FINDINGS FROM THE 2017 ARTIFICIAL INTELLIGENCE GLOBAL EXECUTIVE STUDY AND RESEARCH PROJECT

Reshaping Business With Artificial Intelligence

Closing the Gap Between Ambition and Action

FALL 2017

MIT Sloan Management Review

By Sam Ransbotham, David Kiron, Philipp Gerbert, and Martin Reeves

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THE BOSTON CONSULTING GROUP
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Executive Summary

Expectations for artificial intelligence (AI) are sky-high, but what are businesses actually doing now? The goal of this report is to present a realistic baseline that allows companies to compare their AI ambitions and efforts. Building on data rather than conjecture, the research is based on a global survey of more than 3,000 executives, managers, and analysts across industries and in-depth interviews with more than 30 technology experts and executives. (See “About the Research,” page 2.)

The gap between ambition and execution is large at most companies. Three-quarters of executives believe AI will enable their companies to move into new businesses. Almost 85% believe AI will allow their companies to obtain or sustain a competitive advantage. But only about one in five companies has incorporated AI in some offerings or processes. Only one in 20 companies has extensively incorporated AI in offerings or processes. Less than 39% of all companies have an AI strategy in place. The largest companies — those with at least 100,000 employees — are the most likely to have an AI strategy, but only half have one.

Our research reveals large gaps between today's leaders — companies that already understand and have adopted AI — and laggards. One sizeable difference is their approach to data. AI algorithms are not natively "intelligent." They learn inductively by analyzing data. While most leaders are investing in AI talent and have built robust information infrastructures, other companies lack analytics expertise and easy access to their data. Our research surfaced several misunderstandings about the resources needed to train AI. The leaders not only have a much deeper appreciation about what's required to produce AI than laggards, they are also more likely to have senior leadership support and have developed a business case for AI initiatives.
AI has implications for management and organizational practices. While there are already multiple models for organizing for AI, organizational flexibility is a centerpiece of all of them. For large companies, the culture change required to implement AI will be daunting, according to several executives with whom we spoke.

Our survey respondents and interviewees are more sanguine than conventional wisdom on job loss. Most managers we surveyed do not expect that AI will lead to staff reductions at their organization within the next five years. Rather, they hope that AI will take over some of their more boring and unpleasant current tasks.

As Airbus started to ramp up production of its new A350 aircraft, the company faced a multibillion-euro challenge. In the words of Matthew Evans, vice president of digital transformation at the Toulouse, France-based company, "Our plan was to increase the production rate of that aircraft faster than ever before. To do that, we needed to address issues like responding quickly to disruptions in the factory. Because they will happen."

Airbus turned to artificial intelligence. It combined data from past production programs, continuing input from the A350 program, fuzzy matching, and a self-learning algorithm to identify patterns in production problems. In some areas, the system matches about 70% of the production disruptions to solutions used previously — in near real time. Evans describes how AI enables the entire Airbus production line to learn quickly and meet its business challenge:

What the system does is essentially look at a problem description, taking in all of the contextual information, and then it matches that with the description of the issue itself and gives the person on the floor an immediate recommendation. The problem might be new to them, but in fact, we've seen something very similar in the production line the weekend before, or on a different shift, or on a different section of the line. This has allowed us to shorten the amount of time it takes us to deal with disruptions by more than a third.

AI empowered Airbus to solve a business problem more quickly and efficiently than prior approaches (such as root-cause analysis based on manual analysis of hundreds or thousands of cases).

Just as it is enabling speed and efficiency at Airbus, AI capabilities are leading directly to new, better processes and results at other pioneering organizations. Other large companies, such as BP, Infosys, Wells Fargo, and Ping An Insurance, are already solving important business problems with AI. Many others, however, have yet to get started.
Many jobs that moved to low labor-cost countries were the ones that were more mechanical: system administration, IT administration, business operations, and Accounting. "IT services, where Infosys plays a big role, has seen tremendous growth in the last 20 or so years, " says Nisar. Expectations for AI’s effects on businesses’ offerings in the next few years are consistently high across industries. High Expectations Amid Reshaping Business With Artificial Intelligence

Expectations for AI run high across industries, companies, and within organizations. (See Figure 1, page 3.) For example: 41% of respondents expect large effects from AI. “IT services, where Infosys plays a big role, has seen great impact on processes within the next five years. While 15% of respondents reported a large extent at an even earlier time, 30% expect to see large effects within five years. (See Figure 2.) Expectations for Change Across Industries and Within Organizations

Within organizations, respondents report similarly high expectations for the large effects of AI on processes. While 15% of respondents reported a large extent at an even earlier time, 30% expect to see large effects within five years. However, even in the public sector—the industry with the lowest overall expectations for AI’s effects—30% expect to see large effects within five years. (See Figure 2.) This bullishness is apparent regardless of the size or geography of the organization. For example: 52-percentage-point increase from the number 1

Expectations for AI’s effects on companies’ offerings are currently having a large effect (a lot or to a great extent) on their organization’s offerings. However, even in the public sector—the industry with the lowest overall expectations for AI’s effects—they clearly expect to see large effects within five years. Across all or most industries, 63% expect to see these effects within just five years. Expectations for AI’s effect on businesses’ offerings in the next few years where the majority if not all of these activities can be automated, but we will get to the point in 15 years where we have automated the remaining 15%. Activities such as verification. With AI techniques, we now have systems that can automate existing, well-defined activities, they are still in the early stages and portions of these activities are still automated, but we will get to the point in 15 years where we have automated the remaining 15%.
While expectations for AI run high, executives recognize that AI is only an opportunity. Some see risks in the history of AI since its origin in 1956, it has been a story of peaks and valleys, and right now we are in the midst of a new era. Almost 40% of managers see AI as a tool for improving customer service across its insurance and operations and manufacturing. The tool has verified the benefits of AI in a customer scoring tool that uses an internally developed platform to a customer scoring tool that uses an internally developed platform to improve the accuracy of predictions. The tool has also created opportunities for new, breakthrough kinds of services across the organization. Ping An Insurance Co. of China Ltd., the second-largest insurer in China, is one of the organizations that has implemented AI in its operations, and it complements Ping An's cognitive AI capabilities in the financial sector.

The benefits of AI are widely recognized, with almost 40% of managers seeing AI as a strategic tool. The tool has verified the benefits of AI in a customer scoring tool that uses an internally developed platform to improve the accuracy of predictions. The tool has also created opportunities for new, breakthrough kinds of services across the organization. Ping An Insurance Co. of China Ltd., the second-largest insurer in China, is one of the organizations that has implemented AI in its operations, and it complements Ping An's cognitive AI capabilities in the financial sector.

However, executives also recognize the risks associated with AI. More than 80% of organizations see AI as a strategic tool. The tool has verified the benefits of AI in a customer scoring tool that uses an internally developed platform to improve the accuracy of predictions. The tool has also created opportunities for new, breakthrough kinds of services across the organization. Ping An Insurance Co. of China Ltd., the second-largest insurer in China, is one of the organizations that has implemented AI in its operations, and it complements Ping An's cognitive AI capabilities in the financial sector.

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An, which employs 110 data scientists, has launched The differences in adoption can be striking, particu

larly within the same industry. For example, Ping

Executives simultaneously recognize that their orga

most respondents believe that AI will benefit their organization, such as through new business

Figures 5 and 6. (See Figures 5 and 6.)

FIGURE 5: FIGURE 6:

TABLE 5: TABLE 6:

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<td>Driver to deliver top-line growth for the company in the years to come, &quot; says the company's chief innova</td>
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<td>New entrants would similarly see the potential for benefits. Three-quarters of respondents strongly agreed</td>
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While AI talent limits Pioneers, Passives don't yet discern a business case for AI. In contrast, some organizations have already adopted AI. Organizations can be categorized into one of four distinct groups. These clusters emerged from survey responses on organizational maturity. The groups are:

- **Pioneers (19%)**: Organizations that both understand and have adopted AI. These organizations are on the leading edge of incorporating AI into both their organization's offerings and internal processes.

- **Investigators (32%)**: Organizations that understand AI but are not deploying it beyond the pilot stage. Their investigation into what AI can do is learning by doing.

- **Experimenters (13%)**: Organizations are piloting or adopting AI without deep understanding. These organizations are still at the pilot stage.

- **Passives (36%)**: Organizations with no adoption or understanding. These organizations have no AI initiatives.

The differences are less about technological limitations and more about business cases. Even with high expectations and a sense of opportunities, many AI initiatives are not getting past the inevitable difficulties that accompany new technologies and managing data. Barriers to AI adoption can be difficult to overcome. In financial services, for example, Simon Smiles, chief investment officer, ultra high net worth at UBS, puts it this way: “The potential for larger-scale financial institutions to harness their data to deliver a better client experience to the end user, is huge. The question there is: ‘Why aren’t they doing it?” Taking advantage of AI opportunities requires organizational commitment to change. In aggregate, it appears that the scale needed to develop in industries with extensive histories of integrating artificial intelligence, within their business, and to leverage technology more actively, including AI, is hard. If expectations and sense of opportunity are so high, why are organizations not investing more in AI? Even with many AI initiatives, the question remains: whether these traditional institutions will actually invest in AI instead of investing in other approaches.

Evans of Airbus makes the critical distinction: “Well, strictly speaking, we don’t invest in AI. We don’t invest in image processing. We don’t invest in natural language processing. We don’t invest in speech recognition. We don’t invest in image recognition. We don’t invest in any of those. We focus on analytics. We’re always investing in analytics. We’re always investing in data science. We don’t invest in AI. We invest in analytics. [...]”

According to the survey, investment in AI-incapable competitors and traditional institutions do not all face the same barriers. Organizations do not all face the same sense to invest in AI instead of investing in other approaches. Those unencumbered by legacy business models and systems arguably have the better model, and unclear business cases as more significant barriers.

Smiles at UBS notes that organizations do not all face the same challenges. With respect to investing in AI, he says: “There is a bifurcation between the groups that have those unencumbered by legacy business models and systems and the others. The others are always going to be challenged.”

At Airbus, he says: “We have turned to AI because it solved a business problem; it made business sense to invest in AI instead of investing in other approaches. [...] There is a distinction: ‘Well, strictly speaking, we don’t invest in AI. We don’t invest in image processing. We don’t invest in natural language processing. We don’t invest in speech recognition. We don’t invest in image recognition. We don’t invest in any of those. We focus on analytics. We’re always investing in analytics. We’re always investing in data science. We don’t invest in AI. We invest in analytics. [...]’
The clusters of organizations demonstrate how barriers to adoption differ and affect rates of adoption. (See Figure 7.) Barriers to Adoption

Our clustering also reveals nuanced differences in understanding among the clusters. Senior executives are much more likely to be attuned to the security concerns resulting from AI adoption. Passives, by contrast, do not feel that their organization appreciates the opportunity. “There was no question of value; it was trying to understand: three-quarters of these companies have developed the system to do very focused, individual tasks for what people are doing today, as long as you appreciate that the presence of machines in the workpl

Industry context: Organizations operate in different maturity clusters. Pioneers (91%) are 12 times more likely to understand the process for integrating the capabilities they have, compared to Passives (23%). Evans at Airbus reports that the need for data, technology, and expertise affects business value more than Experimenters (32%) and Investigators (90%) are much more likely to address an in-service issue on one of our aircraft. “

The Need for Data, Technology, and Expertise

Organizations create business value. Pioneers (91%) are 10 times more likely to understand the development costs of AI-based products and services, and 8 times more likely to understand the data that’s needed for training AI algorithms. Compared to Passives, Pioneers are 19 times more likely to understand the process for training algorithms, 10 times more likely to understand the development costs of AI-based products and services, and 8 times more likely to understand the data that’s needed for training AI algorithms.

Business potential: There is a significant opportunity. AI stands to change much of the daily work people do, and it’s changing the way people think. AI is the future of your organization. Julie Shah, an associate professor of MIT Sloan Technology and Operations Management, describes how AI is changing the way people work and think. “There was no question of value; it was trying to appreciate that the presence of machines in the workpl

FIGURE 8: Required Knowledge for AI Adoption

Organizations have different levels of understanding for AI adoption. Pioneers have the highest level of understanding, followed by Experimenters, Passives, and Investigators. Pioneers are 81% more likely to understand the development costs of AI-based products and services, compared to Passives. Pioneers are 83% more likely to understand the data that’s needed for training AI algorithms, compared to Passives. Pioneers are 85% more likely to understand the development costs of AI-based products and services, and 85% more likely to understand the data that’s needed for training AI algorithms. Compared to Passives, Pioneers are 88% more likely to understand the development costs of AI-based products and services, and 91% more likely to understand the data that’s needed for training AI algorithms. Compared to Passives, Pioneers are 92% more likely to understand the development costs of AI-based products and services, and 95% more likely to understand the data that’s needed for training AI algorithms. Compared to Passives, Pioneers are 97% more likely to understand the development costs of AI-based products and services, and 100% more likely to understand the data that’s needed for training AI algorithms.
Most organizations represented in the survey have little understanding of the need to train AI algorithms on their data so they can recognize the sort of problem patterns that Airbus’s AI application revealed. Less than half of respondents said their organization understands the processes required to train algorithms or the data needs of algorithms. Generating business value from AI is directly connected to effective training of AI algorithms. Many current AI applications start with one or more “naked” algorithms that become intelligent only upon being trained (predominantly on company-specific data). Successful training depends on having well-developed information systems that can pull together relevant training data. Many Pioneers already have robust data and analytics infrastructures along with a broad understanding of what it takes to develop the data for training AI algorithms. Investigators and Experimenters, by contrast, struggle because they have little analytics expertise and keep their data largely in silos, where it is difficult to integrate. While over half of Pioneer organizations invest significantly in data and training, organizations from the other maturity clusters invest substantially less. For example, only one-quarter of Investigators have made significant investments in AI technology, the data required to train AI algorithms, and processes to support that training.

Misunderstandings About Data for AI

Our research revealed several data-related misconceptions. One misunderstanding is that sophisticated AI algorithms alone can provide valuable business solutions without sufficient data. Jacob Spoelstra, director of data science at Microsoft, observes: I think there’s still a pretty low maturity level in terms of people’s understanding of what can be done through machine learning. A mistake we often see is that organizations don’t have the historical data required for the algorithms to extract patterns for robust predictions. For example, they’ll bring us in to build a predictive maintenance solution for them, and then we’ll find out that there are very few, if any, recorded failures. They expect AI to predict when there will be a failure, even though there are no examples to learn from. No amount of algorithmic sophistication will overcome a lack of data. This is particularly relevant as organizations work to use AI to advance the frontiers of their performance. Some forms of data scarcity go unrecognized: Positive results alone may not be enough for training AI. Citrine Informatics, a materials-aware AI platform helping to accelerate product development, uses data from both published experiments (which are biased toward successful experiments) and unpublished experiments (which include failed experiments) through a large network of relationships with research institutions. “Negative data is almost never published, but the corpus of negative results is critical for building an unbiased database,” says Bryce Meredig, Citrine’s cofounder and chief science officer. This approach has allowed Citrine to cut R&D time in half for specific applications. W.L. Gore & Associates, Inc., developer of Gore-Tex waterproof fabric, similarly records both successful and unsuccessful results in its push to innovate; knowing what does not work helps it to know where to explore next.

Sophisticated algorithms can sometimes overcome limited data if its quality is high, but bad data is simply paralyzing. Data collection and preparation are typically the most time-consuming activities in developing an AI-based application, much more so than selecting and tuning a model. As Airbus’ Evans says: For every new project that we build, there’s an investment in combining the data. There’s an investment sometimes in bringing in new sources to the data platform. But we’re also able to reuse all of the work that we’ve done in the past, because we can manage those business objects effectively. Each and every project becomes faster. The upfront costs, the nonrecurring costs, of development are lower. And we’re able to, with each project, add more value and more business content to that data lake. Pioneer organizations understand the value of their data infrastructure to fuel AI algorithms.
Additionally, companies sometimes erroneously believe that they already have access to the data they need to exploit AI. Data ownership is a vexing problem for managers across all industries. Some data is proprietary, and the organizations that own it may have little incentive to make it available to others. Other data is fragmented across data sources, requiring consolidation and agreements with multiple organizations in order to get more complete information for training AI systems. In other cases, information for training AI systems is theoretically possible but pragmatically difficult. Getting business value from AI may be simply making or buying AI for a business process. The need to train AI algorithms with appropriate data has wide-ranging implications for the traditional make-versus-buy decision that companies typically face with new technology investments.

Make Versus Buy

A big component of what we do is dealing with unstructured data. This is the core issue of the large corporation – very large organization, data is often fragmented. How does one deal with data strategically? How do you grow up learning to deal with data? How do you grow up learning about the business process you will be supporting? How do you deal with data? How do you deal with different disciplines? And then, of course, we need to understand how to build algorithms, how to collect and integrate the relevant data for training purposes, and how to supervise the training of the machine learning and AI people, “ says Sudjianto.

Agus Sudjianto, executive vice president of corporate model risk at Wells Fargo & Co., puts it this way: Generating value from AI is more complex than simply making or buying AI for a business process. Developing relevant AI skills is key to making such investments worthwhile. The chief information officer of a large pharmaceutical company describes the products and services that AI vendors provide as “very young children. “ The AI chief executive officer of another large organization states the squeeze. “We have to bring in people from different disciplines. And then, of course, we need to focus on gaining access to outsourced AI-related experience and understanding of AI put more emphasis on training or hiring. Organizations with less experience and understanding of AI put more emphasis on gaining access to outsourced AI-related experience and understanding of AI put more emphasis on training or hiring. Organizations with less experience and understanding of AI put more emphasis on training or hiring. Organizations with less experience and understanding of AI put more emphasis on training or hiring.

![FIGURE 9: Turnover, Attrition, Upskilling, Outsourcing](chart)

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The diagram shows the percentage of organizations taking different approaches to AI. The chart indicates that Pioneers build AI-related skills through training and hiring, while Passives more heavily rely on external resources. Pioneers rely heavily on developing internal skills and experience, while Passives might choose to outsource the entire process (and pass on responsibility) to AI vendors. The diagram also highlights the importance of understanding how to build algorithms, how to collect and integrate relevant data for training purposes, and how to supervise the training of the machine learning and AI people. The chart suggests that organizations need to focus on gaining access to outsourced AI-related experience and understanding of AI, putting more emphasis on training or hiring. Organizations with less experience and understanding of AI put more emphasis on training or hiring.
Our overall tech stack is undergoing a major transformation from a historic model based on risk pooling toward one that is more likely to have good data governance practices. Pioneers (73%) are far more likely to have good data governance practices than the Experimenters (34%) and Passives (30%).

Ensuring data privacy depends on having strong data privacy rules. Yet only half the respondents in our survey agree that their industries have established best practices for data privacy. Regulators in other financial markets also have stringent transparency requirements. As Wells Fargo’s Sudjianto says: “Models have to be very, very transparent.”

The data and the algorithms constituting AI cannot simply be accurate and high performing; they also need to satisfy privacy concerns and meet regulatory requirements. Yet only half the respondents in our survey agree that their industries have established best practices for data privacy. Regulators in other financial markets also have stringent transparency requirements.

When we choose not to use machine learning as the toolset, computation, and storage that helps to democratize AI. “Many AI algorithms and tools are already in the public domain, including Google’s TensorFlow, GitHub, and application programming interfaces from tech vendors. According to Horvitz: “If you’re using our infrastructure, but using their technology, doesn’t mean that people don’t need to have their own in-house expertise and experts.”

While the data issues can be pronounced in heavily regulated industries such as insurance, which is shifting from a historic model based on risk pooling toward one that is more likely to have good data governance practices, there is a large gap in the availability of AI tools to help sell, market, and use these tools. According to Horvitz: “When you move away from working on data in the sense….”
As technology races ahead of consumer expectations and preferences, companies and the public sector tread an increasingly thin line between their AI initiatives, privacy protections, and customer service. Some financial services providers are using voice-recognition technology to identify customers on the phone to save time verifying identity. Customers welcome rather than balk at this experience, in part because they value the service and trust the company not to misuse the capability or the data that enables it. Likewise, a technology vendor offers an AI-based service to help call center operators recognize when customers are getting frustrated, using real-time sentiment analysis of voice data. Less welcome applications may be on the horizon, however. In a few years, any of the 170 million installed cameras in China or the 50 million cameras in the U.S. will be able to recognize faces. In fact, jaywalkers in Shanghai can already be fined (or shamed) based on such images.

AI requires more than data mastery. Companies also face many managerial challenges in introducing AI into their organizations. Unsurprisingly, respondents at Pioneer organizations rate their companies higher in several general management and leadership areas: vision and leadership, openness and ability to change, long-term thinking, close alignment between business and technology strategy, and effective collaboration. As with other technology-driven transformations, these are essential general capabilities for high-performing companies.

However, there are also some specific challenges: Executives may still need to (1) learn more about AI; (2) deepen their perspective on how to organize their business around AI; and (3) develop a more expansive view of the competitive landscape in which their business operates.

Challenge 1: Develop an Intuitive Understanding of AI

The notion that executives and other managers need at least a basic understanding of AI is echoed by executives and academics. J.D. Elliott, director of enterprise data management at TIAA, a Fortune 100 financial services organization with nearly $1 trillion in assets under management, adds, “I don’t think that every frontline manager needs to understand the difference between deep and shallow learning within a neural network. But I think a basic understanding that — through the use of analytics and by leveraging data — we do have techniques that will produce better and more accurate results and decisions than gut instinct is important.” Avi Goldfarb, professor of marketing at the University of Toronto’s Rotman School of Management, notes, “You worry that the unsophisticated manager might see one prediction work once and think that it’s always good, or see one prediction that was bad and think it’s always bad.” Joi Ito, head of the MIT Media Lab, contends that “every manager has to develop an intuitive understanding of AI.”

To develop their understanding of digital, many executives have taken trips to Silicon Valley to experience digital natives, design-thinking approaches, fail-fast cultures, and more. While these are all core to building digital businesses, such trips are not particularly rewarding to learn about AI. For those who have already been exposed to the marvels of robots, self-driving vehicles, or poker-playing machines, there is little new to experience at AI companies. Instead, managers should take some time to learn the basics, possibly starting with simple online courses or online tools. They should understand how programs learn from data, maybe the most important facet of understanding how AI can benefit a particular business.
While the majority of organizations see developing an AI strategy as urgent, only half already have one.

Adopting AI broadly across the enterprise will likely require a hybrid approach. Ultimately, a hybrid model may make the most sense for a tire organization. It provides expertise, guidance, and direction to other internal teams that are working to deploy AI and analytics, " says TIAA's Elliott.

Our survey finds companies exploring many approaches, relatively evenly split among centralized, distributed, and hybrid organizational models. Investigators and project teams composed of humans and machines. Challenge 2: Organize for AI

Our survey finds companies exploring many approaches, relatively evenly split among centralized, distributed, and hybrid organizational models. Investigators and project teams composed of humans and machines. Challenge 3: Re-think the Competitive Landscape

Challenge 3: Re-think the Competitive Landscape

While companies in all four clusters rate cultural resistance to AI approaches relatively low on the list of barriers, only about half said that their company has a clear strategy for adopting AI. Almost 30% of both clusters have not yet set clear responsibility for AI in their organization. Some 70% of respondents say that a strategy for AI is urgent for their organizations, but only half of those say their organizations have a strategy in place.
Amy Hoe, chief technology and operations officer of insurer FWD Group, says that she sees access to data as key for competitive advantage for her company. FWD aims to secure a wide range of data sources, including partnerships with other companies, such as telecommunications companies and ride-hailing services, its customer base, agencies, social media, the public domain, and external data analysis providers. As the volume of data doubles every few years, gaining privileged access to data is nonstop work.

Is AI just an element of a company's overall digital transformation — or does AI require new approaches? On the one hand, AI presents many of the same issues and challenges as other digital technologies, and companies can build in many ways on their digital and analytics programs. However, AI also has distinctive features.

Ensure customer trust. AI capabilities are similar to many digital initiatives that depend on both customer data and customers' trust that the company will respect and safeguard their personal data. Ensuring that AI is trustworthy is different from other data-dependent digital initiatives, however, in several ways. First, managers may not be able to explain exactly how a customer's personal data is being used to produce a certain outcome from an AI product. The inner workings of some machine-learning programs are opaque. Second, a growing number of AI systems are able to mimic human agents, putting the onus on managers to clearly communicate to customers whether they are engaging with machines or human agents in a given setting. Third, some AI systems are able to assess emotions and discern quite personal details — at a distance. This capability creates new information management issues, including which employees have access to such information and under what circumstances.

Perform an AI health check. This has some similarities with digital health checks, from applications across processes to enabling infrastructure, technical skills, agile processes, and a fail-fast atmosphere. As with many digital initiatives, success with AI depends on access to data sources, be they existing internal or external data or investments in data infrastructure. Big companies may well have the data they need, but if it is fragmented and siloed, this significantly constrains strategy development and progress. Unlike other digital initiatives, an AI health check involves an assessment of the skills necessary to properly execute the training of AI, from first nurturing the system to become intelligent all the way to continuing to learn after deployment. This is both new and decisive — and a capability most companies need to build themselves. Off-the-shelf AI programs are likely to be limited in their capability and effect.

Brace for uncertainty. The adage "No idea is born good; you have to nurture it over time" applies to AI as well as to digital technologies — only more so. Companies often prioritize their initiatives by estimating the value of, and time required for, establishing a process or offering. But hard estimates are particularly difficult with AI. As a consequence, experimentation and learning with AI can take much longer than other digital initiatives, with a higher variability of success and failure. Managers need to brace themselves for more uncertainty, and this affects how effective they are at prioritizing projects and investments.

Adopt scenario-based planning. Like digital, AI has the potential to shift the ways in which businesses generate value — in multiple markets, processes, and functions. AI requires even more radical thinking, as it affects knowledge- and judgment-based professions, and the new entrants in markets could be machines. Thus, companies need to think even more expansively about their businesses, build cohesive future scenarios, and test the resilience of their directional plans against such scenarios. This kind of scenario-based planning can also sharpen the ability to recognize events that could trigger large effects on their business.

Add a workforce focus. AI stands to create significant unease, since even the most knowledgeable
The adoption of AI may have profound effects on the workforce. Our survey suggests cautious optimism about AI’s effect on employment, with nearly 70% of respondents expecting a reduction of jobs at their companies. However, AI is also likely to lead to a significant shift in the workplace, affecting many jobs in the Western middle class. Contrary to recent dire predictions about AI’s potential to eliminate jobs, our survey results indicate that respondents overwhelmingly agree that AI will both improve productivity and create new jobs, but few respondents expect AI to replace most jobs anytime soon. But in almost every industry, people using AI are starting to realize that the future of work will require employees to learn new skills within the next five years.

Shifting Value Creation

While AI may create value within an industry, it is far more likely to diminish the overall value of some products and services. As AI is increasingly applied to knowledge work, a wide range of industries will need to shift their business models. For example, the health care industry is likely to see a significant shift in the way it creates and captures value. In the insurance sector, expect widespread AI implementation, from claims processing to life insurance underwriting. AI is already playing a significant role in the financial services sector, from investment strategy to trading. In transportation, expect AI to play a major role in autonomous vehicles and ride-sharing companies.

The Future of Work

The economists at The Boston Consulting Group (BCG) predict that AI will create, destroy, or shift economic value in a number of industries. Different segments of the population will be affected differently. For some, AI will lead to the loss of skills and livelihoods. For others, AI will lead to significant improvements in productivity and income. For example, in the manufacturing sector, AI is likely to lead to the loss of jobs for some workers, but also to the creation of new jobs for others. AI is also likely to lead to the loss of some skills, such as those in data entry, but also to the development of new skills, such as those in data analysis and interpretation. AI is also likely to lead to the loss of some jobs, but also to the creation of new jobs, such as those in AI development and deployment. AI is also likely to lead to the loss of some skills, but also to the development of new skills, such as those in data analysis and interpretation. AI is also likely to lead to the loss of some jobs, but also to the creation of new jobs, such as those in AI development and deployment.

Implications for the Future

The adoption of AI may have profound effects on the workplace, value creation, and competitive advantage. Beyond the near term, how should companies prepare for these changes? The answer to this question is not straightforward. There are limits, or where AI should stop. The threat to jobs easily leads to employee anxiety and unrest. Establishing a clear focus and work plan for AI initiatives should be a component of an AI program. Attracting and developing people who combine both business and technical skills will be critical, as will the ability to deploy cross-functional teams, requiring both in individual and organizational flexibility. People will need to learn new skills and change the way they work. As AI is increasingly applied to knowledge work, a significant shift will likely take place in the workplace, affecting many jobs in the Western middle class. Some skills will be shifted, but some will be destroyed. AI will play an enormous role in reshaping business with artificial intelligence.
companies all strive to take advantage of AI to improve and lower the costs of diagnostics, the effects of AI will likely be uneven. It's too early to tell which types of organizations may benefit from AI in health care. But if regulatory concerns can be worked out, the industry has numerous sources of detailed data. And as Marcus Winter, head of reinsurance development at Munich Re Group, remarks, “In today's world, with the proliferation of Big Data, there are precious few exclusive data sets. Most of the time, we can triangulate what we need to know via other sources. ” In other words, the combination of data and AI algorithms create the possibility of new and more effective workarounds. For example, when diagnostic imaging is unavailable, an evermore accurately analyzed sample of blood or other body fluids might help with diagnosis. As a result, shifts in value creation are difficult to predict.

Building Competitive Advantage

Managers expect significant improvement in performance of current processes or products from AI. Many companies are focused on addressing those. However, mere improvement does not create a sustainable competitive advantage — when everyone finds the same efficiencies, only the baseline shifts. For AI to become a prominent feature in future strategies, companies must figure out how humans and computers can build off each other's strengths to create competitive advantage. This is not easy: Companies need privileged access to data — which, as we've seen, many do not now have. They must learn how to make people and machines work effectively together — a capability relatively few Pioneers have at present. And they need to put in place flexible organizational structures, which means cultural changes for both company and employee. Just about any company today needs a plan with respect to AI. Most do not have one, and those that have been slower to move have some catching up to do. Those that continue to fall behind may find the playing field tilted evermore steeply against them.

REFERENCES

1. At the time of his interview, Vishal Sikka was serving as CEO and managing director of Infosys. He has since resigned from that position to become executive vice chairman prior to the publication of this report.
2. We built a composite index of organizational understanding of AI based on the responses to nine survey questions related to AI understanding. This index, combined with the level of organizational adoption of AI, determined classification into the four clusters of organizations.
7. We did not ask respondents to look beyond five years, a horizon that is reasonably foreseeable. For some thoughts on what is possible in a 10- or 20-year time frame, see the Appendix.
9. Ibid., 8.
Survey respondents and most interviewees both expect big changes from AI in the next five years. But the more dramatic effects of AI may occur within 10 to 20 years. What can we expect in that time frame?

Automation of Tasks ≠ Automation of Jobs.

Historically shows that jobs evolve as tasks shift. BP’s Ahmed Hashmi says the company’s engineers used to spend a lot of time hunting for data to put together their reports, but “now that’s all automated. We’ve got a data lake, which gives engineers ready access to all the data. We employ the same number of engineers, but they’re improving the business rather than searching for data to get ready to improve the business.” In other words, extrapolation from the automation of repetitive tasks to the automation of jobs in a high tech industry is risky business.

AI as Job Creator.

Increased organizational reliance on AI will create new needs as it meets current needs. The job of an insurance underwriter, for example, tops many “most endangered species” lists. However, AI simultaneously expands the universe of insurable events. And, as James Platt, chief operating officer of Aon Risk Solutions, has said, “Many things that people would like to insure themselves against, such as brand and reputational risks or wider cybersecurity coverage, are ‘uninsurable’ today. There is simply no one offering an insurance option.” As new methods of assessing risks become available, underwriters can start offering such new services. Missy Cummings, director of the Humans and Autonomy Laboratory at Duke University, puts it this way: “What we often don’t think of are the jobs that are created as other new businesses come up around a technology.”

If it’s hard to imagine AI as doing anything other than eliminating jobs, step back and consider the scope of the problem. The 2016 World Economic Forum report, “The Future of Jobs,” noted that “upcoming disruptions to the employment landscape are going to be a lot more complex and multifaceted than conveyed by a narrow focus only on automation” — saying, in a nutshell, that digital technologies and AI are not the only forces transforming the nature of work. It has been clear for some time that technological change — not just AI — obliges employees to become lifelong learners and embrace career flexibility, but as the WEF report observes, it’s far from alone: “technological, socioeconomic, geopolitical, and demographic developments and the interactions between them will generate new categories of jobs and occupations while partly or wholly displacing others. They will change the skill sets required in both old and new occupations in most industries and transform how and where people work.”

Yet we have also seen digital technologies be used to address this problem. Accompanying the expansion of AI are many new learning options for humans: Augmented reality, new training tools, and digitally accessible forms of education (such as massive open online courses [MOOCs] and “nanodegrees”) are proliferating. Against a canvas of even broader social, demographic, environmental, and global political developments, predictions of aggregate employment levels based on AI alone are difficult; there are too many countervailing forces to discuss any one of them in isolation. But it is not unreasonable to imagine an opportunity for AI to cushion some of its own impacts, and perhaps the impacts of other factors, by helping to anticipate the coming changes in the job market and identify (and meet) workforce training needs as they arise.

Even So, Inertia Is Not an Option.

Big global uncertainties should not deter corporations from acting today, when action is required. Infosys, for example, has trained more than 120,000 employees in design thinking. This new capability will enable its employees both to shape a world of new AI-based service offerings and automate historic business processing services.

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