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The pandemic has rapidly advanced technology strategies and agile ways of working.

Digital acceleration in the time of coronavirus

Business decision-makers around the world were collectively blindsided by the scale and speed that working environments changed as a result of the 2020 coronavirus pandemic. At the same time, a recent survey by MIT Technology Review Insights, in association with VMware, finds that most had inadvertently prepared for the pandemic. More than eight out of 10 North American organizations had already made significant investments in their digital infrastructure and related operational processes — allowing them to take the massive global shift to remote work and online business in stride.

Nearly two thirds (62%) of North American respondents indicate they had business-continuity plans in place, although for many organizations, these were oriented on traditional notions of disaster recovery. "We're used to dealing with emergencies like

tornadoes or hurricanes," says Debika Bhattacharya, vice president for global solutions at Verizon Business Group. The telecom company had a business-continuity team that was focused on bringing the corporate network back into operation after an outage. This changed since the pandemic. "It became more about, 'How do we make sure that we're caring for the well-being of employees who are now working from home?'" Bhattacharya says.

In response, Verizon stepped up communication with its people, with daily video check-ins to determine what employees needed to work from home, be it child-care funding or office equipment. If employees had poor internet service where they lived, the company added additional capacity or otherwise looked to see how it could help. "The focus shifted from just fixing the network to making sure employees are productive," Bhattacharya says.

Verizon's experience points to an important distinction between planning for business disruption — usually a momentary event affecting a portion of an organization's operations — and operating effectively in the pervasive, lengthy pandemic. While a majority of survey respondents had continuity plans, less than half (46%) of them report that these plans were effective.

Yet for a subset of the respondents, there was no doubt over the effectiveness of their business-continuity plans. The linchpin is digital transformation — the incorporation of modern technologies into an organization's processes or strategies to achieve business goals. Organizations that have fully implemented digital transformation projects — a cohort we'll call "digital leaders," representing roughly

Key takeaways

1   **The coronavirus pandemic has accelerated digital transformation strategies.** A third of North American technology executives, responding to a global survey, are increasing their investments, indicating that organizations are speeding up what were once multi-year technology plans.

2   **Remote working is more than a product of the pandemic — it's the next chapter in the future of work.** Formalizing new work-from-home policies and keeping data and applications safe from rising cyberattacks are top employee-experience priorities for more than two thirds of businesses, as they rush to articulate the new world of work.

3   **Technology executives report that the use of agile IT delivery methods is the most urgent customer application development priority.** Nearly 60% of North American organizations are expanding their use of agile techniques and technologies, as customer experience channels become more software-defined, and focusing on how to quickly reduce gaps in application portfolios to keep pace with customer demands.

15% of North American respondents — all report their recovery plans were effective, and nearly 40% say they were very effective. These organizations made investments in technologies that kept them adaptable and resilient before the pandemic, so they were aptly prepared for the disruption that would follow. Now, at the fore of a

About this series

This MIT Technology Review Insights report is part of a series examining the degree to which business preparedness, particularly in technology strategy, contributed to corporate resilience during the ongoing coronavirus pandemic in three world regions: Asia-Pacific, Europe, and North America. Based on survey research and in-depth executive interviews, the series also seeks to understand how technology priorities are changing as a result of ongoing business-continuity efforts.

- In July and August 2020, MIT Technology Review Insights, in association with VMware, surveyed 600 senior executives with technology decision-making responsibilities. More than half of respondents are CIOs, and 40% are other C-level executives.

- Executives who responded to this survey are split evenly among the three regions —

Asia-Pacific, Europe, and North America. This report focuses on North America.

- Respondents work in half a dozen industries; financial services, at 20%, represents the largest response group, followed by 17% each in manufacturing, retail, and government.

constantly changing business landscape where disruption is routine, they're primed to succeed.

'We very quickly scaled up'

Digital leaders see their relatively smooth shift to all-remote working environments and digital channels as proof that their digital transformation efforts are working. "Our new CEO recently led our organization through a strategic planning process meant to see us through 2030, and digital platforms were a huge part of it," explains Mark Wehde, chair of engineering at Mayo Clinic in Rochester, Minnesota. "We envisioned the hospital of the future, moving away from large, complex care centers for routine care to community hospitals and even to people's homes through the use of remote monitoring tools and AI [artificial intelligence]."

When the pandemic hit, "there was a lot of scrambling," says Wehde. The organization realized it needed the digital platforms it was planning for immediately. "We need to be able to treat our patients remotely. We need to keep them home as much as possible." While the crisis revealed that Mayo's digital transformation was moving in the right direction, it was imperative that they pick up the pace to future-proof against coming unknowns: "We thought we were being pretty bold with our 10-year plan, and what we've realized is we probably weren't bold enough — that we actually do need to accelerate this even more. Our 10-year plan was now a two-year plan."

The survey results show most organizations pivoted their digital strategies with similar dispatch. Eighty percent of North American respondents believe digital transformation at their organizations has been speeded by the pandemic, slightly higher than the global average of 75%. Nearly all (93%) of the digital leaders surveyed in North America say their digital transformation has accelerated.

"Our 10-year plan was now a two-year plan."
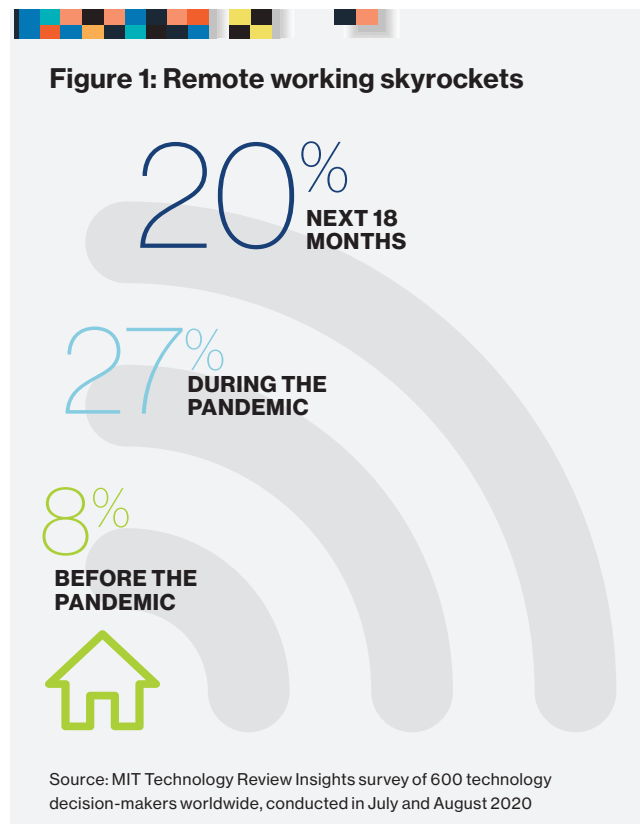Mark Wehde, Chair of Engineering, Mayo Clinic

Terminology

In this report, **"digital leaders"** are survey respondents whose organizations have fully implemented and deployed at least one digital transformation project and whose contingency plans during the coronavirus pandemic were considered effective.

"Digital transformation" is the incorporation of modern technologies into an organization's processes and strategies to achieve business goals such as improving customer outcomes or operational agility.

While there is a new sense of digital-investment urgency, these organizations aren't starting from scratch. At Mayo, much of the technology that makes business during the pandemic possible, such as the now-ubiquitous communications tools like Zoom, already existed. "But what wasn't there was the appetite for it. The healthcare providers didn't want it, the patients didn't want it, and insurance companies and government agencies weren't supporting it in terms of reimbursement," Wehde says. That's all turned around now. Over just a few months, the organization has moved approximately a quarter of its 63,000 employees to their homes. But the migration won't stop after the pandemic, Wehde adds. "On the administrative side, for those of us that don't see patients, our target is to get about 50% of us working remotely long term."

The shift in remote working has been a dramatic one. North American survey respondents had, on average, only 8% of their workforces regularly working remotely

Figure 1: Remote working skyrockets

20% NEXT 18 MONTHS

27% DURING THE PANDEMIC

8% BEFORE THE PANDEMIC

Source: MIT Technology Review Insights survey of 600 technology decision-makers worldwide, conducted in July and August 2020

before the covid-19 lockdowns (see Figure 1). This shot up to 27% during the crisis and was much higher in technology-intensive industry sectors such as telecommunications (37%) and financial services (34%). Some organizations have undergone even more radical transformations. Bhattacharya says digital transformation investments allowed Verizon to hit the ground running. When the lockdowns started, "we had to actually get additional bandwidth because now we had more people joining through the VPN than we ever had before." The telecom added bandwidth to support 110,000 employees using the corporate virtual private network to connect to its systems, compared with just 20,000 before the pandemic.

"We very quickly scaled up in our data centers, and then some of our cloud apps, with the same level of performance," says Bhattacharya. Verizon's customers also benefited from earlier tech investments. Those that had installed virtualized networks or had started moving to the cloud adapted much faster. They didn't have to order hardware to add capacity, for example, and they didn't have to wait for delivery. "It ended up helping them during the pandemic because traffic patterns changed, and they could just virtually increase or decrease capacity when needed," Bhattacharya adds.

Digital leaders take a budgeting cue from the crisis

Digital leaders that had already made significant progress with digital transformation before the pandemic expect their IT budgets to stay the same or expand. With technology proven a key business enabler through the pandemic, a time of belt-tightening for many organizations, digital leaders got to keep or increase their budgets. But they didn't need a big surge in spending on tech initiatives to ride out the pandemic.

The crisis, then, was a catalyst for reviewing IT and technology budgets. Half of North American digital-leader respondents report that their 2020 IT budgets will be the same, and a quarter anticipate modest (less than 10%) increases. By contrast, a large percentage (42%) of respondents who are only "considering" digital transformation will see their budgets decrease in the coming year.
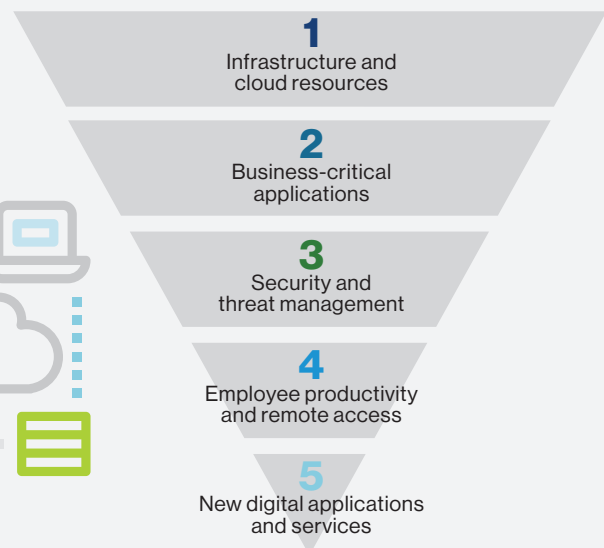
The broad theme of digitally forward organizations preserving or increasing IT budgets plays out differently across different industries: very few — one out of 10 on average — of the respondents from financial services, health care, and telecommunications indicate that they are only considering digital transformation. These industry sectors are typically knowledge-intensive and, consequentially, rely heavily on technology to make business decisions. Unsurprisingly, the majority are already fully engaged in multiple digital business projects. As such, some 40% of respondents in these industries are increasing their IT investments in the coming year.

But just 24% of manufacturing-sector respondents say they will grow their budgets, and 46% say they are cutting back. This correlates to the lower levels of digital transformation in manufacturing; a relatively low 57% of manufacturing respondents say they have implemented such projects. At first glance, this does not square with the global rise in "industry 4.0" projects — nearly every

Figure 2: IT Priorities during lockdown
Technology executives report that in the middle of the pandemic the most important IT priorities were ensuring infrastructure and security could support the most important applications.

1 Infrastructure and cloud resources

2 Business-critical applications

3 Security and threat management

4 Employee productivity and remote access

5 New digital applications and services

Source: MIT Technology Review Insights survey of 600 technology decision-makers worldwide, conducted in July and August 2020

factory operator today speaks of becoming a "smart factory," where AI, the internet of things, and robotics converge to automate production lines and run with big data insights and increasingly predictive capabilities. But research shows that for many manufacturers, such advances are still mostly aspirational: a 2020 survey by IoT Analytics into smart manufacturing trends shows that only 30% of producers are using any of these technologies extensively.[1]

When survey respondents were asked to indicate which technology objectives their organizations prioritized during the pandemic, infrastructural efficiency came out on top — as noted by Bhattacharya, who pointed to the importance of core infrastructure and the utility of scalable cloud resources in helping organizations operate efficiently during the lockdown (see Figure 2).
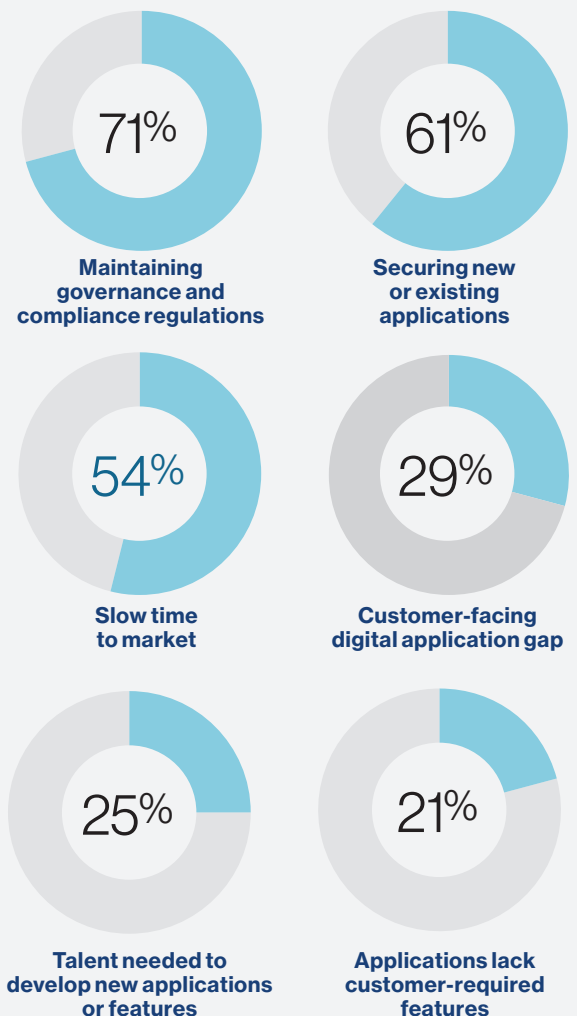
Sanjay Poonen, chief operating officer at VMware, says an important, sometimes overlooked factor in remaining competitive during a time of upheaval is putting people first — prioritizing employees and customers ahead of profits. "When you are able to empathize with employees and customers you do not have to compromise the profits of the firm because you have more productive employees and more engaged customers."

There's a cloud app for that

Organizations are increasingly pursuing cloud-based customer applications, although survey responses don't reveal that the crisis has moved the adoption needle much, largely because of high levels of pre-crisis digitalization. North American respondents indicate that before the pandemic, 18% of their customer-facing applications were hosted in the public cloud. That grew to 23% in the midst of the crisis, and respondents believe it will creep up to 27%. Digital leaders report slightly lower levels of

Figure 3: Top application challenges
Nearly three quarters of digital leaders report that keeping their applications compliant is a challenge. They're more adept at delivering the features customers expect.

71%
Maintaining governance and compliance regulations

61%
Securing new or existing applications

54%
Slow time to market

29%
Customer-facing digital application gap

25%
Talent needed to develop new applications or features

21%
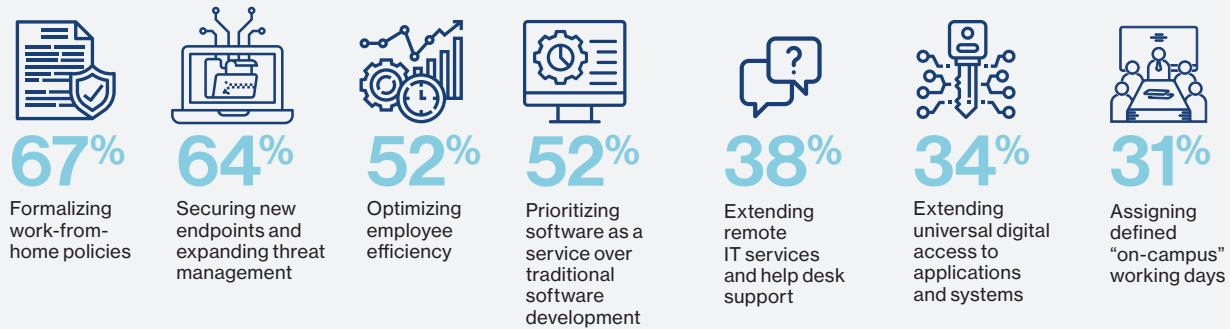Applications lack customer-required features

Source: MIT Technology Review Insights survey of 600 technology decision-makers worldwide, conducted in July and August 2020

current and planned public cloud adoption. This doesn't suggest that digitally forward firms are not hosting on the public cloud — but that they have a more distributed, hybrid, or multi-cloud IT approach.

Keeping up with fast-changing customer demands is the key challenge with customer-facing apps: 71% of digital leaders in North America say compliance is their primary challenge, 61% say security is a chief concern, and 54%

Figure 4: Future workplace priorities The experience of covid-driven upheaval fresh in their minds, North American tech executives expect to formalize policies governing remote work, bolster security for remote workers' laptops and devices, and keep employees productive wherever they are.

67%	64%	52%	52%	38%	34%	31%
Formalizing work-from-home policies	Securing new endpoints and expanding threat management	Optimizing employee efficiency	Prioritizing software as a service over traditional software development	Extending remote IT services and help desk support	Extending universal digital access to applications and systems	Assigning defined "on-campus" working days

Source: MIT Technology Review Insights survey of 600 technology decision-makers worldwide, conducted in July and August 2020

say they were too slow to develop applications to meet customer expectations (see Figure 3). But digital leaders' progress in application deployment help set them up for the rigorous app needs of today. They are less likely to report difficulty in finding the right talent to develop applications, for instance (just 25% of them did), or say they have a "customer-facing digital application gap" (29%).

At Boston Children's Hospital, where the pandemic triggered "a significant acceleration of things that were already in our pipeline," says chief information officer Dan Nigrin, a number of fresh cloud-based initiatives were also hatched. For example, Nigrin's team has been

42%

of respondents who are only "considering" digital transformation will actually see their budgets decrease in the coming year.

increasing the amount of patient administration that can be performed remotely. "We don't want to have patients sitting in waiting rooms filling out forms. We don't want them to be doing their consents prior to a surgery or procedure there in the hospital," Nigrin says. "We want to streamline things and have interactions be as much as possible done remotely." The existing cloud-based patient portal has seen "an explosion of utilization."

The future of work is at home

By any measure, the pandemic has led to a fundamental shift in working practices. Lockdowns have shuttered factory production lines and sent office workers home in droves: a PwC survey of 120 US executives conducted in June found that three quarters of staff are telecommuting at least once a week, and they anticipate that more than half will do so long after the crisis.[2] The remote-work tilt is also driving data access demand to new heights: property consultancy CBRE recently noted that while demand for corporate office space is weakening in a world working from home, data center vacancy in the greater New York area has dropped to under 10% — the lowest rate in years — prompting a data infrastructure investment boom.[3]

Though more than a quarter of North American respondents report they're working remotely full time — a 250% increase on pre-crisis levels — they anticipate this will fall back once restrictions ease, but on average 20% of their workforces will remain at home. As a result, articulating new work-from-home policies has become a clear priority for organizations to improve productivity and employee engagement (see Figure 4). Some 67% will increase

management time and effort to codify remote work practices. At the same time, North America is seeing a slight increase in priorities to create official "on-campus time" — implying that for most organizations, the entirety of their world of work is undergoing a profound cultural and operational shift.

Having a large remote workforce poses a number of fundamental challenges for IT managers, with 41% pointing to the difficulty of maintaining adequate band-width levels for optimal network management. Again, pre-crisis digital transformation progress has mitigated this for some: the ability to scale bandwidth up and down quickly has been a major utility for Verizon's own enter-prise clients. Bhattacharya estimates that the vast majority now avail themselves of dynamic bandwidth capabilities. But while these tools allow efficient IT resource management at the organizational level, a more grass-roots challenge has emerged: contention for bandwidth at home. "You could have somebody on an all-hands call, and suddenly the video quality dips because their kids started playing video games," Bhattacharya says.

Leading organizations see the remote-working present as an opportunity to increase investment in employees' digital skills. Almost a third of North American digital leaders are planning to increase training budgets — compared with 19% in North America and 26% globally — suggesting that tech-forward companies aren't ignoring ongoing training in a fast-paced digital transformation environment. While much of this training is likely "routine maintenance," Bhattacharya points out that the new world of work has also revealed a potential knowledge and skills gap in cybersecurity. "There is now a new threat landscape: people working at home create new end points, and while their corporate laptops are locked down, their personal devices — mobile phones, iPads — could be attacked. Phishing attacks have gone up, so we've provided a lot of training around responses to these increased threats."

At Boston Children's Hospital, Nigrin agrees keeping a remote workforce safe from cyberattacks is a serious challenge: "The theoretical attack surface that these attackers have the ability to go after is so much greater than before, and there are so many more variables." But he also says the threat isn't fundamentally different from when people were in office towers or business parks. "It's

57%
of North American respondents see agile application development as a growing focus.
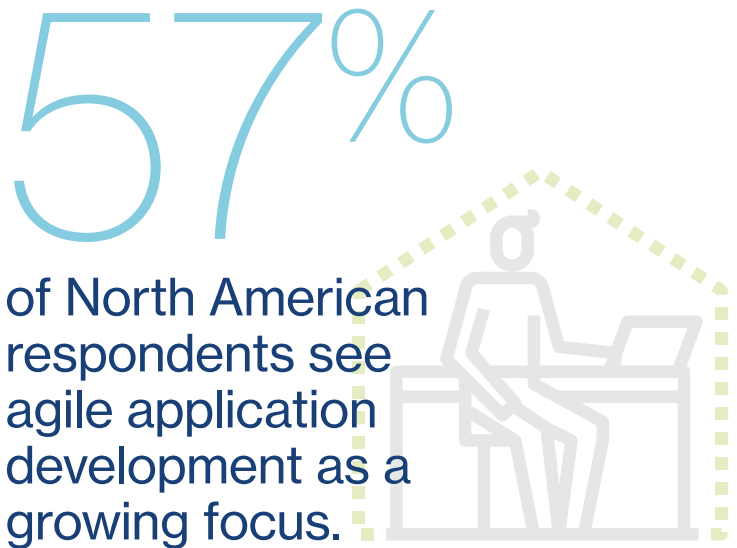
Figure 5: Pandemic-driven tech priorities
For digital leaders, pushing ahead digital transformation projects is the greatest priority. Adopting a modern application development platform is next, followed by automation of manual processes.
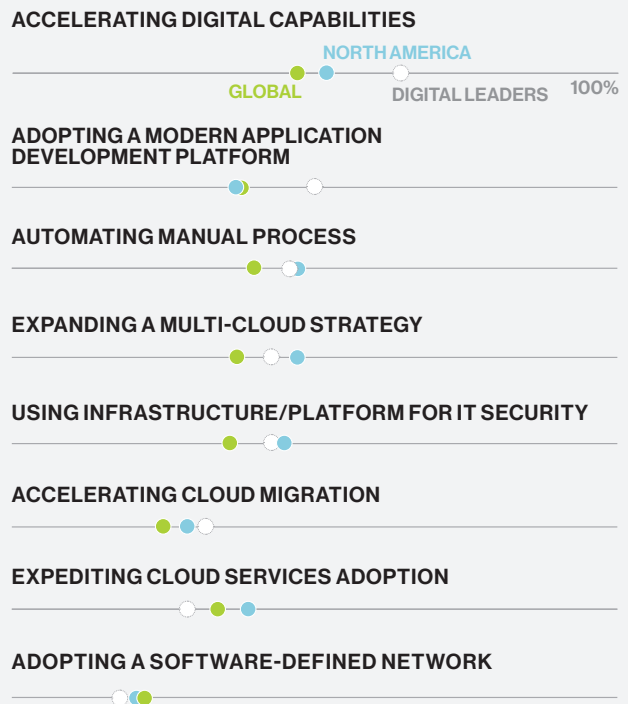
Source: MIT Technology Review Insights survey of 600 technology decision-makers worldwide, conducted in July and August 2020

simply a shift in terms of where the bulk of the activity is happening, what devices it's happening on." As far as actions to take in the new reality, "especially now that we've got our feet planted a bit better, past the first month or two, we've got to circle back and make sure that all of those things are as tight as possible."

Rethinking everything in a post-pandemic world

With several months of pandemic experience behind them, digital leaders are the most aggressive overall about the need to accelerate digital capabilities. Nearly two thirds (64%) of digital leaders say this would be more of a strategic priority over the next 18 months, compared with 52% of North American respondents and 47% globally (see Figure 5).

The respondents who rank this as a priority mainly come from already "digitally transformed" industry sectors: roughly 60% of respondents in the tech-forward financial services and health-care sectors say they're further intensifying digital transformation efforts. Here, too, manufacturing respondents indicate they are less digitally mature: only 28% of manufacturing-sector respondents are increasing infrastructure development plans over the next 18 months.

Increasing the use of agile, continuous-delivery methods in application development is, globally, the area of greatest increase for operational priorities. This is also true for North American respondents, 57% of whom see this as a growing focus over the next 18 months. So organizations see the need to reorganize, but expanding development teams is not how they'll get more applications faster: 35% of respondents in North America (and 25% of digital leaders there) indicate that they'll de-emphasize efforts to expand development teams, regardless of whether they're in-house or outsourced. Growing teams is an increased priority for just 19%.

Reducing the size of application development teams is in keeping with agile development methodologies, which do not dedicate resources to digital projects so much as acquire or build them on demand. The added emphasis on digital transformation implies that developers are going to be forced to produce and release IT capabilities more often, with no more head count in the near term. When coupled with other agile management practices, such as aligning business performance goals to team and individual objectives, research has shown that significant productivity gains can be made in a short period.[4] Markus Levy, director of AI and machine-learning technologies at NXP Semiconductors, observes, "companies are always trying to cut resources or improve efficiencies" through the exploitation of analytic insight, and AI technologies allow organizations to do this "without having to hire a data scientist."

The emphasis on speed and, at a fundamental level, the whole notion of "transforming" is driving organizations like Mayo Clinic. Wehde says a guiding lesson of the pandemic is that the future-forward tech projects started before will be critical after. For example, as part of the organization's "hospital of the future" vision were considerations like demographic changes in the United States — people moving to urban areas, leaving fewer people in rural ones, with fewer health-care options, Wehde says.

"You could have somebody on an all-hands call, and suddenly the video quality dips because their kids started playing video games."

Debika Bhattacharya, Vice President for Global Solutions, Verizon Business Group
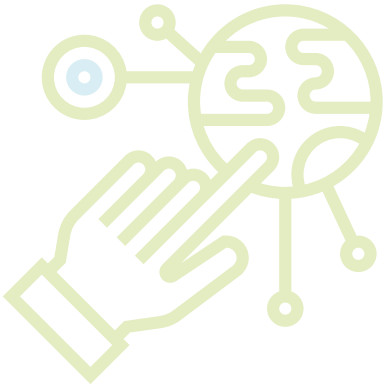
"I think [the pandemic has] shown that everything we thought was a thing, was a thing."

Mark Wehde, Chair of Engineering, Mayo Clinic

Now, the organization is looking to extend remote care, which has gained in acceptance during the pandemic, by employing robotic surgery. "We have specialists that do surgeries at a volume that nobody else in the world does. There might be particularly complex surgeries that a surgeon elsewhere will do once or twice a year, that we do routinely," Wehde says. "How do we leverage that and use robotic technology to do remote surgeries or to do assistance?"

Mayo is also working on visionary projects like integrating haptic technologies — which create the experience of touch — into remote patient exams, Wehde says. "A primary care visit is that touch and feel, being able to feel their lungs or their nodules, your abdomen."

Wehde admits some of the technologies his team is exploring "aren't quite ready for prime time," but the underlying point is the disruption triggered by the pandemic confirmed that Mayo and other digital leaders are on the right track. The technology projects they were rolling out and conceiving and piloting were real — and would have real impact. The pandemic proved it.

"I think it's shown that everything we thought was a thing, was a thing," Wehde says.

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