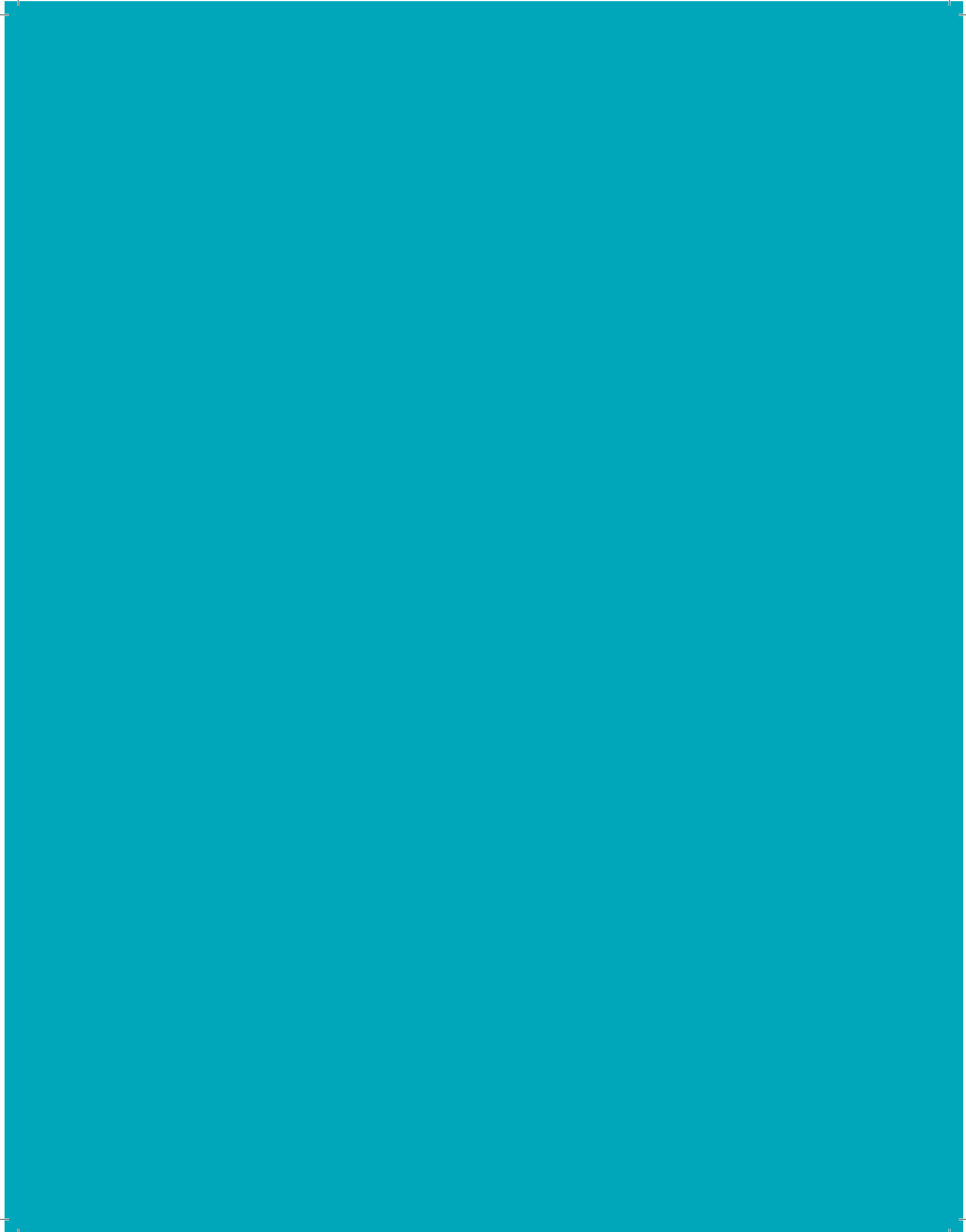


Deloitte.
Insights



**The Fourth Industrial Revolution
is here—are you ready?**



The Fourth Industrial Revolution is here—are you ready?

Deloitte helps organizations understand the opportunities and risks presented by the Fourth Industrial Revolution and apply that insight in pursuit of key objectives. We draw on deep industry experience and extensive knowledge in artificial intelligence, the Internet of Things, analytics and other technologies underpinning Industry 4.0 to help organizations develop and execute innovative approaches to better serve their customers, people, communities and other critical stakeholders.

COVER IMAGE BY: John W. Tomac

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A mix of hope and ambiguity

THE concept of digitizing everything is becoming a reality. Automation, artificial intelligence, IoT, machine learning and other advanced technologies can quickly capture and analyze a wealth of data that gives us previously unimaginable amounts and types of information to work from. Our challenge becomes moving to the next phase—changing how we think, train and work using data—to create value from the findings obtained through advanced technologies.”

Brian Householder, President and Chief Operating Officer, Hitachi Vantara

Are the leaders of businesses and government agencies ready to harness the full potential of Industry 4.0 to benefit their clients, their people, their organizations, their communities and society more broadly?

That’s the core question explored in a recent Deloitte Global survey that sought to measure business and government readiness for the Fourth Industrial Revolution—or “Industry 4.0.”

The survey polled 1,600 C-level executives across 19 countries, coupled with select interviews. What ultimately emerged was a picture of the opportunities and challenges these global leaders saw in creating new value in a changing world—a picture that conveys both hope and ambiguity.

Industry 4.0 signifies the fourth in a series of industrial revolutions, which are characterized by their ability to transform economies, jobs and even society itself through the introduction of new technologies and processes.

Beginning in the late 18th century with the advent of steam power and the invention of the power loom, the first industrial revolution ushered in mechanization and radically changed how goods were manufactured. In the late 19th century, electricity and assembly lines made mass production possible, giving rise to the second revolution. Many cite the third revolution as beginning in the 1970s,

when advances in computing enabled us to program machines and networks, powering automation.

Definitions for Industry 4.0 abound, but the change it portends at its core is the marriage of physical and digital technologies such as analytics, artificial intelligence, cognitive technologies and the internet of things (IoT). This marriage of the physical with the digital allows for the creation of a digital enterprise that is not only interconnected, but also capable of more holistic, informed decision making. In a digital enterprise, data collected from physical systems are used to drive intelligent action back in the physical world. It is the possibilities arising from these feedback loops that generate abundant opportunities for new products and services, better ways to serve customers, new types of jobs and wholly new business models.

As in the previous industrial revolutions, the impact of these changes has the potential to ripple across industries, businesses and communities, affecting not just how we work, but also how we live and relate to one another. But this time, the revolution is advancing at extraordinary speed, driven by technologies developing at an exponential rate. Amid shifting demographics and unprecedented global connectivity—not just technological, but also social and economic—Industry 4.0 can herald greater opportunities than any that came before it. And greater risks.

To explore the question of “readiness” for Industry 4.0, Deloitte Global’s survey of C-level executives focused on four major areas:

- 1. Social impact.** What do these executives see as their roles in making the world a better place in the age of Industry 4.0—not just for their organizations, but for society as a whole?
- 2. Strategy.** How are executives using Industry 4.0 technologies to shift their mindsets, revolutionize their decision making and inform their business strategies to create new value?

3. **Talent and the workforce.** How are executives readying their current talent strategies and workforces for the changes Industry 4.0 will bring, and where will new talent come from?
4. **Technology.** Do executives see Industry 4.0 technologies as a toolset to improve business as usual, or are they harnessing the full potential of smart technologies to enable digital-physical integration, holistic decision making and new business models?

What we discovered is that while executives conceptually understand the changes Industry 4.0 will bring, they are less certain how they can take action to benefit from those changes. In each of the four areas of impact, the survey uncovered some tension between hope and ambiguity:

1. Social impact.

Optimism vs. ownership: While executives see a more stable future with less inequality, they are less convinced about the role they or their organizations have to play in influencing society in an Industry 4.0 era.

- Executives overwhelmingly (87 percent) believe Industry 4.0 will lead to more social and economic equality and stability, and two out of three say business will have much more influence than governments and other entities shaping this future.
- However, less than a quarter believe their own organizations hold significant influence over societal key factors such as education, sustainability and social mobility.

2. Strategy.

Static vs. dynamic: Executives acknowledge they may not be ready to harness the changes associated with Industry 4.0. However, this lack of readiness has not compelled them to alter their current strategies.

- Only one-third of the executives surveyed are highly confident they are capable of acting as stewards for their organization during this time of change. Further, just 14 percent are highly confident that their organizations are ready to fully harness the changes associated with Industry 4.0.

- Yet many executives continue to focus on traditional business operations, as opposed to focusing on opportunities to create new value for their direct and indirect stakeholders.

3. Talent and the workforce.

Evolution vs. revolution: Executives lack confidence that they have the right talent in place to be successful in Industry 4.0. They say they are doing all they can to build the right workforce, but their responses show talent remains low on their list of priorities.

- Only a quarter of executives are highly confident they have the right workforce composition and the skill sets needed for the future.
- However, talent and HR are a relatively low priority (17 percent), despite 86 percent of executives saying they are doing everything they can to create a better-prepared workforce for this new era.

4. Technology.

Challenged vs. prepared: Executives understand they need to invest in technology to drive new business models; however, they have a hard time making the business case for that investment because of a lack of internal strategic alignment and short-term focus.

- Executives say their current technology investments are strongly driven by technology that can support new business models, which they say will have one of the greatest impacts on their organizations over the next five years.
- However, very few executives say they have a strong business case for investing in advanced technology. When asked what the hindrances were, executives most often point to a lack of internal alignment (43 percent), a lack of collaboration with external partners (38 percent) and a focus on the short term (37 percent).

In the following discussion, we'll explore the survey responses in more detail as a way to assess executives' readiness for Industry 4.0 within the context of our four major areas of impact: society, strategy, talent and technology.

Social impact: optimism vs. ownership

The role of business in shaping the 4.0 world

EXECUTIVES are optimistic about the impact of Industry 4.0. Eighty-seven percent of survey participants believe that Industry 4.0 will lead to more social and economic equality and stability. They seem to regard technology as an equalizer that will provide more access to education, jobs and financing across different geographies and social groups. But new technologies will also require different skills and will likely impact jobs—at least for some—which could potentially lead to income disparity and uncertainty.

In addition, Deloitte’s Shift Index¹ indicates that the cumulative effects of technological advances and demographic changes are starting to turn up the steep part of an exponential curve, suggesting that change may be speeding up to levels far beyond previous industrial revolutions.²

“If you look at the first, second or third industrial revolutions, the technology was changing, but over full lifetimes or a couple of generations,” says Xavier Bourgois, chief information officer at technology firm Barco. “Now we have revolutions that take less than a generation. You have people who know how to fix a cassette, but their children do not even know what it was used for. When my six-year-old son is watching a movie on a TV screen, he goes to the TV screen and tries to swipe it.”

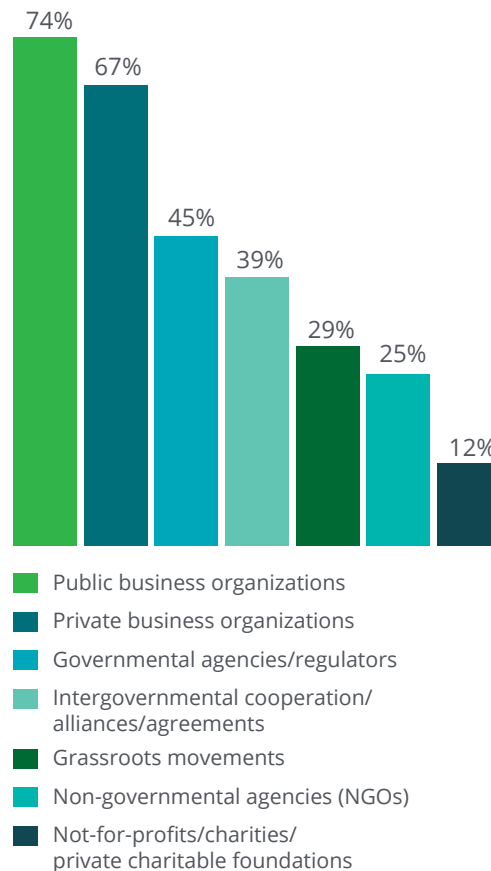
There is no question Industry 4.0 will bring about significant change for almost every aspect of society. A large majority of executives see business—both public (74 percent) and private (67 percent)—as having the most influence on how Industry 4.0 will shape society, with government coming in a distant second, and intergovernmental bodies and nongovernmental organizations playing even less of a role.

That is not to say that government doesn’t have a significant role to play. “The government could help in terms of getting transmission speeds up, paving the ground for dissemination of 5G, and unifying or standardizing legalities when it comes to

having very different, very particular rules regarding management of data, and start with the European Union membership countries,” says Frithjof Netzer, SVP and chief digital officer, BASF Group.

Because executives view business as having the most impact, it should follow that they would expect their organizations to play influential roles

Figure 1: Which of the following entities do you believe will have the most influence over how Industry 4.0 will shape society? (Select up to 3)

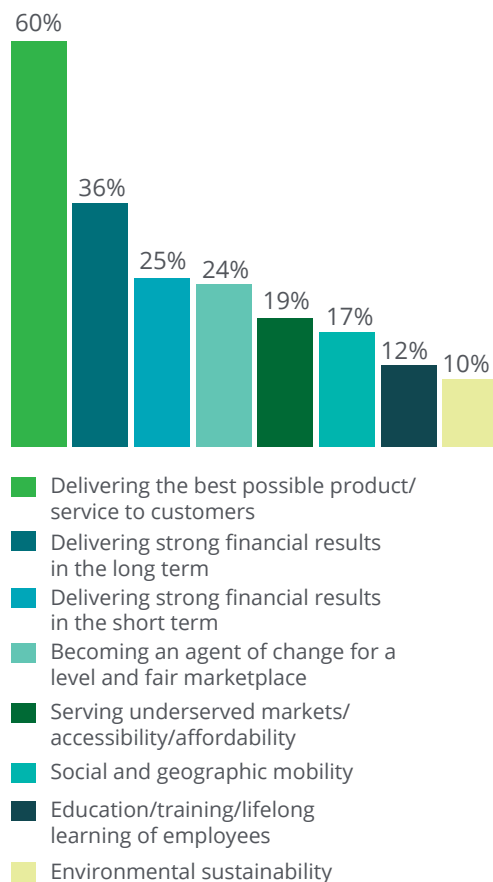


in delivering this more-equitable and stable world. However, our results reveal that executives do not believe their own organizations have significant sway over societal issues such as education and learning for employees, environmental sustainability or social and geographic mobility (Figure 2).

This finding may seem troubling to some, as it suggests that executives believe little is significantly within their organization’s control beyond the ability to deliver the best possible products or services to customers (60 percent). The rest may simply be viewed as depending on too many other, external factors. But in the arena of social impact, organizations that lack a sense of ownership in shaping a “better world” may be handicapping their ability to thrive in the Industry 4.0 environment.

Figure 2: To what degree does your organization consider itself able to influence the following issues?

Number of respondents who answered, “To a significant degree”



“New technology has the ability to change the economics of banking. Banks can now serve previously underserved communities. We are starting to see change in the developing world thanks to technology significantly lowering the cost of delivery. Micro-finance initiatives and small-scale retail banking are beginning to take off.”

— **John Flint**,
Chief Executive, Retail Banking and Wealth Management, and CEO-elect, HSBC

While environmental, social and governance (ESG) ratings and corporate social responsibility (CSR) initiatives are now standard—and many corporations have signed on to the United Nations Sustainable Development Goals—it does not seem that businesses receive enough motivation or support to steer their strategies toward serving broader stakeholders and addressing social issues. In fact, just 35 percent of surveyed executives believe that leading organizations of the future need to spend more time preparing for the impact new solutions will have on society. “The format in which we discuss corporate success determines the realities that business leaders can understand, and sustainability goals are still too subservient to the financial returns,” says Joi Ito, director of MIT Media Lab. This reality gap is further underscored by the

The Fourth Industrial Revolution is here—are you ready?

expectations of millennials, who believe multinational businesses are not fully realizing their potential to alleviate society's biggest challenges.³

Brian Householder, president and COO at Hitachi Vantara, agrees that the day-to-day responsibilities of running the business take precedence over social vision. “While we have existing franchises that we have to manage, we also have to consider how we are changing our organization to make sure that we’re continuing to drive social values into the industry, into the world. It is important for us to figure out how to lead to stay relevant.”

If executives truly expect business to play a leading role in the far-ranging societal implications of Industry 4.0, then its leaders must factor into their strategic planning the interrelationships among a broader set of stakeholders. Organizations are beginning to use Industry 4.0 technologies, coupled with a social and environmental impact mindset, to build differentiated products, explore new markets, secure a sustainable supply chain, attract and retain millennial talent, and transform contentious regulatory relationships, among other things.

Business’ challenge will be finding ways to design and create models for driving transformative change that also result in positive social impact. Harnessing Industry 4.0 technologies for social impact can help

build markets, drive adoption and light a powerful beacon for attracting and retaining top talent. Organizations also will need to consider the ethics and morality of applying advanced technologies beyond the traditional risk concerns of security, privacy, regulatory, compliance, safety and quality.⁴

EXPLORE FURTHER

Pro-business, but expecting more⁵:

Millennials view business positively, but they believe multinational businesses are not fully realizing their potential to alleviate society's biggest challenges.

Social impact of exponential technologies⁶:

With great power comes great responsibility—and disruptive technologies are potentially some of the most powerful forces in the business world today. How can businesses use exponential technologies to drive transformative change and positive social impact?

THE GEOGRAPHICAL PERSPECTIVE

A lack of confidence in the future correlates with the lack of confidence in executives’ ability to act as stewards of Industry 4.0. Asia-Pacific (APAC) stands out as the region with the lowest confidence in both these areas. One-fifth of respondents think they will face social upheavals and increased income inequality, while North American and Latin American executives are the least concerned (8 percent and 6 percent respectively). Executives from the Europe/Middle East/Africa (EMEA) region are in the middle, with 14 percent expressing concerns about social issues resulting from Industry 4.0.

Only 8 percent of APAC executives see themselves as highly capable to act as stewards during this time of change and disruption. This stands in stark contrast to the views expressed by executives from the Americas. Forty-eight percent of executives from the Americas consider themselves highly confident about their abilities to act as stewards. The EMEA region’s confidence is more moderate, at 36 percent.

Three countries in particular—India (32 percent), South Africa (28 percent) and China (23 percent)—envision social upheavals and increased income inequality as a result of Industry 4.0. These countries have all recently undergone major economic or political changes, which, in some cases, resulted in high growth, but also introduced previously unknown social fissures. This may contribute to their higher sensitivity about weathering additional social issues in the future.

Strategy: static vs. dynamic

Taking a broader, strategic view

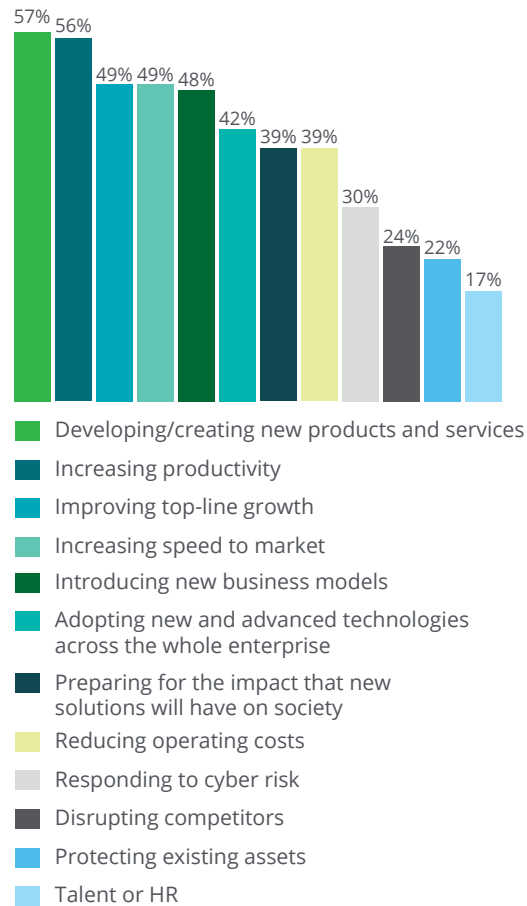
WHILE we often hear about “great disruptors” coming along and upending entire industries, or even established organizations using innovation effectively to reinvent themselves or introduce new products or services, not all organizations are making such strides. Many executives recognize the changes Industry 4.0 portends, but are not sure how to capitalize on the opportunities. In fact, just 14 percent of surveyed executives feel highly confident that their organizations are ready to fully harness the opportunities associated with Industry 4.0.

One reason for this lack of confidence could be that many executives also continue to focus on traditional business operations, as opposed to focusing on opportunities to create new value for their direct and indirect stakeholders. For example, when asked what topics they discuss most frequently as an organization over the course of a year, topping their list were developing business products (57 percent) and increasing productivity (56 percent). These are important issues for Industry 4.0, since one of its hallmarks is developing innovative products and services, as well as increasing productivity, by using new technologies and/or the data created by connected objects.⁷

However, Industry 4.0 offers great opportunities for innovation well beyond products and services that may require a new set of approaches in areas such as talent, cyber risk and competitive disruption. These are areas in which Industry 4.0 applications can, for example, help deliver continuous learning, tap new sources of talent, reach underserved markets, offer predictive tools to help improve processes and reduce risk, connect supply chains, create new ecosystems, enable more agile systems that can adapt and respond to changes in real time and much more.⁸ And yet, these issues trend to the bottom of the list of priorities (Figure 3).

Perhaps more surprisingly, respondents’ priorities did not change much even when looking toward the

Figure 3: Over the course of a year, what topics do you discuss most frequently as an organization? (Select up to 5)



future. When the question was shifted to a more forward-looking perspective (“To be a leading organization in the future, which of the below elements do you think you should spend time thinking about/focusing on?”), the order of priority remained virtually the same. This seems to indicate that being a leading organization in the future is currently seen purely through today’s business lens.

Taken together, our findings suggest that many organizations may be suffering from the phenomenon

known as “organizational inertia,” which occurs as a group remains fixated on its past accomplishments to protect its current state, while unknowingly blind to changes taking place within the marketplace.⁹ This can leave well-established organizations more vulnerable to disruption, as faster and more agile competitors can be less susceptible to maintaining the status quo. The underlying forces that drive organizations to inertia can be difficult to recognize and avoid. This poses significant risk, as those mired in inertia often fail to realize it until financial performance takes a downward turn or they have fallen so far behind the competition that it becomes difficult, if not impossible, to catch up.¹⁰

It is, therefore, crucial that organizations shift their strategic mindsets to a broader set of areas to capitalize on the opportunities Industry 4.0 will bring.

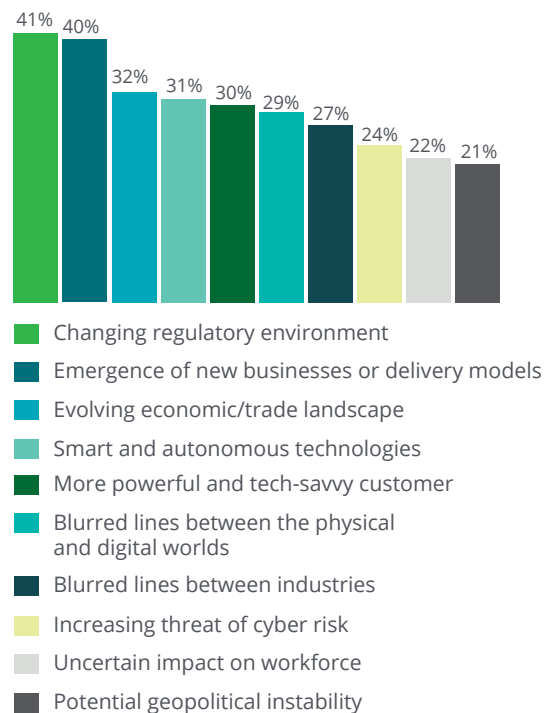
“The Fourth Industrial Revolution creates unlimited possibilities for the people who are interested in business. While it can be scary when companies apply technology to transform business models in their industries or across other industries, it generates innovation and improves competitiveness.”

— *Chun-Yuan Gu,*
President of Asia, Middle East and Africa Region,
ABB

Factors impacting business in the next five years

As executives look out at areas they expect to have the most impact on their organizations in the next five years, the changing regulatory environment and the emergence of new businesses or delivery models are at the top of their minds. The largest group of respondents sees new regulations as having the greatest impact on their organizations over the next five years (Figure 4). The pace and breadth of technological changes stand to further intensify the uncertainty around the regulatory environment, as business executives question whether regulations are keeping up with technological advancements.¹¹

Figure 4: Which of the following issues will have the greatest impact on your organization over the next 5 years? (Select up to 3)



“We have governing structures, legal systems, rules and institutions that were appropriate for the last industrial revolution, not this new one,” says John Flint, chief executive, retail banking and wealth management, and CEO-elect, HSBC.

New regulation will likely be a response to how well—or not—government perceives business is managing the impact of Industry 4.0 on the workforce, the public sphere and the environment. Taking a broader view of how business strategies impact these stakeholders can help businesses engage in a more productive conversation with government about how the regulatory environment evolves.

“Governments write the law on behalf of their people, but I think big business has a responsibility to catalyze the conversation,” notes Flint. “We can’t write the laws. But we can determine how we choose to behave. We can express a view of risks and what right behaviors and attitudes are, and then we can live by them. I think as business leaders, we have to get this debate going.”

Not all organizations view changing regulations as a challenge. For McLaren Racing, engineers look upon regulatory changes as an opportunity to grow. “The regulations in Formula 1 are reviewed every year, so we are quite used to dealing with change,” says Chief Operating Officer Simon Roberts at McLaren Racing. “In most businesses, when you have a regulation change, people see it with fear. Here, we see it as an opportunity for our engineers to go back to the drawing board. From a technology and innovation

perspective, we have to be adaptable every year, which is why we don’t work to a strict five-year road map, because performance advantages in our competitive world are gleaned from who responds best each season to the ever-evolving parameters the teams work within, according to the sport’s regulations.”

Beyond regulations, many executives also recognize that new business and delivery models, as well as the evolving economic/trade landscape, and smart and autonomous technologies, will affect their organizations in the coming years.

As strategic discussions increasingly focus on how business can evolve and capitalize on innovation, executives cannot be myopic and think only of near-term business growth. Rather, it is important to take a more encompassing and longer-term perspective that recognizes the enhanced role organizations can play in the responsible use of disruptive technologies. Successful organizations will take a broad view. They will see connections between business and social needs; between financial outcomes and innovative strategies; between worker productivity and a changing workforce; between improving operations and creating new value. Indeed, taking a broader view can pay off in the end. Organizations that have widened their focus toward a more holistic, strategic view of how Industry 4.0 allows them to generate new value for a broader array of stakeholders may already be rewarded with higher growth (see sidebar “Broader View, Higher Growth” on page 10).

EXPLORE FURTHER

What really differentiates strategy is courage¹²:

Courage is the willingness to take action when it is hard, risky or scary to do so. In the tighter context of business strategy, it’s the willingness to engage in courageous conversations, to spark courageous considerations, and to make and execute courageous choices.

Courage under fire¹³:

Disruption is a topic everyone is talking about. While many organizations fear it, others realize the many opportunities that disruptive technologies, processes and social norms present. But with every opportunity comes an element of risk. Not every disruption will impact your enterprise positively.

BROADER VIEW, HIGHER GROWTH

An exclusive group of 6 percent of organizations surveyed have achieved growth of 10 percent or more over the last fiscal year. Our analysis revealed that these high-growth organizations stand out for their broad view of responsibilities and stakeholders. For example, their executives more often see themselves as architects of society in addition to being business leaders. Also, high-growth organizations are the ones that are more likely to focus on areas such as sustainability or learning.

Figure 5: Please rate your agreement with the following statements.



STRATEGIC PRIORITIES BY GEOGRAPHY

Executives' views on how to balance transformative and disruptive strategies with operations focused on efficiency and cost-effectiveness vary by region. Executives from the Americas are more focused on disruption (31 percent) than executives from APAC (18 percent) and EMEA (22 percent). APAC and EMEA executives are keeping a closer eye on reducing costs (42 percent and 41 percent respectively) than are Americans (32 percent).

The biggest difference is the focus on speed to market of products and services; 65 percent of APAC executives and 52 percent of EMEA executives prioritize increasing speed, compared with just 31 percent of executives from the Americas.

Talent and the workforce: evolution vs. revolution

The future of work

DESPITE the clear impact Industry 4.0 will have on workforces in every industry and geography, many executives we surveyed do not express urgency when it comes to tackling the challenge of the future of the workforce. As previously noted, when asked about the topics they discuss most frequently, talent and human resources are at the very bottom of the list of issues (Figure 3), and only 22 percent of respondents believe that the uncertain impact of Industry 4.0 on the workforce

will have a significant effect on their organizations (Figure 4).

Further, the findings indicate that a vast majority of executives believe they are doing all they can to prepare their workforces for Industry 4.0, that they can rely on the current education systems to properly prepare and equip workers, and that their current employees can be retrained as needed (Figure 6).

At the same time, however, only a quarter of the executives surveyed expressed high confidence that

Figure 6: Which of the following statements about the Fourth Industrial Revolution's impact on the workforce is more true?



they have the right workforce composition and skill sets needed for the future. The fact is, many jobs and required skills will change dramatically, though it may be too early to say how, or to what degree. There are two fundamental drivers that executives can consider when trying to anticipate the changes: technology (e.g., robotics and cognitive/AI) and the changing workforce (i.e., gig economy, crowdsourcing, etc.).¹⁴

Technology: Enhancing and augmenting the workforce

Just 7 percent of executives consider their organizations highly capable of planning for and addressing the effects that technology-driven changes have on their organizational structures and employees. One area where the effects of technology are especially concerning is robotics and AI. Industry leaders and academics we spoke with envision more collaborative jobs between humans and robots.¹⁵ While we typically hear about the danger of low-skilled jobs being supplanted by technology, the reality is that practically every skill level will be affected.¹⁶ But “it’s not that the person will augment the machine, it’s really the other way around,” says Hitachi’s Householder. “The value-add of the human worker will focus on essentially enduring human skills such as supervision, creativity and emotional intelligence.”

“We actually rely a huge amount on the profound knowledge of all our employees,” says McLaren’s Roberts. “When we are asking the team in production for their ideas about how we should make next year’s chassis, we are asking them because they really know how to do this stuff, and they know how to do it despite the very high-level, sometimes vague instructions that are provided from our engineering system according to the parameters that have been input into it.”

Historically, technology creates more jobs than it destroys.¹⁷ Chun-Yuan Gu, president of the Asia, Middle East and Africa region at ABB, believes in the potential of Industry 4.0 to improve our work lives. Gu describes the positive opportunities that using advanced technologies can have on our lives. “Thanks

to the ability to gain knowledge virtually, we will be able to optimize our brain power without expanding the footprint,” he says. “People will work in collaborative, decentralized ecosystems and will have flexibility to work close to where they want to live.”

Creating such a collaborative, human-friendly work/life environment will require a broader approach than organizations are currently taking. Many of the executives’ survey responses indicate that when they do focus on the workforce, it is mostly operational. Organizations tend to be most capable of using advanced technologies to enable employees to be more efficient (47 percent). But this approach—limiting the interaction of employees and technology to efficiency—could hamper organizations’ success. To be able to actively co-create the Industry 4.0 society, the workforce must be fluent in technology as a powerful force of transformation.¹⁸

“If you look at schools, apprenticeships and university programs, governments should do much more in fostering an IT culture. Coding and creating apps, for instance, should become a regular part of anyone’s curriculum.”

— *Frithjof Netzer,*
SVP and Chief Information Officer,
BASF

Changing workforce: Attracting and developing new types of talent

As organizations seek to make this jump of utilizing technology to transform their workforce, this transition must be carried out with a broad, social view in mind. “Even though we embrace disruption and change, humans do not function well in unstable positions. We need to figure out how to create the kind of stability that humans need in an environment where change is inevitable and happening at a very rapid rate,” says Barbara Dyer, executive director, Good Companies Good Jobs Initiative at MIT.

What will make this further challenging is that more than 61 percent of survey respondents anticipate that their organizations’ workforces will trend more toward contractual, temporary and/or ad hoc employees. This is supported by a larger economic trend that suggests one of the fastest-growing segments of the workforce is those engaged in alternative workforce arrangements with more workers working off campus and off balance sheets.¹⁹ In fact, 95 percent of net new employment in the United States between 2005 and 2015 consisted of alternative work arrangements, and the number of workers engaged in alternative work arrangements steadily grew from approximately 10 percent in 2005 to nearly 16 percent by 2015.²⁰ This new type of worker and employer relationship will create both opportunities and challenges to navigate.

To create stability in this new worker arrangement, Dyer suggests instilling in all of us the kind of navigational skills that enable us to continuously move through a rapidly transitioning economy in ways that give us confidence that we’re going to have the ability to put a roof over our heads and food on the table.

Our interviews with executives reveal that many we spoke with are seeking to make navigational skills part of their organizational cultures. The executives are focusing not so much on the transformation of current educational institutions but on a disruption in the approach to learning—that is, it is no longer about formal education, but about an ongoing process of continually acquiring new skills and knowledge.

Hitachi’s Householder talks about the need for organizations to create a culture to encourage employees to embrace learning. “It gives you the best opportunity to succeed. Because we could get the smartest people in the world to figure out the kinds of skills that we need to create for our workforce in the future, and I guarantee that we’re going to get most of it wrong, just because it’s unclear how it’s all going to take shape,” he says. “If you can create enough of a learning and entrepreneurial culture to experiment and put things into action and figure out what works, and then scale it, I think you have the best opportunity for success.”

For organizations that go beyond employee efficiency to consider how humans will interact with technology, how their organizations will serve non-traditional employees, and how they will educate all their workers, Industry 4.0 has the potential to create opportunities for new roles—ones that enable humans to play to their strengths while partnering with technology for greater innovation, alternative work environments, and reshaped roles and institutions.²¹

EXPLORE FURTHER

*Future of Work*²²:

Driven by accelerating connectivity, new talent models and cognitive tools, work is changing. As robotics, AI, the gig economy and “crowds”—on-demand, scalable external talent—grow, jobs are being reinvented, creating the augmented workforce. We must reconsider how jobs are designed and work to adapt and learn for future growth.

*2017 Deloitte’s Global Human Capital Trends*²³:

A number of converging issues are driving the need to “rewrite the rules.” Technology is advancing at an unprecedented rate, but many organizations retain industrial-age structures and practices that are long outdated. Forward-looking leaders have an opportunity to help their organizations adapt to technology, help people adapt to new models of work and careers, and help business adapt to and encourage positive changes in society, regulation and public policy.

HUMAN CAPITAL TRENDS

According to “2017 Deloitte Global Human Capital Trends,” the problem is not simply one of “reskilling” or planning new and better careers.²⁴ Instead, organizations must look at leadership, structures, diversity, technology and the overall employee experience in new and exciting ways. Robotics, AI, sensors and cognitive computing have gone mainstream, along with the open-talent economy. Organizations can no longer consider their workforces to be only the employees on their balance sheets, but must include freelancers, gig economy workers and crowds. These on- and off-balance-sheet workers are being augmented with machines and software.²⁵ Together, these trends will result in the redesign of almost every job, as well as a new way of thinking about workforce planning and the nature of work.²⁶

This requires adopting a human capital management approach for Industry 4.0. Many organizations still retain HR practices—from training and development to managing culture—from the last industrial revolution. They need new models to help leaders and organizations adapt to technology, help people adapt to new models of work and careers, and help the organization act as a positive force in society.

CONFIDENCE ABOUT WORKFORCE BY GEOGRAPHY

Confidence about whether their organizations are ready to address the impact of Industry 4.0 on the workforce correlates with levels of confidence about the ongoing relevance of humans. Almost a third of respondents from the Americas and EMEA feel they are highly prepared for the impact of Industry 4.0 on their workforces. The least confident are respondents from APAC (10 percent).

There is a divergence in how different geographies perceive the role of humans in the movement of people and goods. A majority of respondents from APAC (70 percent) believe that autonomous technologies will increasingly replace human workers, while nearly half (49 percent) of executives from EMEA think that. Respondents from the Americas see machines augmenting humans (North America: 77 percent; Latin America: 78 percent).

Technology: challenged vs. prepared

How ready are organizations to embrace industry 4.0 technology?

THE shift to Industry 4.0 means the ability to adopt and integrate digital and physical technologies to improve operations, become more productive, grow and innovate. This can represent a profound change for any organization. Executives understand this already; close to three-quarters note that they focus technology initiatives on their operations and processes (Figure 7).

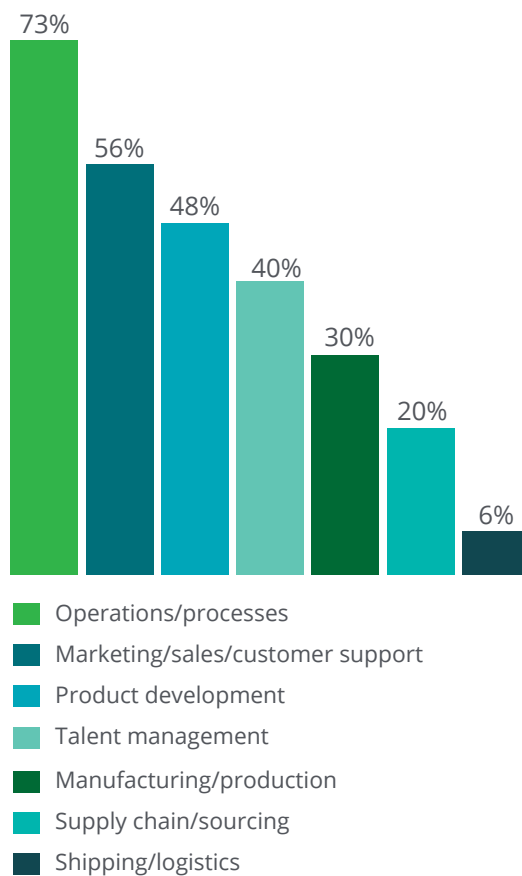
But leveraging the full transformational potential of Industry 4.0 requires also taking a broader perspective about how to use smart, connected technologies. In these early stages of the revolution, organizations have become highly capable at using digital technologies to do the same things they’ve always done, only faster and better. Already, 47 percent of executives consider their organizations highly capable at using advanced technologies to enable employees to be more efficient.

But true Industry 4.0 organizations use advanced technologies to take it a step further and create new business models, determining new ways in which to create, deliver and capture value.²⁷ Making that leap from familiar terrain to true innovation can prove challenging.

Industry 4.0 is revolutionary because it enables organizations to capture data from the physical world, analyze it digitally and drive informed action back in the physical world. This continuous and cyclical flow of information, known as the physical-to-digital-to-physical loop, enables organizations to react in real time to shifts in the ecosystem.²⁸ Beyond that, it also enables them to use the mass of collected data to begin to recognize patterns, simulate and model potential future scenarios, and learn and even predict future shifts. This can make them more responsive to unexpected shifts in demand, more flexible in the face of unpredictable environmental shifts and better prepared to address challenges, both internally and externally.²⁹

“The combination of digital technologies and a user/consumer desire for convenience, comfort and real-time response enables and challenges us to do things that we’ve never thought we would be doing,” says BASF’s Netzer.

Figure 7: Which of the following areas are currently the focus of your technology initiatives? (Select up to 3)



The Fourth Industrial Revolution is here—are you ready?

These capabilities are made more effective as more stakeholders become involved. Organizations that expand their use of Industry 4.0 technologies to include suppliers, customers, workers, partners and others in their ecosystems can find more transformative benefits.³⁰ For instance, data about how a customer uses a product or service can be fed back into the design process, enabling an organization to develop a better product that more effectively suits customers' needs; to pinpoint when and how a product breaks to troubleshoot more effectively and predictively; or to develop wholly new products based on previously unseen customer behavior.³¹

For example, at chemical manufacturer BASF, data analysis is used to improve the efficiency of manufacturing processes and anticipate client demand, as well as to consult clients on the best applications of the organization's solutions. "By combining our data with customers' data, we are able to derive recommendations for how to improve process parameters at their plants," says Netzer.

These new value-creation models require ecosystems that can cut across different internal functions, external organizations and industries. For example, the rise of autonomous vehicles is blurring the lines among several industries, including automotive, communications and entertainment.³²

Surveyed executives admit that they are not yet wholly comfortable with applying technology to transform their business models and drive new opportunities to create value. Less than a quarter consider themselves ready for new delivery models or blurred lines between industries. Further, the proportion of those who can connect a strong business case to advanced technology investments is in the single digits (Figures 8 and 9).

One reason for their low level of confidence may be that, as noted above, their strategies continue to focus on traditional near-term business operations, as opposed to focusing on longer-term opportunities to create new value for their direct and indirect stakeholders. In fact, when asked about the most common challenges their organization faces when adopting new technologies, executives most often point to a lack of internal alignment about which strategies to follow, lack of collaboration with external partners and short-termism (Figures 10).

Considering that executives are not fully comfortable with the most transformative uses of

Figure 8: How prepared is your organization to address the following issues?

Respondents who answered, "Highly prepared"; only select responses shown

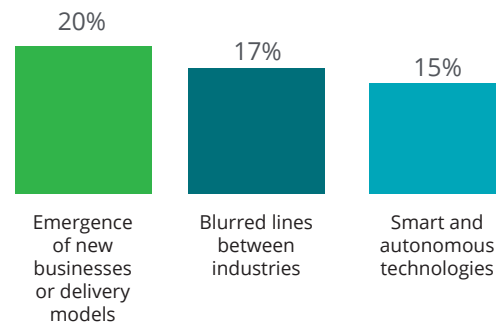
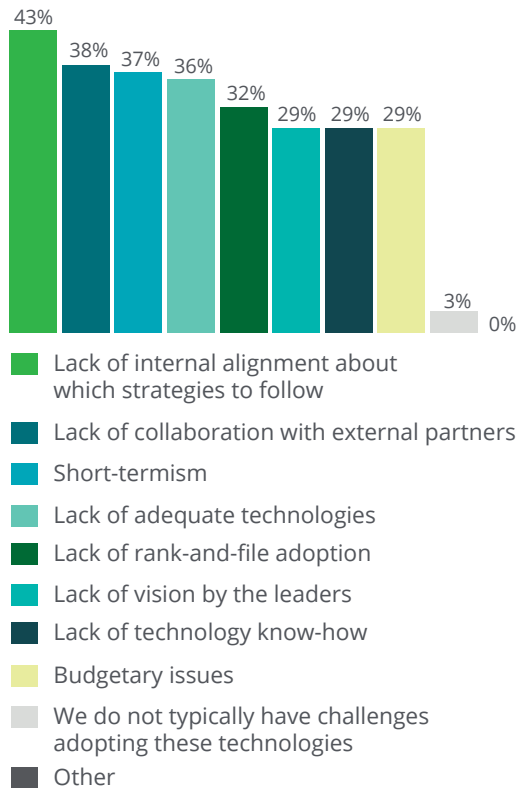


Figure 9: To what extent do you agree with the following statements about your organization's readiness to benefit from new smart and autonomous technologies?

Respondents who answered, "Highly confident"; only select responses shown

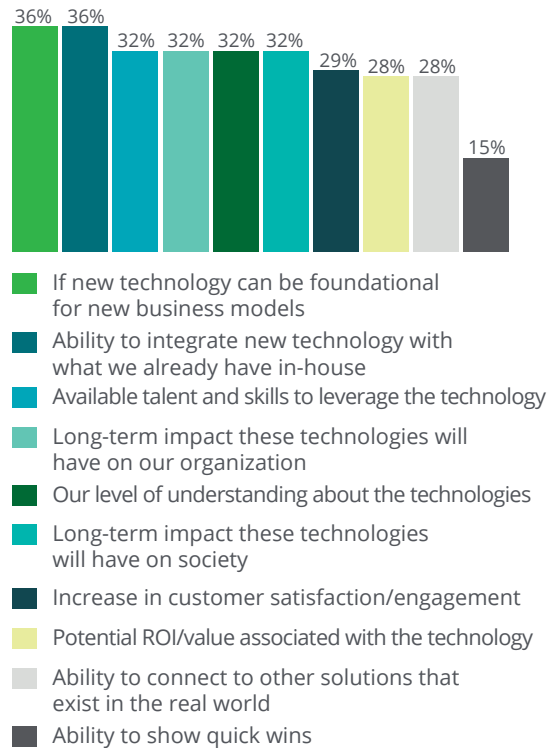


Figure 10: What are the most common challenges your organization faces as it seeks to adopt new technologies and their applications? (Select up to 3)



technologies, and that nobody can know which scenarios will ultimately become commonplace, how can executives make decisions about which technologies or business models to pursue? There can be many ways to pursue digital transformation; indeed, organizations can pursue multiple transformations simultaneously, throughout their ecosystems. In research on Industry 4.0, Deloitte explored the two main impacts digital technologies could have on organizations—streamlining business operations and boosting business growth—and identified the three main pillars in which Industry 4.0 technologies could drive tangible value: among products, within the supply chain and for customers³³. Each of these areas demonstrates myriad ways Industry 4.0 technologies can transform every facet of an organization.

Figure 11: What influences your investment in advanced technologies? (Select up to 3)



As executives seek to implement advanced technologies, it is natural to build on their existing assets, but it’s important that new technologies lay the groundwork for new business models. Our survey suggests that executives are guided in their technology investments both by what can work with their current technologies (36 percent), as well as what can become foundational for new business models (36 percent) (Figure 11).

Our interviews with executives reflect this duality. Barco approaches technology innovation by strategizing on two levels: mature core business areas and new growth initiatives. “In the core business, we are really looking at operational efficiency: How can we further optimize? How can we have more working productivity? We focus on performance,” says Barco’s Bourgois. “For the growth initiatives, when we believe that the idea has potential, we are looking at how we can be swift, how we can create the needed

outcome and whether the solution responds to a customer need. It focuses on ‘Design Thinking.’”

These days, a new opportunity may transition into a mature product or service fast. Just a couple of years ago, Barco came up with a wireless presentation device called Clickshare, removing the burden of cables to share content. It is growing at a pace exceeding 20 percent and is now at a stage that the organization is pushing it to become

an even bigger star, with more efficiencies and new capabilities—hardware and software combined at users’ fingertips.

This swift transition from opportunity to maturity highlights not only the speed at which technologies are transforming business, but also the need to strike the right balance in the approach to technology innovation—creating opportunity for new value creation and the longer-term business case.

“Ideas that are good for humans will take root, even if today they seem far-fetched. For example, autonomous vehicles—if they indeed eliminate most traffic accident deaths—will be accepted as the safer way to drive. After all, in most of the world we don’t allow cigarette ads anymore. I think in the future this idea of ‘fun to drive’ is going to sound as ridiculous as a smoking commercial.”

— *Joi Ito,*
Director,
MIT Media Lab

EXPLORE FURTHER

Connecting the digital and physical worlds through Industry 4.0³⁴:

Industry 4.0 can create interconnected digital enterprises, ecosystems, supply networks and consumer interactions that communicate, analyze, learn and apply information to drive actions in the physical world.

Creating a new mobility ecosystem³⁵:

Will technological advances and shifts in social attitudes lead to our no longer owning or driving vehicles? The global auto industry’s transformation has far-reaching implications for how we move from point A to point B and, in turn, affects carmakers, energy organizations, insurers, healthcare, government funding and more. Value shifts as a new ecosystem of mobility emerges.

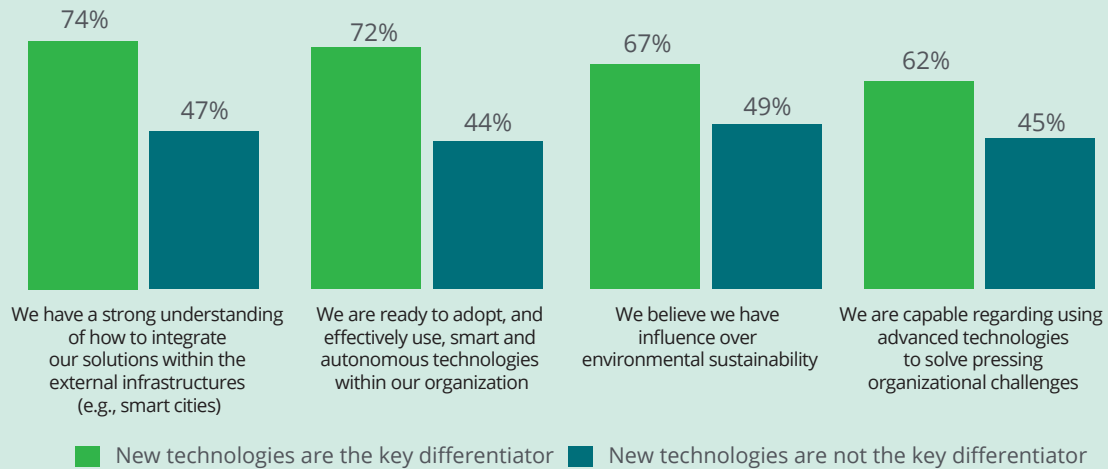
Achieving digital maturity³⁶:

A global survey of more than 3,500 managers and executives reveals five key practices of organizations that are developing into more mature digital organizations.

TECHNOLOGY IS KEY

How executives approach technology strongly correlates with how well prepared they believe they are for Industry 4.0 and the business case they can make for new technologies. Those who view implementing new technologies as the key competitive differentiator (20 percent) are more confident they are prepared across a broad range of areas than those for whom technology is one of many priorities.

Figure 12. Benefits of a focus on technology



NORTH AMERICAN FOCUS ON TECHNOLOGY

Close to a third of respondents from the Americas consider technology a key competitive differentiator, compared with 12 percent in APAC and 18 percent in EMEA. This focus on technology breeds a degree of confidence: More respondents from North America believe that they have a strong business case for their technology solutions (14 percent), with APAC respondents being the most doubtful (5 percent), and Latin America and EMEA coming in at 9 percent. North American respondents also believe they have a better handle (18 percent) on what’s required for business success in Industry 4.0 than do their APAC counterparts (12 percent). That said, the level of confidence is relatively low across all groups.

Summary

INDUSTRY 4.0 represents the ways in which smart, connected technology becomes embedded within organizations, as well as peoples' daily lives. This revolution of digital and physical technologies gives rise to vast possibilities—but it can also upend the status quo and create nearly as much uncertainty as it does opportunity. A newcomer's idea can disrupt an established industry, or a broad set of digital data augmented by artificial intelligence and sophisticated models can rival expertise gathered over many years of hands-on experience. As expressed by Chun-Yuan Gu, "This knowledge, which takes an organization decades to gain, becomes more accessible to new organizations with less experience but the right technology."

In this way, Industry 4.0 also enables organizations to take advantage of network-based, data-driven, autonomous and cognitive digital and physical technologies to create truly innovative business solutions—rather than simply using technology to pursue the same old ways of doing business. In the process, however, its effects can ripple outward to touch everything that organization touches. It is therefore crucial to understand the important connections between business and social needs; between financial outcomes and innovative strategies; between workforce productivity and people's feeling of stability and well-being; between integrating existing technologies and creating completely new solutions.

Our research has revealed that, overall, executives around the world are in the early stages of readying their organizations to harness the full potential of Industry 4.0. As they progress, there are opportunities to strengthen key connections that will benefit their clients, their people, their organizations, their communities and society more broadly:

- **Social impact.** Accept that each and every organization has the power to influence, in multiple ways, the promise of the Fourth Industrial Revolution to create a more equitable and stable world.
- **Strategy.** Take a holistic approach to strategic planning, exploring how core capabilities can be enhanced by new ones to develop new products and services, and create new value for a broader range of stakeholders.
- **Talent and workforce.** Make it a priority to prepare workers to navigate the age of Industry 4.0 by creating a culture of learning and collaboration, and creating training opportunities—both within the organization as well as in underserved communities.
- **Technology.** View technology as the most powerful differentiator in an Industry 4.0 world, and invest in integrating new applications that can support new business models. And—most importantly—understand that Industry 4.0 technologies shouldn't be limited to just one part of the organization; they should be integrated across the organization to better support a broad spectrum of responsibilities and stakeholders necessary to thrive in an Industry 4.0 world.

While the Fourth Industrial Revolution has the power to change many things across a broad spectrum—work, operations, society—one thing is certain: It's here, and executives need to be ready. It is clear that the old way of doing things isn't enough anymore, and those who make the most impact will be the ones who embrace all facets of Industry 4.0 and all the opportunities it will bring.

METHODOLOGY

This research is based on a survey of 1,603 global executives conducted by Forbes Insights in the second half of 2017. Survey respondents represented 19 countries from the Americas, Asia and Europe, and came from all major industry sectors. All survey respondents were C-level executives, including CEOs/presidents (16 percent), with the rest evenly divided among COOs, CFOs, CMOs, CIOs and CTOs. All executives represented organizations with revenue of \$1 billion or more, with more than half (53 percent) coming from organizations with more than \$5 billion in revenue.

Additionally, Forbes Insights and Deloitte conducted one-on-one interviews with global industry leaders and academics.

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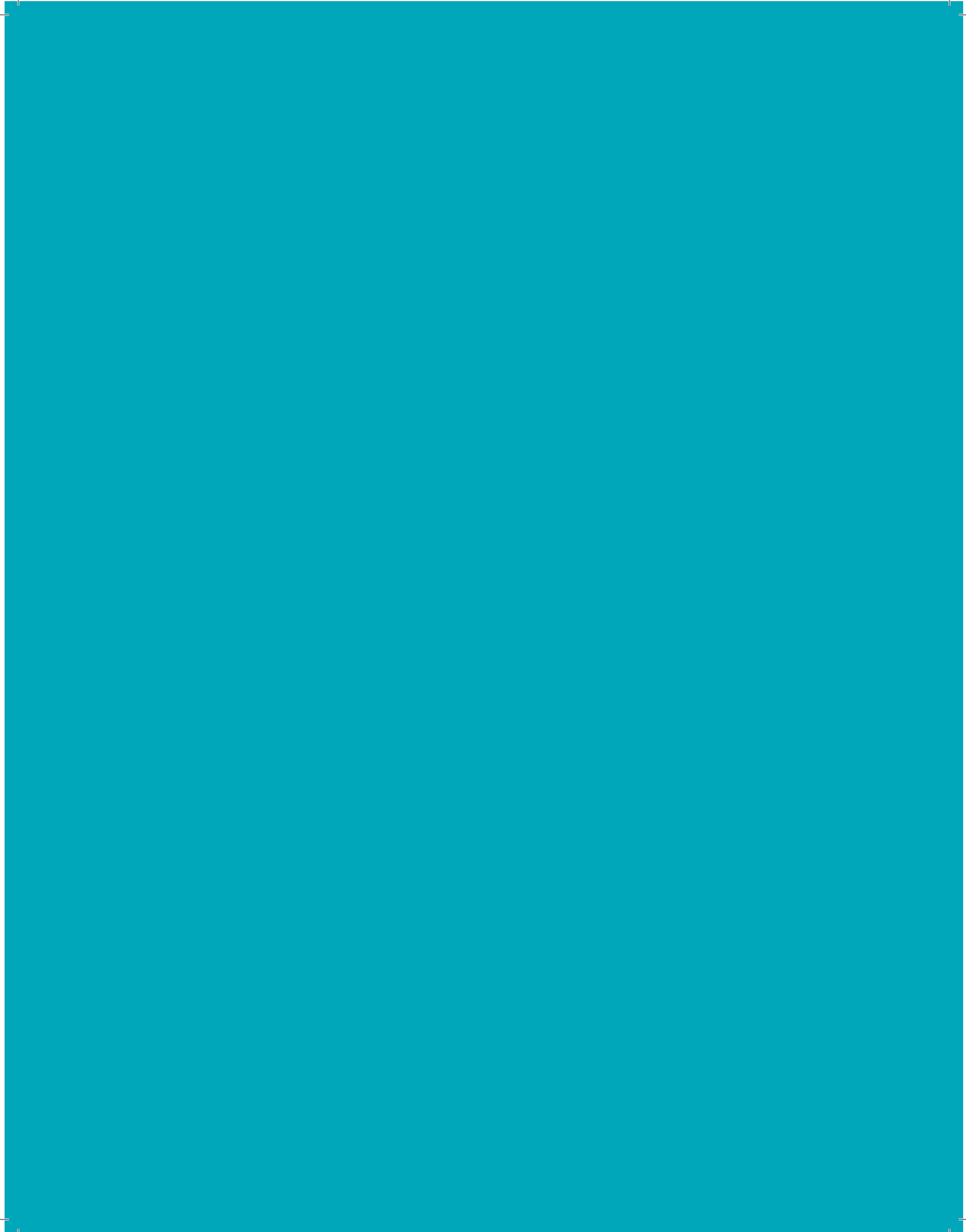
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ENDNOTES

1. Deloitte's Shift Index aims to help executives understand and take advantage of the long-term trends, driven by public policy and the exponential rate of change in the digital infrastructure, that are causing significant changes around them. <https://www2.deloitte.com/us/en/pages/center-for-the-edge/topics/deloitte-shift-index-series.html>
2. John Hagel, John Seely Brown, Maggie Wooll and Andrew de Maar, "The paradox of flows: Can hope flow from fear? 2016 Shift Index," Deloitte Insights, Dec. 13, 2016.
3. "Pro-business," but expecting more, The Deloitte Millennial Survey 2017.
4. Marcus Shingles, Bill Briggs and Jerry O'Dwyer. "Social impact of exponential technologies: Corporate social responsibility 2.0," Deloitte Insights, February 24, 2016.
5. <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/About-Deloitte/gx-deloitte-millennial-survey-2017-executive-summary.pdf>
6. <https://dupress.deloitte.com/dup-us-en/focus/tech-trends/2016/social-impact-of-exponential-technologies.html>
7. Brenna Sniderman, Monika Mahto and Mark Cotteleer, "Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises," Deloitte Insights, February 22, 2016.
8. Adam Mussomeli, Doug Gish and Stephen Laaper, "The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains," Deloitte Insights, December 1, 2016.
9. Brenna Sniderman, Kelly Monahan and John Forsythe. "3D opportunity for engineers: Using behavioral science to help build a new mindset," Deloitte Insights, January 25, 2016.
10. Ibid.
11. Bill Briggs, interviewed by Tanya Ott, "Preparing for digital innovations," Deloitte Insights, February 8, 2017.
12. <https://www2.deloitte.com/global/en/pages/strategy-operations/monitor-deloitte/articles/courage-under-fire-monitor-deloitte.html>
13. <https://www2.deloitte.com/global/en/pages/risk/articles/directors-alert-courage-under-fire.html>
14. Jeff Schwartz, Heather Stockton and Kelly Monahan, Forces of change: The future of work, Deloitte Insights, 2017, <https://dupress.deloitte.com/dup-us-en/focus/technology-and-the-future-of-work/overview.html>
15. John Hagel, Jeff Schwartz and Josh Bersin, Navigating the future of work, Deloitte Insights, 2017, <https://dupress.deloitte.com/dup-us-en/deloitte-review/issue-21/navigating-new-forms-of-work.html>
16. Ibid.
17. Ian Stewart, Debapratim De and Alex Cole, "Technology and people: The great job-creating machine," <https://www2.deloitte.com/uk/en/pages/finance/articles/technology-and-people.html>
18. Anthony Stephan, Martin Kamen and Catherin Bannister, "Tech fluency: A foundation of future careers," Deloitte Review, 2017, <https://dupress.deloitte.com/dup-us-en/deloitte-review/issue-21/tech-fluency-mastering-the-language-of-technology.html>

19. Sonny Chheng, Kelly Monahan and Karen Reid, “Beyond office walls and balance sheets: Culture and the alternative workforce,” Deloitte Review, 2017.
20. Ibid.
21. John Hagel, Jeff Schwartz and Josh Bersin, “Navigating the future of work: Can we point business, workers, and social institutions in the same direction?” Deloitte Insights, July 31, 2017.
22. <https://dupress.deloitte.com/dup-us-en/focus/technology-and-the-future-of-work.html>
23. <https://www2.deloitte.com/content/dam/Deloitte/global/Documents/HumanCapital/hc-2017-global-human-capital-trends-gx.pdf>
24. Josh Bersin, Bill Pelster, Jeff Schwartz and Bernard van der Vyver, Introduction: Rewriting the rules for the digital age, Human Capital Trends Report, 2017, <https://dupress.deloitte.com/dup-us-en/focus/human-capital-trends/2017/introduction.html>
25. Jeff Schwartz, Laurence Collins, Heather Stockton, Darryl Wagner and Brett Walsh, The future of work: The augmented workforce, Human Capital Trends Report, 2017, <https://dupress.deloitte.com/dup-us-en/focus/human-capital-trends/2017/future-workforce-changing-nature-of-work.html>
26. Jeff Schwartz, Heather Stockton and Kelly Monahan, “Forces of change: The future of work,” Deloitte Insights, 2017, <https://dupress.deloitte.com/dup-us-en/focus/technology-and-the-future-of-work/overview.html>
27. Mark Cotteleer and Brenna Sniderman, “The Forces of Change: Industry 4.0,” Deloitte Insights, December 18, 2017.
28. For further information about the physical-to-digital-to-physical loop, see Brenna Sniderman, Monika Mahto and Mark Cotteleer, “Industry 4.0 and manufacturing ecosystems: Exploring the world of connected enterprises,” Deloitte Insights, February 22, 2016.
29. For further information on simulation, modeling and prediction and their impact on operations and planning, see Aaron Parrott and Lane Warshaw, “Industry 4.0 and the digital twin: Manufacturing meets its match,” Deloitte Insights, May 12, 2017; and Rick Burke, Adam Mussomeli, Stephen Laaper, Martin Hartigan and Brenna Sniderman, “The smart factory: Responsive, adaptive, connected manufacturing,” Deloitte Insights, August 31, 2017.
30. Adam Mussomeli, Doug Gish and Stephen Laaper, “The rise of the digital supply network: Industry 4.0 enables the digital transformation of supply chains,” Deloitte Insights, December 1, 2016.
31. Jeff Hood, Alan Brady and Raj Dhanasri, “Industry 4.0 engages customers: The digital manufacturing enterprise powers the customer life cycle,” Deloitte Insights, December 15, 2016.
32. Cotteleer and Sniderman, “The Forces of Change: Industry 4.0.”
33. Mark Cotteleer and Brenna Sniderman, “The Forces of Change: Industry 4.0,” Deloitte Insights, December 18, 2017.
34. https://dupress.deloitte.com/dup-us-en/focus/industry-4-0.html?icid=left_industry-4-0
35. <https://dupress.deloitte.com/dup-us-en/focus/future-of-mobility/transportation-technology.html>
36. <https://dupress.deloitte.com/dup-us-en/focus/digital-maturity/digital-mindset-mit-smr-report.html>



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