategy & Consulting. S&C works with C-suite executives and boards of the world's leading organizations, helping them accelerate their digital transformation to enhance competitiveness, grow profitability and deliver sustainable value. Annette's global team of more than 40,000 people includes strategists and consultants, industry and function experts, data scientists and human performance professionals—with a collective mission to help clients apply data, analytics, artificial intelligence, assets and innovation to deliver business outcomes at speed and scale.

Annette co-sponsored the launch of Accenture's Cloud First initiative to address how businesses operate, connect with customers and embed continuous innovation. A strong champion for 360-degree value for clients, Annette directs her team to address not only economic value but also the value for their people, stakeholders and communities. Annette is a member of Accenture's Global Management Committee.

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Kathleen O'Reilly leads Accenture Strategy, which creates shareholder value and enables competitive agility by partnering with boards, CEOs and C-suite executives to define and answer their most strategic business questions, including growth, profitability, technology-driven transformation, M&A, operating models and sustainability. Kathleen's global team of more than 5,000 people includes strategists in 40 countries, serving clients across Accenture's global footprint in more than 120 countries and 40 industries. She is passionate about bringing innovation to clients, attracting and developing top talent, advancing inclusion and diversity in every aspect of her work, and strengthening Accenture's impact in local communities.

Kathleen has been recognized as one of *Consulting Magazine's* "Top 25 Consultants", named "Working Mother of the Year" by *Working Mother Magazine* and honored by The Stevie Awards as "Female Executive of the Year." She is also a member of Accenture's Global Management Committee.

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About the research

Accenture's Business Futures program is designed to track the Signals of business change that we think will shape the possible futures of organizations.

A three-step process was taken to compile Business Futures:

01. Crowdsource:

Our team of over 400 researchers constantly scans organizations, looking for examples of emerging business trends. We drew on the collective insights of our research team through a crowdsourcing exercise, with researchers submitting more than 400 Signals of business change. We also conducted in-depth interviews with members of Accenture's expert network—including representatives from across business, academia, and civil society—to understand the Signals of business change that they saw shaping the futures of organizations. The combined input was categorized and consolidated, resulting in an initial list of 30 Signals.

02. Prioritize:

We stress-tested the Signals observed by our researchers with our global community of over 2,000 managing directors from across Accenture's Strategy and Consulting services, as well as representatives from Accenture's broader businesses. They ranked the business impact and maturity of the 30 Signals through an online survey and put forward suggestions for additional Signals to consider. Leaders from across Accenture then discussed this input via a series of virtual workshops run by a team of design-thinking experts from our flagship R&D and global innovation center, The Dock. The workshops were used to further refine the list of Signals down to 25, of which six were prioritized based on four criteria: 1) their relevance to CEOs; 2) their potential business impact; 3) the breadth of their impact across industries and markets; and 4) their uniqueness.

03. Test and substantiate:

We used mixed research methods to test and further substantiate the six prioritized Signals and their implications for how organizations may work in the future. These included a survey of 2,650 C-suite executives situated in 18 countries and spanning 20 industries, in-depth interviews with our expert network, case study development, data science, and economic modeling. We also drew on quantitative analysis of 155 underlying forces driving the Signals across six thematic areas: societal, economic, geopolitical, environmental, technological, and consumer.

Going forward, we will continue to track all of the Signals on the Business Futures radar, using natural-language processing techniques to monitor the extent to which each of the Signals is covered by the media, as well as by company reports and earnings calls. These insights will also be used to identify new Signals.



Methods used to test and substantiate the six Signals

01. Learning from the Future

We wanted to better understand how organizations' desire to more accurately predict the future was impacting demand for different types of skills. To do this, we used data on quarterly job listings from 2014-19 for 794 companies compiled by Burning Glass, an analytics firm that tracks US job listings from over 40,000 sources. We started by reviewing Burning Glass's skills taxonomy and selecting a list of "skills clusters" (i.e., groups of specialized skills). We focused on clusters that relate to what we call "predictive" skills, such as data science and machine learning.

Next, we assessed whether demand for specialist roles related to "Learning from the Future" was increasing. We identified roles with "intensive" demand for the selected skill clusters (i.e., where at least 50% of the skills required for a role related to the selected skill cluster). We then assessed whether demand for these intensive roles was increasing faster than

demand for roles overall, as well as whether the proportion of intensive roles related to the skills cluster was increasing over time (i.e., whether the role was becoming more "intense"). We found that demand for these intensive roles grew 2x faster than the overall growth in roles listed in the last five years. We also found that the intensiveness within roles had also increased over time.

We then assessed whether demand for the skills related to "Learning from the Future" increased in roles more broadly (i.e., in roles not traditionally related to the selected skill clusters). For instance, has demand for roles that require machine learning increased only in roles involving data analysis or has it also increased in, say, marketing roles that did not traditionally require such skills? We found that demand for predictive skills in roles that were historically not predictive-skill intensive increased during the time period.



02. Pushed to the Edge

We wanted to better understand whether trade was becoming more regional. We used data from FactSet, a financial data and software company, on the evolution of the number and location of companies' customers and suppliers over time. We used data on 758 companies, for which data was available for 2010-11 and 2018-19. We compared the distribution of companies' customers and suppliers across six regions—North America, Latin America, Africa, Europe, Asia and the Middle East—between the two periods. We looked at the average number of relationships by region, as well as the total number of unique companies by relationship and region. We found that 62% of companies had suppliers closer to their customers in 2018-19 compared to 2010-11.

03. Sustainable Purpose

We wanted to better understand (1) the extent to which organizations' delivery on purpose matched their stated intent and (2) the extent to which organizations that do deliver on purpose financially outperform organizations that do not deliver on purpose. To do this, we first used data from Arabesque, an asset manager in which Accenture is an investor, on the level and consistency of firms' ESG activity as a proxy for their ability to deliver on purpose. (The Arabesque S-Ray composite ESG index tracks companies' actions across more than 200 ESG metrics. Updated frequently, the index uses machine learning and big data to draw on information from more than 30,000 sources published in 170+ countries.)

To assess the extent to which organizations' delivery on purpose matched their intent, we compared 1,043 companies' performance on ESG indicators from 2018-20 against the extent of discussion about ESG related-topics

during companies' earnings calls over the same period. We retrieved transcripts of earnings calls—covering both the initial presentation and the ensuing Q&A—from Dow Jones Factiva's database. We developed a list of keywords and phrases that captured relevant discussions related to ESG issues during the calls. We also compared earnings call paragraphs to the definitions of relevant ESG indicators used by Arabesque; specifically, we computed key sentence and phrase embeddings from indicator descriptions (using Bert pre-trained models) and compared these embeddings using cosine-similarity to find sentences with similar meanings.

Next, we fine-tuned the model and validated its accuracy. To do this, we manually reviewed and tagged more than 7,000 extracts from the earnings calls. Using keyword matching, the Arabesque topic proximity comparison, and the predictions of the fine-tuning model, we



tagged paragraphs related to at least one ESG dimension. Finally, we computed the number of times that ESG issues were discussed per earnings call held during the period. We then split companies into quartiles according to the extent of their ESG discussions and into quartiles according to their actual performance on ESG. Only 31% of the 261 companies that devoted the most discussion to ESG topics in their earnings calls (i.e., were in the top quartile) were also among the top quartile of overall performers on ESG. For 43% of the 521 companies that devoted an above-average share of their earnings calls to ESG topics, their actual performance on ESG indicators was consistently below average.

To assess the extent to which organizations that deliver on purpose perform better financially, we looked for statistically significant associations between ESG performance and financial performance in more than 8,300 companies during 2013-20. From this data, we created four controlled clusters of companies according to their ESG performance:

- Low (companies with ESG index scores at, or below, the lowest quartile for a given year and industry)
- Medium (within the interquartile range for a given year and industry)
- High (at, or above, the highest quartile for a given year and industry)
- Consistently high (at, or above, the highest quartile for all periods)

We used data from S&P Capital IQ to measure financial performance, and we focused on operating margin, net income and total return to shareholders. We then used empirical panel econometric regression models to determine the relationship between ESG performance and financial performance, with a focus on how the four clusters behaved. Our findings have coefficients significant at the 1% level.

04. Supply Unbounded

We wanted to better understand (1) changes to consumer views toward delivery and (2) the economic impact of overcoming the physical limits of distance with the help of new technologies.

To better understand changing consumer views, we ran a sentiment analysis, looking at digital media mentions over the last two years. First, we created a set of keywords based on eight categories: speed, sustainability, reliability, local sourcing, cost, quality, customer experience and transparency. We then used these keywords to analyze posts in the United States, United Kingdom, Canada and Australia. The types of sources covered included blogs, forums, microblogs, news platforms, professional reviews, employee reviews, comments, consumer reviews, Facebook, Instagram, Twitter, Tumblr and YouTube.

As we ran our analysis, we focused on the shift in net sentiment—i.e., the difference between positive and negative mentions, as a proportion of total mentions.

To capture the economic ramifications of overcoming the physical limits of distance through new technologies, we used a gravity model. (Gravity models predict trade flows between countries as a function of distance, GDP, common language, and historical trade relationships; gravity models also account for the effects of sources of friction to, or enablers of, trade, such as free-trade agreements).

Working with Frontier Economics, an economics consultancy, we augmented our gravity model to understand the increase in cross-border trade that results when new technologies reduce the distance between trade partners.



Relying on past studies of the effects of distance on trade, we then applied a percentage decrease of the distance effect in services and manufacturing for ten economies. (The ten economies are Australia, China, France, Germany, India, Japan, Spain, Switzerland, the United Kingdom and the United States.)

05. Real Virtualities

We wanted to better understand (1) the growth in VR and AR innovation and (2) changing demand for VR and AR skills.

To better understand the growth in VR and AR innovation, we used patent data as a proxy. Drawing on the Google Patents database, we identified patents that use “virtual reality” or “augmented reality” in their title or abstract. We then examined the growth in patents filed, published and granted for these fields over the past decade. We compared these results to overall growth in patents for all fields, to examine the relative focus and interest in VR and AR.

To better understand changing demand for workers’ skills, we analyzed job-listings data from Burning Glass (see “About the Research: Learning from the Future” for more detail about the data source). We analyzed both the number of job listings that required VR or AR skills and how that number has changed over time. We also examined the types of roles with VR- and AR-related skills in their descriptions. We found that such listings were led by technology-related roles, such as those classified as “software” or “design”. We found that VR and AR skills were also increasingly part of job descriptions in non-technology roles.

06. The New Scientific Method

We wanted to better understand (1) the economic impact of faster innovation processes and (2) the growth in cross-sector partnerships.

To better understand the economic impact of faster innovation processes, we worked with Frontier Economics to assess the extent to which using new technologies to reduce costs and accelerate testing and development in R&D could increase investment in innovation and boost GDP growth. We found that doing so would add 0.33 percentage points, on average, to the GDP growth rate in 2030 for the ten economies we studied—equal to US\$276 billion in additional economic growth, at 2019 price levels. (The ten economies are Australia, China, France, Germany, India, Japan, Spain, Switzerland, the United Kingdom and the United States.)

We started by identifying the “key sectors” that would benefit most from technology-driven time and cost savings in R&D testing



and development (based on expert interviews and case studies). The key sectors were pharmaceuticals, materials science, automotive, aerospace and smart cities. The R&D cost reduction for each of these sectors was based on estimating the proportion of R&D costs that come from testing and development (based on a literature review), as well as how much testing and development costs would fall when applying new technologies (based on a literature review and case studies). For other sectors, we assumed the effect to be half the average of the key sectors.

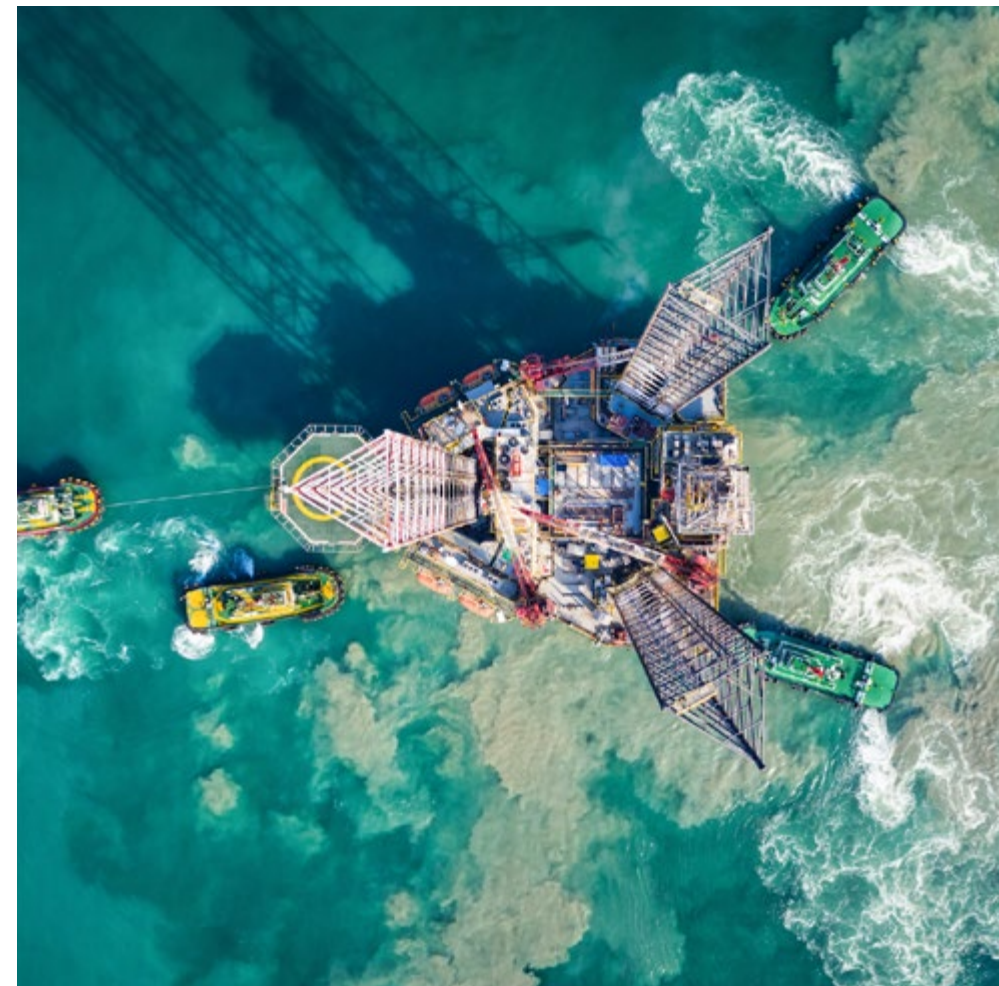
To estimate the total R&D cost reduction for each country, we multiplied the R&D cost reduction in each sector by how much R&D the sector conducts relative to other sectors.

To calculate the GDP impact, we first adjusted the total R&D cost reduction based on each country's ability to benefit from innovation, using the Global Innovation Index (an annual report produced by the UN and other organizations) as a multiplier. We then calculated the R&D intensity for the past five

years, using the increased R&D investment (which we assumed to be equal to the reduction in R&D cost) to calculate the new R&D intensity rate. To convert the increase in R&D intensity to an effect on GDP growth rates, we applied the social rate of return (which accounts for both the direct benefits and costs associated with investments in R&D, but also considers any positive externalities resulting from increased investment in R&D).

To better understand whether companies are creating more partnerships with organizations outside their industries, we used data from FactSet (see “About the Research: Pushed to the Edge” for more detail about the data source) to assess the number and industry of partners.

For the 826 companies in our sample, we analyzed the proportion of their partners that belonged to the same industry as the companies did. We also analyzed how this proportion changed over the past decade. We found that the share of cross-industry partnerships increased from 46% in 2010-11 to 57% in 2018-19.



Survey demographics

Business survey

Accenture Research conducted a global survey of 2,650 C-suite executives to assess how impactful each of the 25 Signals would be to their organizations, as well as to gain more detailed insights into how they were responding to the six prioritized Signals. The survey was fielded from March through April 2021. Respondents were C-level executives at large organizations situated in 18 countries and spanning 20 industries.

18 Countries

| | | | | | |
|----|-----------|----|-------------|-----|----------------|
| 4% | Australia | 5% | France | 1% | Norway |
| 4% | Brazil | 6% | Germany | 4% | Spain |
| 4% | Canada | 8% | India | 1% | Sweden |
| 8% | China | 4% | Italy | 6% | Switzerland |
| 1% | Denmark | 5% | Japan | 15% | United Kingdom |
| 1% | Finland | 6% | Netherlands | 19% | United States |



20 Industries

2%

Aerospace and Defense

6%

Airline, Travel, and Transport

5%

Automotive

5%

Banking (Retail or Investment)

3%

Capital Markets

6%

Chemicals

5%

Communications

5%

Consumer Goods

5%

Energy (Oil, Gas, Coal, Renewables, and other Energy)

5%

Health

5%

High Technology

5%

Industrial Goods and Equipment

6%

Insurance

5%

Media and Entertainment

5%

Natural Resources

2%

Pharmaceutical, Bio Tech and Life Sciences

5%

Public Service

6%

Retail

5%

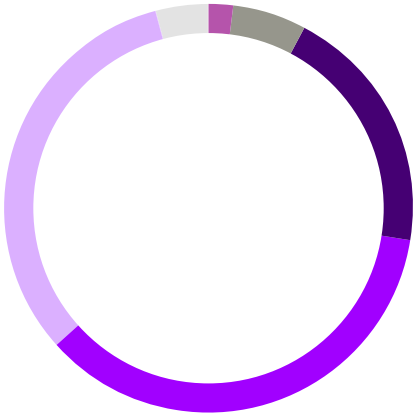
Software and Platforms

5%

Utilities

Revenues

- US\$50 billion or more
- US\$20 billion to US\$49.9 billion
- US\$10 billion to US\$19.9 billion
- US\$5 billion to US\$9.9 billion
- US\$1 billion to US\$4.9 billion
- US\$500 million to US\$999 million



Roles

- | | | | |
|-----|-------------------------------|-----|------------------------------------|
| 21% | Chief Executive Officer | 11% | Chief Operating Officer |
| 1% | Chief Digital Officer | 9% | Chief Sales and Commercial Officer |
| 11% | Chief Financial Officer | 10% | Chief Strategy Officer |
| 11% | Chief Human Resources Officer | 9% | Chief Supply Chain Officer |
| 3% | Chief Information Officer | 5% | Chief Technology Officer |
| 9% | Chief Marketing Officer | | |

Signals of business change

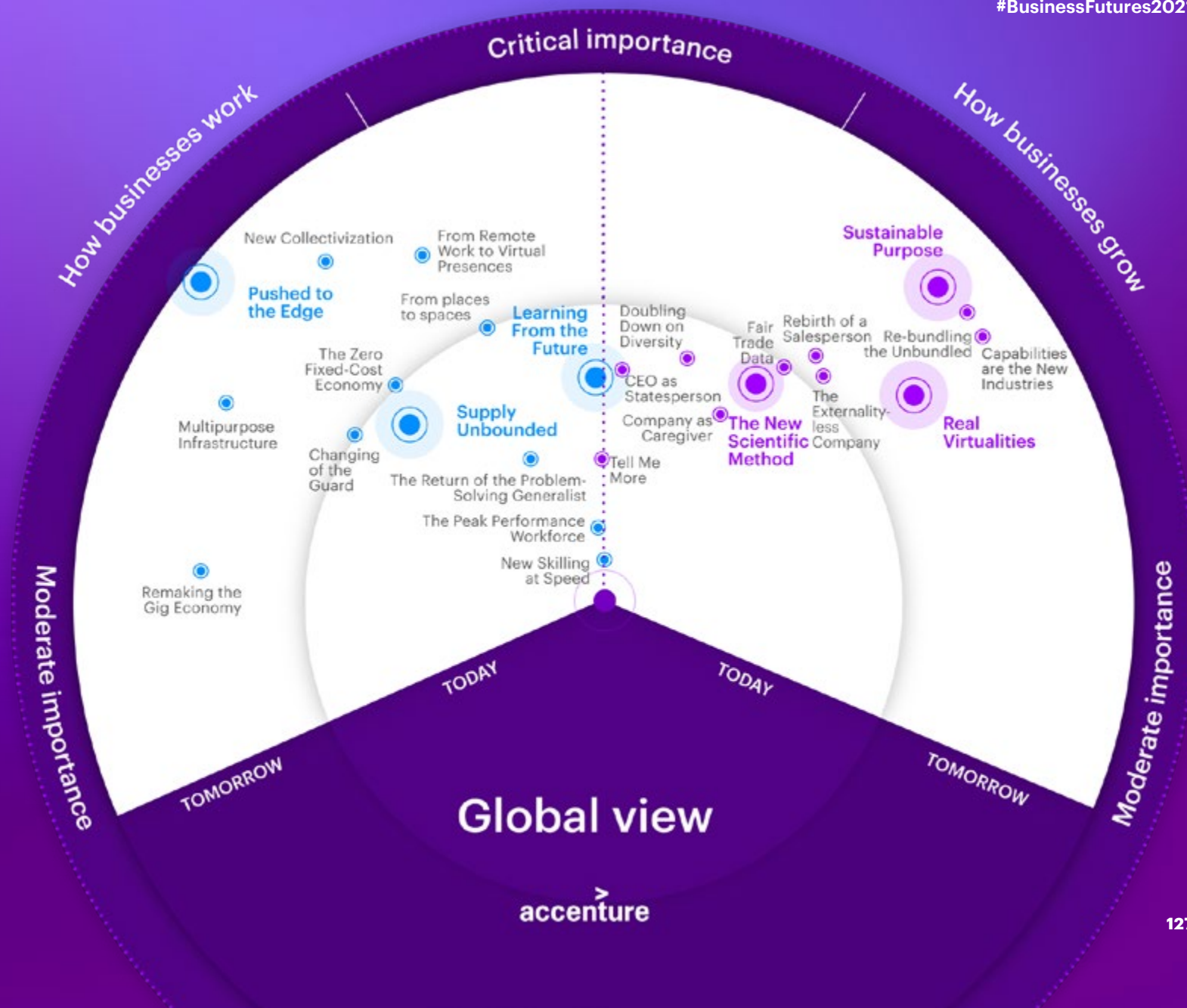
We used the responses from our C-suite survey to place the Signals on our radar based on two criteria:

Impact:

How important will the Signal be to the future success of organizations? The Signals are categorized into two areas: 1) changes to how businesses work, primarily affecting operating models; and 2) changes to how businesses grow, primarily affecting business models.

Maturity:

In what time horizon will the Signal mature and have its greatest business impact: today, or tomorrow (within the next three years)?



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- 8 Respondents were asked how confident they were in their current ability to foresee and respond to future events in 6 areas: business environmental changes that affect our strategy; financial and regulatory changes that affect our liquidity and solvency; economic, environmental and behavioral changes that affect customer sentiment and demand patterns; labor and work design changes that affect workforce sentiment and availability; failures in manufacturing processes and equipment; bottlenecks in your supply chain. Only 6% of respondents were completely confident of their foresight in the majority of the 6 areas.
- 9 Respondents were asked when they expected technology to make it possible for them to be completely confident in their ability to foresee critical events across the 6 areas. 41% of respondents said that technology would make it possible for them to be completely confident in their ability to foresee critical events in the majority of the 6 areas within the next 3 years.
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06. The New Scientific Method

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