

THE IMPERATIVE FOR PREPARING FOR THE FUTURE OF WORK

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Emerging Technology

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As business leaders, many of us are intrigued and a little anxious about the future of work.

Today, more than anytime in recent memory, we see emerging technology promising to completely transform how, where, and when employees do their jobs. We know, on the one hand, that all of this change presents unprecedented opportunity to dramatically improve productivity, business operations, and competitiveness. Yet we worry that innovation is coming along so quickly that it can be difficult for organizational leaders to pinpoint how to direct worker time, energy, and resources.

To that end, Microsoft, a company committed to enabling employees and organizations worldwide, recently partnered with Harvard Business Review Analytic Services to ask more than 600 business leaders around the globe what they think work will be like in 2040. In addition, we connected with academics, technologists, and our customers to learn firsthand how they envision the future of work.

The results of this effort are intriguing. For instance, whereas many people worry about technology supplanting human beings, the leaders we connected with were more optimistic. Most saw technology adapting to how we work—not the other way around. At the same time, business leaders said they believe automated technologies, such as artificial intelligence and machine learning (ML), will create more jobs than they displace in the long run. Additionally, many said they expect communication and collaboration tools to empower more employees than ever before to contribute to business-critical decisions across far-flung and distributed organizations.

These are exciting times, to be sure, and many of us are in the middle of trying to decide how best to capitalize on future-of-work technologies against a backdrop of uncertainty and doubt.

For that reason, we encourage you to read our white paper, “The Imperative for Preparing for the Future of Work.” We think you will find this paper both informative and enlightening as you consider what the future will hold for the modern workplace.

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EXECUTIVE SUMMARY

The way work gets done has been evolving for centuries, but seldom faster than it has in recent years as the digital revolution disrupts one industry after another. Even so, many experts believe changes in how people work will accelerate even more over the next few decades.

The catalyst in many cases will be technology that is currently still very much in its infancy, including artificial intelligence (AI) and machine learning (ML), robotics, the internet of things (IoT), virtual reality (VR), and augmented reality (AR). Socioeconomic factors will also play a role as younger generations stream into the workforce and challenge old workplace norms.

Many businesses recognize they will need new technologies to enable better collaboration between employees and business partners and to help them pull deeper insights from ever-growing amounts of data. Organizations unable or unwilling to embrace technological change will likely put themselves at a competitive disadvantage, not only from a performance perspective but also in their efforts to attract top talent.

To test this hypothesis, Harvard Business Review Analytic Services recently surveyed more than 600 business and IT decision makers from a wide number of industries around the world about how they see work evolving between now and 2040. And more than a dozen senior executives and academics in fields like AI and organizational structure were interviewed. Among our key findings:

Technology and human beings will become collaborators. Whenever there is advancement in automation technology, fears that it will put too many people out of jobs naturally arise. Employees performing more mundane tasks could, indeed, have to find new work. But survey respondents believe powerful new technologies like AI and ML will actually lead to long-term job creation as they work seamlessly in the background to help employees perform smarter, faster, and more efficiently.

Ambient technology will conform to human behavior. Business leaders recognize that coming innovations will help employees do their jobs faster, better, and far more productively. Many expect technology to energize the work environment—seamlessly supporting and engaging people more efficiently as they collaborate with one another and move between tasks. But they also believe organizations will need to provide ongoing technical training and upskilling opportunities for workers so they can get maximum value from those tools.

HIGHLIGHTS

72%

OF SURVEY RESPONDENTS SAY AI IS LIKELY TO HAVE THE MOST TRANSFORMATIVE EFFECT ON THE WORKPLACE BETWEEN NOW AND 2040.

68%

SAY AI WILL ALLOW THEM TO BE MORE PRODUCTIVE.

67%

EXPECT AI TO BECOME A ROUTINE AND COMMODITIZED COMPONENT OF EVERYDAY WORK.

Some business leaders believe the workplace of the future won't be a place people occupy—at least not fulltime—but **a collection of locations tied together** by digital connections.

Data democratization will empower more employees to make strategic decisions. Companies have been trying to streamline organizational hierarchies for decades, but by using digital technology to make information more readily and widely available, almost any authorized employees in the workplace of the future will be able to quickly understand what their employers are doing, and why, and will be empowered to make business-critical decisions. Leaders believe this democratization will ultimately lead to more flattening of organizational structures.

Employees will turn to dynamic talent networks to get work done. The survey makes clear that, in the future of work, teams may look vastly different than they do today. Leaders anticipate that organizations, in an effort to stimulate more creativity and innovation, will look to build teams possessing diverse experiences, skills, and perspectives. Given that, future workforces will have a blend of full-time employees who span organizational boundaries and gig workers who span geographical locations. There will be less emphasis on having subject matter experts with specific domain expertise and more on building teams with strong networking skills to complete projects that power the organization.

Corporate cultures will prioritize workplace technology. Some business leaders believe the workplace of the future won't be a place people occupy—at least not full time—but a collection of locations tied together by digital connections, including communication and collaboration technologies that will continue to transform over time. In this view, the future workplace will be more of a

conduit for getting work done than a physical hub where people assemble.

Security, privacy, and the elimination of bias will underlie everything.

New workplace technologies won't be able to deliver on their promise if stakeholders, including employees and customers, aren't able to trust that their online activities are free of bias and that their personal information is protected. Security and privacy safeguards will need to be built into all of the technology enabling employees to communicate, collaborate, and share information.

Technology and Humans Will Collaborate

While many believe that AI and ML are still in nascent stages, rapid advances in recent years, and the rise of familiar AI consumer applications like online product recommendations and virtual assistants, have more businesses paying attention to them. For example, 53% of survey respondents foresee widespread availability of virtual assistants for people at work.

As these powerful technologies mature, they will automate many previously tedious processes so workers can spend more time focused on higher priorities. These technologies will deliver fast, data-driven recommendations to help employees make smarter strategic decisions. Over time, many believe, these technologies will become mostly ambient, operating in the background and seamlessly conforming to how people work, making them more productive and enabling more meaningful and actionable insights. In short, technology will collaborate with workers to make smarter strategic decisions while assuring productive communication and collaboration across organizations.

"My view is that a lot of the technology we will get or are starting to see right now will bring a huge burst forward in productivity, not only on the manufacturing side of business but also in the office environment," says Mario Mueller, corporate director, group IT integration and services, for German automaker Volkswagen. "This includes technology for sharing information, for working together, and for handling many processes that today are dependent on human labor."

This is where business leaders see huge potential. Although many different technological developments have hit their radar, nearly three-quarters (72%) of survey respondents say AI is likely to have the most transformative effect on the workplace between now and 2040, far outpacing other technologies such as robotic process automation (32%), cloud computing (29%), and IoT (27%).

The functional areas expected to benefit most from intelligent robots, intelligent automation, and other technologies are supply chains and logistics, e-commerce, and IT—cited in each case by 81% of survey respondents. Nearly as many (77%) cite operations/production, followed by security (72%). Sales and business development (43%), human resources (40%), and executive management (29%) are expected to be the least impacted. Naturally, different companies will take advantage of new technologies at different times and at varying scale.

The ability of machines to mimic human thinking and behavior has many people worried about the prospect of machines performing human jobs. But business and IT leaders surveyed don't seem as concerned. Most (68%) say AI will allow them to be more productive; 67% expect it to become a routine and commoditized component of everyday work; and only 33% believe it will eliminate more jobs than it creates.

"One of the big myths around AI is that it will be harmful," observes Peter Stone, professor of computer science at The University of Texas at Austin and cofounder of the AI company Cogitai. "People become scared because they

hear something like an AI program has beaten the world Jeopardy! champion or the world chess champion. They feel like AI must be smarter than them, and able to do everything they can."

How companies respond to such fears will matter, in terms of both their public image and their efforts to engage with employees to figure out which bits of work should be automated and which retained by humans. After all, workers worried they could lose their jobs by sharing information about how technology could replace them aren't likely to be very forthcoming.

"I don't think we know at all yet what overcoming this hurdle will require," says John Boudreau, professor of management organization at the University of Southern California's Marshall School of Business. "For example, would it be worth it to commit that we won't automate until we've given employees a chance to get ready for that?" Organizations that figure out how to open the lines of communication with workers and fully unlock their knowledge, he suggests, may find themselves "miles ahead" of those that don't.

Other observers note that rather than being something for the average worker to fear, technology should be viewed as a friend and collaborator. It can help people be better at their jobs, they say, by eliminating distracting "busy work" and arming them with insights to improve.

Lee Branstetter, lead faculty for the Block Center's Future of Work Initiative at Carnegie Mellon University's Heinz College, even argues evidence will emerge that the combination of human and machine—as opposed to the wholesale replacement of humans by machines—will be the most powerful outcome for companies that embrace advanced technologies.

"Humans are very resistant to change in general," Branstetter says. "Evidence will emerge that this combination of human intuition and machine power is really powerful. Organizations that can adequately harness it are going to do better than organizations that resist it."

Ambient Technology Will Conform to Human Behavior

In the past, many business leaders have been unsure of new technologies like AI and slow to embrace them. Others cradled innovation but struggled to get buy-in from their employees.

In the new world of work, leadership will have little choice but to move more quickly to integrate promising new technologies that conform to the way people, especially younger generations, prefer to work. It will have to be ambient, intelligently working in the background to help people in more distributed workforces generate fresh and innovative ideas on behalf of their employers. The key to success will be to deploy tools that people can wrap their arms around, feel comfortable with, and use in their daily regimens.

According to Volkswagen's Mueller, "If you don't start now, or even yesterday, you will be out of the market." The challenge isn't one of just technological expertise or will, he adds, but also of culture and hubris, especially at large and successful enterprises. In other words, in the new world of work, it's simply dangerous to believe that just because an approach made a company successful in the past, it will continue to do so in the future.

"If you are thinking you are the greatest, the biggest, that you have all the success, you might also be thinking, 'Why should we change?'" Mueller says. "We have to make it part of the mindset that no matter how successful we have been in the past, we have to be willing to change if we want to continue to be successful. We have to be open-minded. And we have to act now."

MOST (68%) SURVEY RESPONDENTS SAY AI WILL ALLOW THEM TO BE MORE PRODUCTIVE.

Putting Tomorrow's Changes into Perspective

Many business experts argue that the pace and scale of change in the digital age far exceed what businesses have had to adapt to in the past. But some caution against exaggerating this phenomenon.

The industrial revolution of the 18th century, notes Lee Branstetter, lead faculty for the Block Center's Future of Work Initiative at Carnegie Mellon University's Heinz College, introduced the world to steam power, which enabled the development of machinery that could drive trains, ships, factories, and mass production.

Later, in the 19th century, came electricity. "This was an incredible transformation," Branstetter notes. "I would make the case that a world with and without electricity is even more different than a world with and without the internet—to say nothing of a world with and without Instagram. We have actually gone through fairly dramatic change over the past 100 years. Do I think the changes that we're going to go through in the next 10 or 20 are greater than the changes that we've been through in the past 50 or 100? Probably not. They're going to be different changes. But I don't think that they're going to be fundamentally greater."

Similarly, while Branstetter thinks the gig economy is important and growing, he's also quick to note that it's growing from a very small base, and he argues that most people will continue to work under conventional employment contracts over the next couple of decades. He even casts doubt on the idea that vast numbers of people will be working somewhere other than their employer's offices or production facilities, noting that most new economy jobs right now are clustered more than ever in a relatively small number of "superstar" cities where there are critical masses of people with complementary skills.

All that said, Branstetter is optimistic about what the future holds, including the opportunities for advanced technologies to transform work. He's simply not sure it will happen as quickly as some expect.

"I tend to believe in evolution rather than revolution," he says. "The things we call industrial revolutions in our economic past tended to be gradual processes that worked themselves out over time. And the time span was one of decades, not months."

At the same time, companies also need to bring their workers along for the ride. They have to gain employee support and encourage them to embrace new technology. Workers don't often do this on their own, which means companies must explain the need for the technology, encourage them to use it, and offer useful training programs that become part of their daily regimen.

Companies also need to recognize that not every generation is up to speed on the latest technology. For the first time, there are now five generations in the workforce,² all with varying degrees of comfort with technology. Older workers, for example, while still strong contributors to companies, may be intimidated by newer technologies and struggle with them, especially compared with their digitally savvy young colleagues.

This is one area where virtually all the experts and executives interviewed for this report agree. They say lifelong training and education for workers will become critical to the future of work, both for ensuring people can keep pace with technology and for driving innovation. In fact, 72% of survey respondents predict employers are likely to offer employees more continuing learning and training opportunities during the next two decades, and it is reasonable to believe that job candidates will gravitate toward companies offering these benefits. Similarly, 87% say schools and universities should revise their curricula to better prepare graduating students for jobs in the digital age.

"We have to invest in training and be better than others at attracting and motivating people," confirms Joachim Rosenberg, executive vice president of Sweden's Volvo Group and chairman of the company's UD Trucks subsidiary in Japan. "We have a responsibility there toward ourselves, our people, society, and all of our stakeholders."

In this new environment, organizations will invest in customized training for employees. Degrees, certifications, and continuing education will all be employment qualifications. Workers themselves will seek out organizations that provide continuous upskilling programs.

Carnegie Mellon's Branstetter says some of the same technologies that will transform work could also be used to revolutionize learning. For example, he says, it's possible to design AI-driven adaptive learning systems that can give students math problems, figure out on the basis of their mistakes what they don't understand, and then deliver focused instruction in that material until they achieve mastery (before moving them on to the next logical topic).

"When I think about what good could come out of collaboration between AI and humans, this is really one of the most potentially productive and helpful domains," Branstetter says. "It's in the skill and human capital formation process itself. Our schools

haven't changed that much over the generations, and that's actually a problem. But now we may be able to substantially change how we teach. It's possible that in future years we could get much closer to the ideal of personalized instruction for every student at a politically acceptable cost."

Data Democratization Will Make More Employees Strategic

Anticipated advances in AI—along with the information and analysis that it will put at workers' fingertips—are likely to result in organizational models becoming flatter, with decisions made at the edges by employees at all levels. With access to the right technology and information, more people within organizations will be empowered to make key decisions on projects, speeding efficiencies and learning. Employees from various locations in the world will congregate—virtually in many cases—into cross-functional teams to accomplish whatever needs to be done. One day, an engineer might be working with someone in sales on developing a new product; on another day, he or she might be partnering with someone in customer service to pinpoint the source of a frequent customer complaint about a different product.

A senior leader for employee experience at a global airline based in the Asia-Pacific region says his organization is already pushing decision making further toward the front lines of the enterprise.

"We're seeing it right now in our contact centers, where it started with giving employees the authority to decide simple things like whether to issue a refund to a customer or apply certain cancellation fees," he says. "Now we're working on systems and solutions that will allow our frontline employees to make decisions in face-to-face interactions, as well."

One workspace the airline is targeting is its own airplanes. Right now, the executive notes, crew members often don't have access to the same information their customers have while a plane is in the air. A passenger with

"When everyone has fingertip access to information, **work becomes more democratic**," explains Volvo's Rosenberg.

in-flight Wi-Fi service, for example, may know before flight attendants that his or her connecting flight has been delayed.

"We need to make sure our employees, at that frontline level, have access to that information at the same level as our customers," he says.

Volvo's Rosenberg buys into the idea that organizational structures will become flatter in the decades ahead as employees become more empowered.

"When everyone has fingertip access to information, work becomes more democratic," he explains. "The distance between a CEO and a frontline worker narrows. This implies a flatter, more horizontal organization where information is shared not only from the top down but also from the bottom up and across the enterprise. In this flatter enterprise, there will be more dialogue, more communication, more collaboration, not least across functions. As a result, continuous improvement work will be reinforced, productivity will increase, and colleague experience and trust will strengthen."

In fact, Rosenberg says, UD Trucks is already putting these ideas into practice. Last year, after outsourcing the manufacture of one of the product lines at its main truck factory in the greater Tokyo area, it collapsed the layers of management at that facility from five to three. "Many people might think that this is all about saving costs, but that is not the full story," Rosenberg says. "It's also to a large extent about boosting the engagement and the involvement of colleagues, as well as increasing the speed of decision making. It's about having the individuals who know the frontline operations the best, which is always our



WORKERS THEMSELVES WILL SEEK OUT ORGANIZATIONS THAT PROVIDE CONTINUOUS UPSKILLING PROGRAMS.

frontline colleagues, and being able to leverage their ideas and practices in a quicker and better way. Consequently, it's about becoming more effective and efficient at the same time."

Meanwhile, across the parent organization, Volvo Group is piloting programs in which autonomous teams use various technologies to identify problems or ideas for improvement and pursue them on their own, with minimal oversight. Jens Gustaffson, senior vice president for corporate communications at Volvo Group, says the decentralized structure the company is building is already helping to drive revenue.

"Today you have to provide best-in-class tools to your employees, with as much freedom as possible on what kinds of tools they can use," says Marie-Louise Converse, director of

Volvo Group's Designed Around Me Program for employees, which seeks to improve the employee experience. "If we're not providing a seamless experience for them in terms of how they get information and how they can manage administrative tasks—if we make it too complicated—they will just turn our solutions down or choose to work elsewhere."

On a related note, companies will need to imbue the work experience with a sense of purpose to attract and retain top talent. When asked what they expect to be the biggest motivators for workers in 2040, several survey respondents wrote in answers related to purpose-driven work.

Some employers are already taking steps in this direction. As the auto industry begins to shift from petroleum-powered vehicles to electric-powered and self-driving vehicles, for example, Volkswagen is working hard to make sure its employees understand why the work they do is important, and that they can play a role in changing the world for the better. "Our employees understand that we are investing billions in these new technologies, and that we will be in the market with more and more fully electric vehicles," Mueller says. "They can see that it's real change, not just words, and that it's coming to fruition in their lifetimes."

Man and Machine Partnerships: Health Care

Researchers have been working for years to develop AI applications that can diagnose disease and continue to make progress in their efforts. In April 2019, for example, scientists in the United States and China reported they had jointly built an AI application that can diagnose common childhood diseases, such as influenza and meningitis, just as accurately as doctors can. Their system drew on records from more than 600,000 Chinese patients during an 18-month period, and it was built on a neural network, which can learn tasks by analyzing large amounts of data.

While questions remain about which kinds of jobs AI algorithms will take over in the coming decades, many experts suggest that in the medical field new applications like the one described above are likely to become useful tools that help doctors rather than replace them—and not just in diagnosing disease or injury.

"Computers are already pretty good at medical billing, and they're getting better and better at diagnosis," says Tom Mitchell, professor of machine learning, computer science, robotics, language technologies, and biomedical engineering at Carnegie Mellon University. "They'll probably get better at therapy suggestions, too."

Still, Mitchell says, "They are not, for a long time, going to be better at having the conversation with the patient about which of those therapies to adopt. So, like most jobs, the job of doctor will not go away as a result of AI. But the distribution of tasks that doctors spend their time on will shift."

Perhaps the bigger question, Mitchell adds, is what will happen once those jobs are redefined.

"Will we end up hiring fewer people because doctors will be able to service more patients per day than they currently can?" he asks. "Will we elect to just eliminate jobs to do the same quality of service at a lower cost? Or will we decide to improve the quality of service and keep the costs the same?"

Employees Will Turn to Dynamic Talent Networks

By 2025, Millennials are expected to make up three-quarters of the global workforce.³ Many in this generation, born between 1981 and 1996, have grown up with mobile and connected technology and expect to use it in both their personal and professional lives. Also on deck is Generation Z. Born since 1997, they are considered the first true digital natives and are now entering the labor force as well.

Both generations are known for being more comfortable with technology than their predecessors. To them, being stuck in a stuffy office from 9 to 5 or being required to punch time clocks makes little sense when technology allows them to do their jobs just as well

from remote locations. In fact, three-quarters of Millennials want more opportunities to work remotely, and more than half believe it boosts their productivity, a Deloitte report found.⁴ Not surprisingly, our survey finds that flexible work schedules are seen as more important employee motivators than salary or benefits, guaranteed employment, or family incentives.

With many organizations struggling to land top talent in a tight labor market, understanding and adjusting to these preferences and beliefs becomes critical. As more younger people assume positions of authority within companies, it is likely they will naturally incline toward engaging labor that doesn't necessarily map to traditional models.

Indeed, a 2019 Upwork study⁵ finds 69% of younger-generation managers (composed of mostly Millennials but also of Gen Zs) already have team members who are allowed to work remotely. Younger-generation managers also are 28% more likely to utilize remote workers than are Baby Boomers, who were born between 1944 and 1964. The study further predicts that by 2028, nontraditional, flexible talent—"gig workers," including freelancers and temporary and agency laborers—will comprise 24% more of departmental head count than they do today.

Beyond generational preferences, many leaders see tremendous value in having a broader mix of workers who can join together on the fly or dissolve just as quickly, based on business or project needs. Indeed, 70% of survey respondents believe an employee's ability to network and tap the skills and knowledge of others, both within and outside of their companies, will be just as important as their own subject-matter expertise in the decades ahead.

"Successful organizations will absolutely rely on sustained, durable, and resilient relationships between people," says Lesley Farrell, professor of education at the University of Melbourne's Melbourne Graduate School of Education. "And whether those people are in the same office or

across the world, organizations will be depending on those relationships and the capacity of those people to join themselves up into groups."

In the future of work, teams could be local, regional, or global. Collaboration will not be wholly dependent on the availability of a conference room or dial-in capabilities (although huddle rooms equipped with the latest communications technology are likely to become more common). Rather, it will be about using workplace technology to assemble networks of talent and perspectives for specific jobs or initiatives. Because organizations can look beyond workers in their facilities, the reliance on teams led by subject matter experts will give way to more collaborative group efforts.

"Teaming using only full-time employees has traditionally been a rather resource-intensive way to get things done," observes Anita Williams Woolley, associate professor of organizational behavior and theory at Carnegie Mellon University's Tepper School of Business. "It means using people who maybe don't quite have the expertise, but they're available, or they're at the right location. It takes a while to get them to a point where they can actually collaborate effectively. There are a lot of problems that can be solved more quickly by harnessing the power of coordination technologies to bring together people in extended networks who have exactly the capabilities you need."

In some cases, these extended networks may involve experts who have no formal connection to the business at all.

While this trend is accelerating, it isn't entirely new. For instance, USC's Boudreau notes that in 2011, pharmaceutical and biotechnology companies were able to unlock the structure of a complicated enzyme tied to the AIDS virus by creating a virtual team. What's more, using an online protein-folding game called Foldit, they accomplished this task in a mere three weeks.

"The 20 people in the world who could solve the problem solved it," Boudreau



THREE-QUARTERS OF MILLENNIALS WANT MORE OPPORTUNITIES TO WORK REMOTELY, AND MORE THAN HALF BELIEVE IT BOOSTS THEIR PRODUCTIVITY.⁴

says. "Nobody got paid, nobody was an employee. But because the scientists were smart enough to deconstruct that one part of the problem and put it out there into the ecosystem, in the right population, they got the problem solved. The point is that you couldn't solve it with employment. You couldn't find those 20 people, and even if you did, they don't want to work for you. I'm not suggesting all work will get done this way, or even a majority. But I think we're finding that every day, little by little—kind of like upgrading technology—there are alternatives to traditional work arrangements that can be better than the traditional arrangements for some part of our work."

Ultimately, Boudreau envisions a global talent market "where workers can easily connect with work that exists in another place, where work happens on interconnected social structures, and where the workers you engage, or who engage with you, have options that go well beyond the traditional employment contract. In this way, the organization of the future will become a hub within a larger ecosystem of ways to get work done that certainly includes employment, but also a whole

Man and Machine Partnerships: Retail

For an iconic American company whose manufacturing processes are still astonishingly manual, Red Wing Shoes is racing toward the workplace of the future.

Headquartered in Red Wing, Minn., Red Wing Shoes makes boots and shoes that it sells in its own stores around the globe. It started overhauling the way it gets work done in the 2000s after its leadership team recognized that communication and collaboration between its siloed functional areas were sorely lacking. Cross-functional teams were assembled to share insights and information, and that, along with the hiring of new chief financial and chief information officers, led to a series of technological improvements, including the replacement of the company's 20-year-old point-of-sale system and the implementation of a new cloud-based CRM platform, a new financial closing system, and a modern ecommerce platform.

That was just a start. Since then, Red Wing Shoes has been busy rethinking virtually every aspect of how it produces boots and shoes.

"We had to change how we work internally," says Marc Kermisch, former CIO, who held that post while also leading The Garage, the company's recently launched innovation center. "We went from having a very insular workforce composed of people who grew up in and around our community to one that is much more diverse and, in part to accommodate people we really wanted but who didn't want to relocate, more distributed."

Now, the company is further modernizing its ecommerce, order management, and customer service platforms. It's dabbling in instant messaging with its ecommerce customers and conducting pilot programs with automated chatbots that can answer common questions faster, and more consistently, than can human call center staffers—freeing those staffers to spend more time servicing customers and building relationships with them.

On its factory floors, Red Wing Shoes is investing in visioning technologies to help employees be safer and more productive while also improving quality. One shop-floor improvement, for example, uses image recognition technology to abruptly stop a sole-trimming machine if a colored glove on the operator's hand gets within a few millimeters of the machine's serrated blade, which spins at 1,200 rpm and could otherwise slice off an errant finger. Elsewhere, using infrared vision technology coupled with machine learning algorithms—a form of artificial intelligence—Red Wing is training computers to score the quality of hides and present that information to human employees for validation, with an eye toward improving yields and product quality.

"We were a little late to the game in many ways in terms of how work has changed," says Kermisch. "But over the past three to five years, that's shifted dramatically. And connectivity technologies have really been at the heart of that. Red Wing Shoes now finds itself in a position, in the current labor market, where people don't want to go into the trades at the same rate they once did. We can't hire employees into our factories at the pace we used to. So in our case, embracing technology and automation isn't a way to displace workers, but rather a way to augment the worker experience—and mitigate the fact that we have 20% of our positions open at any given time."

Kermisch adds that if he were asked to pick three things that will dramatically influence the work environment in 20 years, he would start with voice interaction. "I think that will be huge," he says. "At least my hope is that in 2040, I'm talking to my computer instead of typing." He also expects to see vision and image recognition capabilities maturing in computers, so that they can see people or their environment and react accordingly. Finally, he expects ML and other AI applications to play a central role in work, although he suspects that humans may continue to be responsible for interpreting and putting into context what machines are able to do.

population of human workers who are going to drop in and drop out under various arrangements, as appropriate."

Once again, to make this work, organizations will have to make use of advanced technologies to provide high-quality, actionable data, analytics, and AI- or ML-driven recommendations to all approved employees, both local and remote.

"Collaboration in the past was always there, but it was hard, because people often did not have the information they needed—and had no idea where to get it," says Mueller. "New tools will make this process much easier."

In addition to technology, companies will have to nurture a culture that allows this kind of networking and lets individuals contribute in ways that are natural to their working styles. As they increasingly rely on hyper-contributors with dynamic networks to influence and drive work, this may require that employers reward employees for how well they develop and contribute to these sets of connections.

"If you and I are in a community of 40 people, whether a job group or even our community of LinkedIn connections, someone could go through and measure, or ask us about, how often we take and give information to others, or who provides us with positive and negative energy—any question like that," says Boudreau. "Then, we can draw a map, call it a social network map, that shows these connections. This map also could show whether someone is very centrally connected to lots of different people and communities, or more peripherally connected—or connected just to one. This could be very valuable information. But right now, virtually the entire world's policymaking still rests on the job as the unit of analysis when it comes to work and employment. We're just terrible at measuring alternative forms of work and how much they're impacting our economy."

Part of the challenge for organizations in this new environment where workforces are highly diverse and

distributed, says the University of Melbourne's Farrell, will be finding or grooming people who know how to establish and maintain relationships with people unlike themselves.

"Leading companies are already actively recruiting culturally diverse workforces, not just because it makes them look good but because they see it as really productive," Farrell says. "Diversity creates what I've sometimes called 'the creative abrasion of difference'—the creativity that can happen when people who are diverse in terms of not only their cultural background and life experience but also their technical background. It takes quite a lot of work by people with a variety of perspectives to develop a multidimensional understanding of what a problem is, let alone define a solution. And companies need to be good at creating a climate in which this can happen."

As automation proliferates far beyond where it is today and takes responsibility for the most routine work, Farrell says, companies will prioritize finding employees who can flourish in a world of nonroutine responsibilities. "This changes everything: recruitment, training, how you put people together, how you introduce people to technologies, and how you understand what their work is and the conditions of their work."

Farrell says many companies she's working with are trying to understand what skills people who are doing nonroutine jobs will need. It's clear those skills will include the ability to establish and build relationships with colleagues with diverse backgrounds, understand problems, and negotiate solutions. Possessing a strong business or technical background may not be enough, she says.

"Even if companies recruit perfectly prepared young people coming out of schools and universities, their skills and capacities are going to be outdated really fast," Farrell warns. "The rate and the dimension of change are going to be more rapid and deeper going forward. Companies will have to

think about workforce education in a way that is much more integral to their business strategy."

Corporate Cultures Will Prioritize Workplace Technology

With workforces becoming more dispersed and diverse, it follows that the workplace itself will adjust to facilitate the type of communication and collaboration that maximizes productivity.

For most forward-looking organizations, this will mean implementing strong workplace plans that lay out how they will accommodate distributed employees, including gig workers, seamlessly into their systems while prioritizing secure but easy access to data and systems. According to the Upwork survey, younger managers are already thinking along these lines, with more than half ranking future workforce planning as a top priority for their departments—nearly three times more than Baby Boomers.

While many employees will continue to work within the physical confines of their companies, in the workplace of tomorrow they also will need the ability to collaborate with colleagues and partners elsewhere in the world. This means collaboration tools in brick-and-mortar locations will evolve to accommodate a variety of meeting scenarios, including virtual teams coming together on the fly, as will the devices that remote workers use. In fact, more than 75% of survey respondents say virtual conference rooms enabled by advanced technologies such as VR and 3D holograms will become more commonplace in the future. Among executives identifying their companies as being on the leading edge of digital transformation, the numbers are even more pronounced, with 87% of respondents saying high-tech conference rooms will become common by 2040 and 74% expecting common areas to serve as communications hubs. In addition, 87% think organizations will need to use data to better understand how



COLLABORATION TOOLS IN BRICK-AND-MORTAR LOCATIONS WILL EVOLVE TO ACCOMMODATE A VARIETY OF MEETING SCENARIOS, INCLUDING VIRTUAL TEAMS COMING TOGETHER ON THE FLY.

workplace design affects business performance, and 74% say they expect common areas in brick-and-mortar offices to become more plentiful by 2040, in part to facilitate more meaningful communication.

When asked which advanced technologies and applications will have the most transformative effect on their own workplace between now and 2040, survey respondents largely focused on those that would help them connect and collaborate with coworkers. For example, 41% cited tools that would help them search for experts and intelligence across the organization, 40% cited tools to provide meeting and collaboration assistance, 27% pointed to text analysis or phrase recognition capabilities, 22% identified computer vision applications for identifying objects, and 21% called out emotion recognition features.

"There's tremendous competition for new ideas and products," observes architect Robert Mankin, a Los Angeles-based partner at NBBJ and head of the company's workplace design practice. "Companies



CORPORATE RESPONSIBILITY, PERCEPTION, TRANSPARENCY, AND TRUSTWORTHINESS WILL BE CRUCIAL IN THE WORKPLACE OF TOMORROW—AS WILL THE ETHICAL USE OF AI.

want workplaces that encourage the connections, synergies, and serendipitous encounters that lead to a new idea or the next great breakthrough for their organization. That happens through social spaces and shared amenities. We already see that the proportion of space our clients devote to cafés and lounges is increasing in proportion to heads-down office space.”

Mankin says the recently completed headquarters of tech giant Tencent Holdings Ltd. in Shenzhen, China, is an illustration of this new template. The company, best known for its WeChat social-networking app, which has more than one billion users, devoted 40% of its new space to shared amenities, including a gymnasium, running track, swimming pool, library, and café. To further facilitate spontaneous interactions, it also insisted on having a variety of routes for employees to reach their offices. And it devoted a prominent space to an employee training center called Tencent University.

Companies are increasingly interested in creating social spaces where people can take a break from work, relieve stress, and engage in fresh thinking, Mankin adds. “These could take the form of a lounge, where they could do things like exercise, play ping-pong, or cook, or a ‘maker space’ where they build a mockup or prototype of their product, or get their hands dirty using a variety of shop tools and do something completely outside of their normal day-to-day office activities.”

Mankin also foresees companies creating more large, flexible office spaces that can quickly be converted for different uses. On the technology front, he predicts that office space will feature wider use of IoT and facial recognition technologies to help make the employee experience more productive. Offices will also include learning environments like Tencent’s, provide expanded connections to outdoor space, and focus more on reducing an employer’s carbon footprint. He expects many aspects of building maintenance and operations to be automated, with spaces

and furniture that can be quickly reconfigured for different uses.

Mankin additionally envisions a need for greater transparency in the workplace, with executive leadership more visible to the rest of the company as it seeks to set the tone for the organization. That process will be especially important, he says, as younger generations enter the workforce and demand a connection to the values and purpose of an organization.

Eliminating Threats and Bias

In the workplace of the future, data privacy and security will remain critical. So, too, will the need for employees, customers, and other stakeholders to trust that organizations comply not only with regulatory requirements but also with the expectations of their customers. If people can’t trust a company’s ability to keep personal data private, they won’t use it. Nor will they buy into AI-enabled products or services if they don’t believe those products and services protect and serve their interests.

“There’s a level of trust that needs to be earned by AI technologies,” says Stone. “Certainly, people who get into an autonomous car need to be able to trust that it’s going to be safe for them. In the health care industry, for AI technologies to live up to their positive potential, doctors, patients, and nurses all have to trust that technologies such as AI-enabled diagnostics are accurate.” There also needs to be enough transparency to AI, Stone says, that people believe AI applications are free from bias. “These are going to be important themes in the development of AI over the next 30 years or so.”

In short, corporate responsibility, perception, transparency, and trustworthiness will be crucial in the workplace of tomorrow—as will the ethical use of AI. Companies will strive to make sure they are deploying technology in ways that remove bias and promote inclusion. They will also seek to ensure their AI applications integrate security and privacy solutions in ways that help protect company,

The survey finds that the most common barriers to building a workplace equipped for the future are **budget constraints**, **employee resistance to change**, and **a risk-averse culture**, each cited by approximately four in 10 survey respondents.

employee, and customer information from unvetted sources.

As part of this effort, companies will need to develop intelligent security and privacy policies that revolve around the work that needs to be done and can track the location of information regardless of who is using it. Only by ensuring data and networking security will companies be able to transform into the knowledge-sharing enterprises they hope to become.

Barriers to Progress Abound

Change is hard for any organization. While executives recognize the opportunity in transformation, companies often struggle to overcome financial, technological, and cultural hurdles. It's not very different with the future of work.

For instance, the survey finds that the most common barriers to building a workplace equipped for the future are budget constraints, employee resistance to change, and a risk-averse culture, each cited by approximately four in 10 survey respondents. More than a quarter of respondents also cite a lack of strategy or vision from the C-suite as slowing progress.

Says one respondent: "I believe our company is aiming too low. There are deeper opportunities, but we're just scratching the surface." Adds another: "We're not even looking." One respondent allows that "exhaustion from hopping on too many fads has led staff and faculty into separate neophile and curmudgeon camps rather than open-minded skepticism."

Even when a newer technology makes tremendous sense because of the

value it could potentially bring to an organization, companies aren't always aggressive enough about implementing it. As mentioned earlier, an overriding majority of survey respondents say organizations need to use data and analytics over the next two decades to better understand how workplace design and features impact business performance. However, just 29% see their organization as a leader in taking advantage of big data and data analytics or in exploring and adopting advanced technologies like AI or robotic process automation. Only four in 10 say their organizations have realized performance benefits to date from their investments in advanced technologies.

10 Steps to Prepare for Tomorrow

Preparing for the workplace of tomorrow is a complex undertaking that will require the involvement of numerous parties. Individuals, for example, will have to take some responsibility for ongoing training and education. Universities and researchers will need to play a role as well, exploring ways to use emerging technologies such as AI, AR, and VR to prepare students to become the next generation of technologically astute workers.

Still, it is the business community that will be most responsible for shaping the workplace of the future. Experts identify 10 ways companies can begin preparing now:

1. THINK BROADLY ABOUT WHERE AI CAN HELP.

Tom Mitchell, professor of machine learning, computer science, robotics, language technologies, and biomedical

engineering at Carnegie Mellon, observes that all of the companies he works with ask how to use AI to improve their products, but few inquire how it can improve their internal operations or efficiency. That lack of curiosity will lead to missed opportunities as AI transforms the way work gets done.

2. BEGIN DECONSTRUCTING JOBS INTO THEIR UNDERLYING TASKS OR ACTIVITIES.

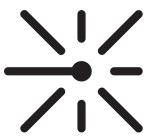
"As you keep your eye on new technology, this will make it easier to break out those that can be automated," says Mitchell. "Then, as you improve the efficiency of those tasks, you can start rethinking which others should be bundled together for individual employees. You may find you need fewer employees, or that the bundles of tasks assigned to them cross departmental boundaries in ways you wouldn't have considered in the past but that nonetheless improve performance."

3. BEGIN AN HONEST DIALOGUE WITH EMPLOYEES ABOUT AUTOMATION.

Organizations that win their employees' confidence will find it easier to partner with them in transitioning to automation. The major Asia-Pacific-based airline cited earlier has been trying to personalize change, says one of the company's senior technology leaders, in the sense that it's seeking to make sure its actions are solving problems employees actually believe exist.

4. WHEN HIRING, LOOK FOR AGILE PROBLEM SOLVERS.

You can't train adaptability and how to think outside the box, says the



TECHNOLOGICAL ADVANCES ON THE HORIZON HAVE THE POTENTIAL TO DRAMATICALLY RESHAPE THE WAY WORK GETS DONE—FOR THE BETTER—OVER THE NEXT TWO DECADES.

airline's employee experience leader, "but if you hire employees with those attributes, you can train them on their job responsibilities."

5. PROVIDE BEST-IN-CLASS COMMUNICATION AND COLLABORATION TOOLS THAT DRIVE A SEAMLESS EXPERIENCE.

This technology must be matched with the right physical infrastructure and cultural attributes. If it is too clunky or complicated, says Volvo Group's Gustaffson, workers will look elsewhere for employment.

6. TAKE EARLY SIGNS OF DISRUPTIVE TECHNOLOGY SERIOUSLY.

"You won't see the disruption coming if you're not keeping an eye on the small upgrades," says Boudreau. "Instead of dismissing that new innovation, start talking about what you'll do in a world where it becomes ubiquitous."

7. BEGIN MAKING YOUR EXISTING TECHNOLOGY, FROM WEBSITES TO IT SYSTEMS, MORE CONFIGURABLE TO TAKE ADVANTAGE OF AI TECHNOLOGIES.

Stone notes that his AI startup, Cogitai, often must wait to help prospective customers because their existing systems aren't yet ready to accept or

act upon AI recommendations. For example, an algorithm may be able to reveal what kinds of vacations different customers favor, but a hotel company's website may not be configurable enough to display varying images based on those findings when customers visit the site. Changing your IT systems to be ready for AI "will require some upfront costs, but I think the way things are going, it will pay you back in spades," Stone says.

8. ADOPT A FAIL-FAST MENTALITY. Keep adrenaline moving through the organization to foster a learning and evolving mode in which decisions about whether to proceed with or stop initiatives are made quickly. "If you don't have the ability to make decisions quickly about which things are going to work and which must be let go, you're really going to struggle in the future," says the senior technology leader for the Asia-Pacific-based airline.

9. DECIDE WHETHER TO USE AUTOMATION AS A TOOL PRIMARILY TO EMPLOY FEWER PEOPLE OR TO PROVIDE BETTER SERVICE.

Mitchell says executive leadership should be thinking now about which approach will most benefit their

organization. Boudreau largely agrees. "Companies have to ask if they are going to be the employer that goes on record saying, 'We'll give you a chance to catch up so come work for us,' or if they are going to be one that decides to automate as soon as it's technically feasible and let workers figure out on their own how to adjust."

10. CONSIDER SECURITY AT EVERY STEP OF DIGITAL TRANSFORMATION.

In an increasingly digital world, data security and the privacy of company and customer information will be critical to winning the confidence and trust of all stakeholders. Security and privacy will have to be embedded in new technologies. They can't be an afterthought.

Conclusion

The technological advances on the horizon have the potential to dramatically reshape the way work gets done—for the better—over the next two decades. These advances promise to automate repetitive and tedious tasks, empower people to perform at a higher level those activities that remain, and allow organizations to push decision making closer to the edge of the enterprise. People will have more freedom to work when and where they wish and will be able to more easily network and partner around the globe. Workplaces themselves will be designed to facilitate these new ways of working, with AI embedded into virtually every facet of the work experience.

The most successful companies in this new world of work will be those that embrace these changes and attract the most talented members of the workforce by investing in their success.

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