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INSIGHT CENTER COLLECTION

The Risks and Rewards of AI

The Risks and Rewards of AI

Assessing the opportunities and the potential pitfalls

This Insight Center looked at the enormous upsides—and potential pitfalls—of artificial intelligence, machine learning, and sophisticated learning algorithms. What is the latest technology, and what are the implications for business operations, marketing, cybersecurity, strategy—and the economy more broadly? What do futurists predict about the next 5-10 years of AI advancement? And, as much as AI opens new doors for businesses, what are the risks to watch out for? This insight center is essential reading for any executive with responsibilities for innovation, R&D, technology investments, risk management, IT, and the C-suite.

Harvard Business Review

DECISION MAKING

How AI Will Change the Way We Make Decisions

by Ajay Agrawal, Joshua Gans and Avi Goldfarb

JULY 26, 2017

With the recent explosion in AI, there has been the understandable concern about its potential impact on human work. Plenty of people have tried to predict which industries and jobs will be most affected, and which skills will be most in demand. (Should you learn to code? Or will AI replace coders too?)

Rather than trying to predict specifics, we suggest an alternative approach. Economic theory suggests that AI will substantially raise the value of human judgment. People who display good judgment will become more valuable, not less. But to understand what good judgment entails and why it will become more valuable, we have to be precise about what we mean.

What AI does and why it's useful

Recent advances in AI are best thought of as a drop in the cost of prediction. By prediction, we don't just mean the future—prediction is about using data that you have to generate data that you don't have, often by translating large amounts of data into small, manageable amounts. For example, using images divided into parts to detect whether or not the image contains a human face is a classic prediction problem. Economic theory tells us that as the cost of machine prediction falls, machines will do more and more prediction.

Prediction is useful because it helps improve decisions. But it isn't the only input into decision-making; the other key input is judgment. Consider the example of a credit card network deciding whether or not to approve each attempted transaction. They want to allow legitimate transactions and decline fraud. They use AI to predict whether each attempted transaction is fraudulent. If such predictions were perfect, the network's decision process is easy. Decline if and only if fraud exists.

However, even the best AIs make mistakes, and that is unlikely to change anytime soon. The people who have run the credit card networks know from experience that there is a trade-off between detecting every case of fraud and inconveniencing the user. (Have you ever had a card declined when you tried to use it while traveling?) And since convenience is the whole credit card business, that trade-off is not something to ignore.

This means that to decide whether to approve a transaction, the credit card network has to know the cost of mistakes. How bad would it be to decline a legitimate transaction? How bad would it be to allow a fraudulent transaction?

Someone at the credit card association needs to assess how the entire organization is affected when a legitimate transaction is denied. They need to trade that off against the effects of allowing a transaction that is fraudulent. And that trade-off may be different for high net worth individuals than for casual card users. No AI can make that call. Humans need to do so. This decision is what we call judgment.

What judgment entails

Judgment is the process of determining what the reward to a particular action is in a particular environment. Judgment is how we work out the benefits and costs of different decisions in different situations.

Credit card fraud is an easy decision to explain in this regard. Judgment involves determining how much money is lost in a fraudulent transaction, how unhappy a legitimate customer will be when a transaction is declined, as well as the reward for doing the right thing and allowing good transactions and declining bad ones. In many other situations, the trade-offs are more complex, and the payoffs are not straightforward. Humans learn the payoffs to different outcomes by experience, making choices and observing their mistakes.

Getting the payoffs right is hard. It requires an understanding of what your organization cares about most, what it benefits from, and what could go wrong.

In many cases, especially in the near term, humans will be required to exercise this sort of judgment. They'll specialize in weighing the costs and benefits of different decisions, and then that judgment will be combined with machine-generated predictions to make decisions.

But couldn't AI calculate costs and benefits itself? In the credit card example, couldn't AI use customer data to consider the trade-off and optimize for profit? Yes, but someone would have had to program the AI as to what the appropriate profit measure is. This highlights a particular form of human judgment that we believe will become both more common and more valuable.

Setting the right rewards

Like people, AIs can also learn from experience. One important technique in AI is reinforcement learning whereby a computer is trained to take actions that maximize a certain reward function. For instance, DeepMind's AlphaGo was trained this way to maximize its chances of winning the game of Go. Games are often easy to apply this method of learning because the reward can be easily described and programmed – shutting out a human from the loop.

But games can be cheated. As *Wired* reports, when AI researchers trained an AI to play the boat racing game, CoastRunners, the AI figured out how to maximize its score by going around in circles rather than completing the course as was intended. One might consider this ingenuity of a type, but when it comes to applications beyond games this sort of ingenuity can lead to perverse outcomes.

The key point from the CoastRunners example is that in most applications, the goal given to the AI differs from the true and difficult-to-measure objective of the organization. As long as that is the case, humans will play a central role in judgment, and therefore in organizational decision-making.

In fact, even if an organization is enabling AI to make certain decisions, getting the payoffs right for the organization as a whole requires an understanding of how the machines make those decisions. What types of prediction mistakes are likely? How might a machine learn the wrong message?

Enter Reward Function Engineering. As AIs serve up better and cheaper predictions, there is a need to think clearly and work out how to best use those predictions. Reward Function Engineering is the job of determining the rewards to various actions, given the predictions made by the AI. Being great at it requires having an understanding of the needs of the organization and the capabilities of the machine. (And it is *not* the same as putting a human in the loop to help train the AI.)

Sometimes Reward Function Engineering involves programming the rewards in advance of the predictions so that actions can be automated. Self-driving vehicles are an example of such hard-coded rewards. Once the prediction is made, the action is instant. But as the CoastRunners example illustrates, getting the reward right isn't trivial. Reward Function Engineering has to consider the possibility that the AI will over-optimize on one metric of success, and in doing so act in a way that's inconsistent with the organization's broader goals.

At other times, such hard-coding of the rewards is too difficult. There may so be many possible predictions that it is too costly for anyone to judge all the possible payoffs in advance. Instead, some human needs to wait for the prediction to arrive, and then assess the payoff. This is closer to how most decision-making works today, whether or not it includes machine-generated predictions. Most of us already do some Reward Function Engineering, but for humans — not machines. Parents teach their children values. Mentors teach new workers how the system operates. Managers give objectives to their staff, and then tweak them to get better performance. Every day, we make decisions and judge the rewards. But when we do this for humans, prediction and judgment are grouped together, and the distinct role of Reward Function Engineering has not needed to be explicitly separate.

As machines get better at prediction, the distinct value of Reward Function Engineering will increase as the application of human judgment becomes central.

Overall, will machine prediction decrease or increase the amount of work available for humans in decision-making? It is too early to tell. On the one hand, machine prediction will substitute for human prediction in decision-making. On the other hand, machine prediction is a complement to human judgment. And cheaper prediction will generate more demand for decision-making, so there will be more opportunities to exercise human judgment. So, although it is too early to speculate on the overall impact on jobs, there is little doubt that we will soon be witness to a great flourishing of demand for human judgment in the form of Reward Function Engineering.

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Harvard Business Review

EXPERIMENTATION

The First Wave of Corporate AI Is Doomed to Fail

by Kartik Hosanagar and Apoorv Saxena

APRIL 18, 2017

Artificial intelligence is a hot topic right now. Driven by a fear of losing out, companies in many industries have announced AI-focused initiatives. Unfortunately, most of these efforts will fail. They will fail not because AI is all hype, but because companies are approaching AI-driven innovation incorrectly. And this isn't the first time companies have made this kind of mistake.

Back in the late 1990s, the internet was the big trend. Most companies started online divisions. But there were very few early wins. Once the dot-com bust happened, these companies shut down or significantly downscaled their online efforts. A few years later they were caught napping when online upstarts disrupted industries such as music, travel, news, and video, while transforming scores of others.

In the mid-2000s, the buzz was about cloud computing. Once again, several companies decided to test the waters. There were several early issues, ranging from regulatory compliance to security. Many organizations backed off from moving their data and applications to the cloud. The ones that persisted are incredibly well-positioned today, having transformed their business processes and enabled a level of agility that competitors cannot easily mimic. The vast majority are still playing catch-up.

We believe that a similar story of early failures leading to irrational retreats will occur with AI. Already, evidence suggests that early AI pilots are unlikely to produce the dramatic results that technology enthusiasts predict. For example, early efforts of companies developing chatbots for Facebook's Messenger platform saw 70% failure rates in handling user requests. Yet a reversal on these initiatives among large companies would be a mistake. The potential of AI to transform industries truly is enormous. Recent research from McKinsey Global Institute found that 45% of work activities could potentially be automated by today's technologies, and 80% of that is enabled by machine learning. The report also highlighted that companies across many sectors, such as manufacturing and health care, have captured less than 30% of the potential from their data and analytics investments. Early failures are often used to slow or completely end these investments.

AI is a paradigm shift for organizations that have yet to fully embrace and see results from even basic analytics. So creating organizational learning in the new platform is far more important than seeing a big impact in the short run. But how does a manager justify continuing to invest in AI if the first few initiatives don't produce results?

VIDEO A.I. COULD LIBERATE 50% OF MANAGERS' TIME
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We suggest taking a portfolio approach to AI projects: a mix of projects that might generate quick wins and long-term projects focused on transforming end-to-end workflow. For quick wins, one might focus on changing internal employee touchpoints, using recent advances in speech, vision, and language understanding. Examples of these projects might be a voice interface to help pharmacists look up substitute drugs, or a tool to schedule internal meetings. These are areas in which recently available, off-the-shelf AI tools, such as Google's Cloud Speech API and Nuance's speech recognition API, can be used, and they don't require massive investment in training and hiring. (Disclosure: One of us is an executive at Alphabet Inc., the parent company of Google.) They will not be transformational, but they will help build consensus on the potential of AI. Such projects also help organizations gain experience with large-scale data gathering, processing, and labeling, skills that companies must have before embarking on more-ambitious AI projects.

For long-term projects, one might go beyond point optimization, to rethinking end-to-end processes, which is the area in which companies are likely to see the greatest impact. For example, an insurer could take a business process such as claims processing and automate it entirely, using speech and vision understanding. Allstate car insurance already allows users to take photos of auto damage and settle their claims on a mobile app. Technology that's been trained on photos from past claims can accurately estimate the extent of the damage and automate the whole process. As companies such as Google have learned, building such high-value workflow automation requires not just off-the-shelf technology but also organizational skills in training machine learning algorithms.

As Google pursued its goal of transitioning into an AI-first company, it followed a similar portfolio-based approach. The initial focus was on incorporating machine learning into a few subcomponents of a system (e.g., spam detection in Gmail), but now the company is using machine learning to replace entire sets of systems. Further, to increase organizational learning, the company is dispersing machine learning experts across product groups and training thousands of software engineers, across all Google products, in basic machine learning.

This all leads to the question of how best to recruit the resources for these efforts. The good news is that emerging marketplaces for AI algorithms and datasets, such as Algorithmia and the Google-owned Kaggle, coupled with scalable, cloud-based infrastructure that is custom-built for artificial intelligence, are lowering barriers. Algorithms, data, and IT infrastructure for large-scale machine learning are becoming accessible to even small and medium-size businesses.

Further, the cost of artificial intelligence talent is coming down as the supply of trained professionals increases. Just as the cost of building a mobile app went from \$200,000–\$300,000 in 2010 to less than \$10,000 today with better development tools, standardization around few platforms (Android and iOS), and increased supply of mobile developers, similar price deflation in the cost of building AI-powered systems is coming. The implication is that there is no need for firms to frontload their hiring. Hiring slowly, yet consistently, over time and making use of marketplaces for machine learning software and infrastructure can help keep costs manageable.

There is little doubt that an AI frenzy is starting to bubble up. We believe AI will indeed transform industries. But the companies that will succeed with AI are the ones that focus on creating organizational learning and changing organizational DNA. And the ones that embrace a portfolio approach rather than concentrating their efforts on that one big win will be best positioned to harness the transformative power of artificial learning.

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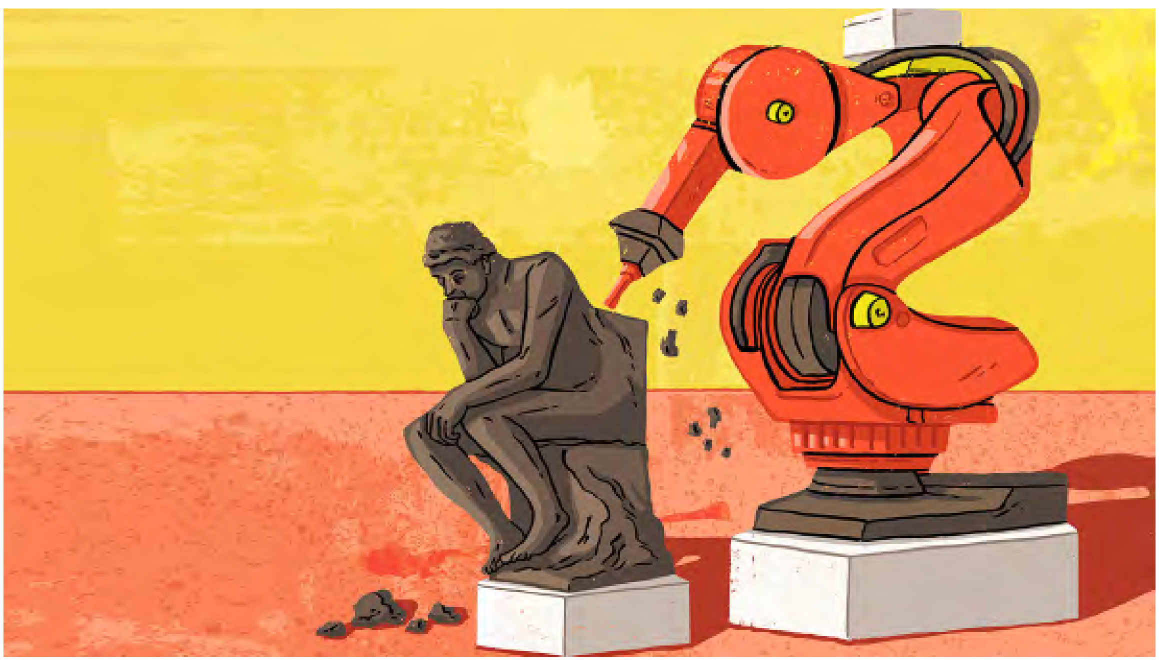
Harvard Business Review

TECHNOLOGY

How Automation Will Change Work, Purpose, and Meaning

by Robert C. Wolcott
JANUARY 11, 2018



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The vast majority of humans throughout history worked because they had to. Many found comfort, value, and meaning in their efforts, but some defined work as a necessity to be avoided if possible. For centuries, elites in societies from Europe to Asia aspired to absolution from gainful employment. Aristotle defined a “man in freedom” as the pinnacle of human existence, an individual freed of any concern for the necessities of life and with nearly complete personal agency. (Tellingly, he did not define wealthy merchants as free to the extent that their minds were pre-occupied with acquisition.)

The promise of AI and automation raises new questions about the role of work in our lives. Most of us will remain focused for decades to come on activities of physical or financial production, but as technology provides services and goods at ever-lower cost, human beings will be compelled to discover new roles — roles that aren't necessarily tied to how we conceive of work today.

Part of the challenge, as economist Brian Arthur recently proposed, "will not be an economic one but a political one." How are the spoils of technology to be distributed? Arthur points to today's political turmoil in the U.S. and Europe as partly a result of the chasms between elites and the rest of society. Later this century, societies will discover how to distribute the productive benefits of technology for two primary reasons: because it will be easier and because they must. Over time, technology will enable more production with less sacrifice. Meanwhile, history suggests that concentration of wealth in too few hands leads to social pressures that will either be addressed through politics or violence or both.

But this then raises a second, more vexing challenge: as the benefits of technology become more widely available — through reform or revolution — more of us will face the question, "When technology can do nearly anything, what should I do, and why?"

Particularly since the Industrial Revolution, technology has transitioned a widening portion of humanity away from the production of life essentials. While many people remain trapped in a day-to-day struggle for survival, a smaller percentage of humans are thus burdened. As AI and robotic systems become far more capable and committed, work will increasingly hum along without us, perhaps achieving what John Maynard Keynes described in *Economic Possibilities for our Grandchildren* as *technological unemployment*, in which technology replaces human labor faster than we discover new jobs. Keynes predicted this would only be "a temporary phase of maladjustment," and that within a century, humankind might overcome its fundamental economic challenge and be freed from the biological necessity of working.

This is an immensely hopeful vision, but also a winding, perilous path. Keynes cautioned, "If the economic problem is solved, mankind will be deprived of its traditional purpose… Yet there is no country and no people, I think, who can look forward to the age of leisure and of abundance without a dread."

With trepidation, Keynes wondered how people would focus their attentions, interests and fears when absolved from making a living. As we unmoor from traditional pursuits, how will we avoid a nihilistic, Huxlian future? How will we define our own sense of purpose, meaning, and value?

We can explore this question through the work of philosopher, historian, and journalist Hannah Arendt, who in the 1950s designed a far-reaching framework for understanding all of human activity.

In *The Human Condition*, a beautiful, challenging, profound work, Arendt describes three levels of what she defines, after the Greeks, as the *Vita Activa*.

Labor generates metabolic necessities — the inputs, such as food, that sustain human life. *Work* creates the physical artifacts and infrastructure that define our world, and often outlast us — from homes and goods to works of art. *Action* encompasses interactive, communicative activities between human beings — the public sphere. In action, we explore and assert our distinctiveness as human beings and seek immortality.

Over the next 100 years, AI and robotic systems will increasingly dominate labor and work, producing necessities and the physical artifacts of human life, enabling more of us to ascend (Arendt did present this as ascending — this *is* a qualitative value judgment) to the realm of action. Of course, some people might engage in labor or work by choice, but *choice* is the essential distinction.

Most ancient Greek philosophers prioritized contemplation over action as the pinnacle of human endeavor. Arendt did battle with this notion, arguing on behalf of action. Contemporary culture appears to agree. Ultimately, though, action and contemplation function best when allied. We have the opportunity — perhaps the responsibility — to turn our curiosity and social natures to action *and* contemplation.

We'll face dramatic adjustments to our *Vita Activa* over the coming decades, each of us asking what to do and why. Hopefully our grandchildren will be free to pursue a life of engagement and exploration — or to garden or cook. If we are fortunate, this will be a choice rather than a necessity.

Arendt opened *The Human Condition* with a caution about "a society of laborers which is about to be liberated from the fetters of labor." The danger? That "this society does no longer know of those other higher and more meaningful activities for the sake of which this freedom would deserve to be won." Arendt particularly focused this challenge on the Communist ideology which so glorified labor. It could equally be leveled at us.

When our machines release us from ever more tasks, to what will we turn our attentions? This will be *the* defining question of our coming century.

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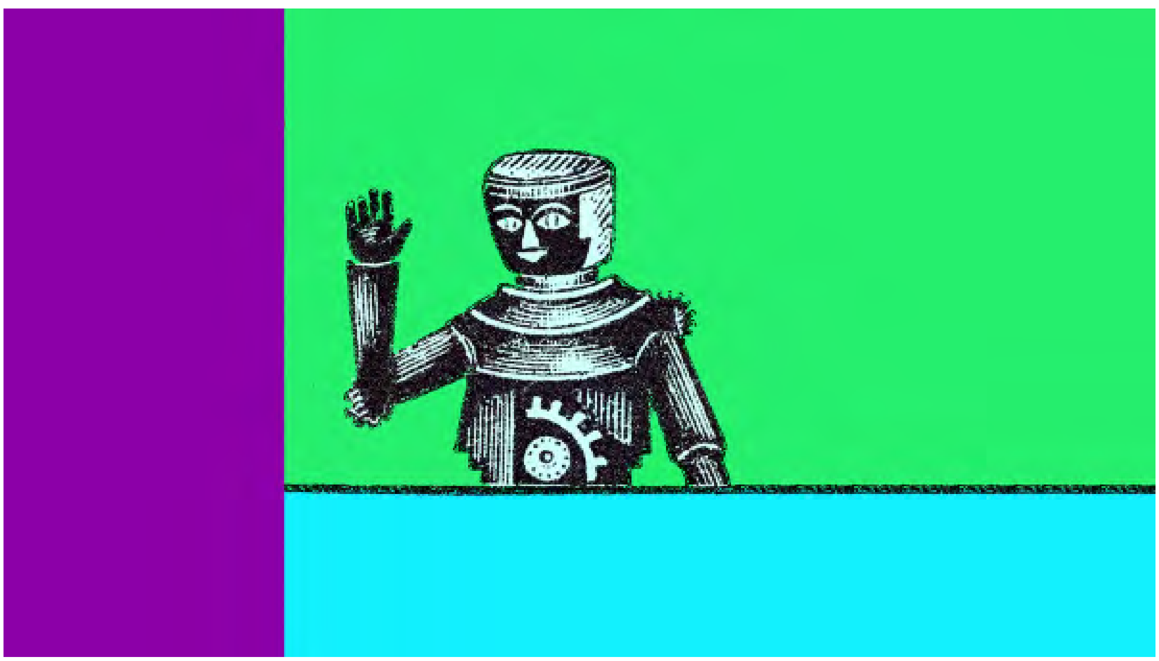
DATA

Robo-Advisers Are Coming to Consulting and Corporate Strategy

by Thomas H. Davenport, Barry Libert and Megan Beck

JANUARY 12, 2018



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Does a robot manage your money? For many of us, the answer is yes. Online and algorithmic investment and financial advice is easy to come by these days, usually under the moniker of "robo-advisor." Startups such as Wealthfront, Personal Capital, and Betterment launched robo-advisors as industry disruptors, and incumbents, such as Schwab's (Intelligent Advisor), Vanguard (Personal

Advisor Services), Morgan Stanley and BlackRock have joined the fray with their own hybrid machine/advisor solutions. It's clear that robo-advisors and AI play an important and growing role in the financial services industry, but a question remains. Will robo-advisors disrupt corporate capital allocation the same way they have personal capital allocation? And, will they shake up the trillion-dollar corporate consulting and advisory industry?

Robo-advisors, which were introduced in 2008, are steadily eating up market share from their human counterparts much the way that Amazon and Netflix have taken share from Walmart and Regal Cinemas.

A study by Deloitte estimated that "assets under automated management" (including hybrid offerings) in the U.S. will grow to U.S. $5 trillion to U.S. $7 trillion by the year 2025 from about U.S. $300 billion today. This would represent between 10% and 15% of total retail financial assets under management. At the end of 2016, Fitch Ratings estimated that all robo-advisors managed under U.S. $100B in assets, and predicts double-digit growth in assets under management over the next several years. Finally, A.T. Kearney predicts that assets under "robo-management" will total $2.2 trillion by 2021.

If AI-guided investing can work for a person, can it also work for a company? Corporations buy and employ human advice from many wise advisors—consultants, lawyers, investment bankers—in the same fashion that investors did in the past. Corporate strategy is complex, and the advice is expensive. However, the approaches advisors take are usually data-driven and guided by previous experiences. This is just the sort of problem that can benefit from machine intelligence.

This makes corporate strategy an enormous and untapped prize for "robos" and "AI-enabled" expert advice across the entire enterprise; this market is ripe for disruption much the way the financial investing industry was in 2008. Marketing and sales, manufacturing, recruiting (including people assessment), customer service, and support are all fields that can benefit from artificial intelligence according to McKinsey's recent research. The reasons for this potential disruption now are many:

- **There is an explosion in the amount of corporate data**. In fact, it is doubling every 14 months and it will reach 10.5 ZB by 2020. This data is both financial (revenues, profits, growth) and non-financial (customer sentiment, employee engagement, marketing effectiveness, product feedback, and partner ecosystems). The availability of this data creates fertile ground for robos to provide algorithmic insights and recommendations that deliver highly predictive, error-proof, and low-cost advising.

- **Companies are both operators and investors.** Research by McKinsey shows that US companies allocate about $650B a year across all their activities—be it financial, physical, human, intellectual, or customer capital. However, they don't have the tools or practices to best allocate capital, and as a result, 92% of companies allocate their capital the same way year over year. Just like individual investors, most corporations could probably use some help in making wise investment decisions.

- **AI is growing exponentially in enterprises**. By almost all accounts, companies at the digital frontier such as Google, Facebook, and Microsoft are investing vast amounts in AI—somewhere between $20 billion and $30 billion alone in 2016. Many established firms—a 2017 Deloitte survey suggested about 20% in the U.S.—are making substantial investments in AI as well. Further, venture capitalists are jumping in with both feet. $4 to $5 billion was invested by VCs in AI in 2016. Lastly, private equity firms invested another $1 billion to $3 billion. These numbers represent more than three times as much as was invested in 2013.

- **The costs of AI-enabled tools are falling, and availability is rising.** Both proprietary tools, like IBM's Watson, and open-source tools from firms like Google, Microsoft, and Amazon, are widely available. Cloud-based hardware is also increasingly available to any business at low cost.

- **Companies in every industry can benefit** from making more data and algorithm-based decisions in areas of internal operations and finance. Analytics are growing in every business function and industry. "Robo-advice" is a straightforward extension of these analytical tools.

Each one of us is becoming increasingly more comfortable being advised by robots for everything from what movie to watch to where to put our retirement. Given the groundwork that has been laid for artificial intelligence in companies, it's only a matter of time before the $60 billion consulting industry in the U.S. is going to be disrupted by robotic advisors. For those who want to stay ahead of the curve, there are three strategies you can take:

Build a pure-play solution: Several robo-advice companies started their offerings with machine-only advice. Their goal was to hit the lowest possible price point, and to appeal to "digital native" customers. However, as the companies providing hybrid advice have grown rapidly, most startups now also offer some level of human advice—typically for a higher fee. Only Wealthfront remains a machine-only robo-advisor. This suggests that corporate robo-advice providers should think carefully before abandoning the human component completely. At Vanguard, the Personal Advisor Services offering features advisors as "investing coaches" who are able to answer investor questions, encourage healthy financial behaviors, and be, in Vanguard's words, "emotional circuit breakers" to keep investors on their plans. There are likely to be corporate equivalents of these functions.

Create your own internal robo-advisory service: Companies could develop their own robotic or semi-robotic advice for key decision domains. This is in fact what cancer hospitals, for example, are attempting to do with IBM Watson in cancer care, and what customers of semi-automated machine learning platforms are doing for highly quantitative decisions (DataRobot is one example; Google's new AutoML is another). However, developing a robo-advisor only for one's own internal issues may be more difficult and expensive than many companies are willing to venture into. Further, it is decidedly outside the wheelhouse for most established firms, which brings us to the third option.

Partner with or acquire an existing provider: In financial robo-advice, firms that were not first to market are now moving quickly to either partner with a startup or acquire one. Examples include

BlackRock, which recently acquired FutureAdvisor for a reported $150-200 million; JP Morgan's recent partnership with Motif Investing, and UBS' equity investment in SigFig. There are likely to eventually be a number of vendors of corporate robo-advice, though they are not widely available at this point.

Regardless of which strategy you pursue, it seems likely that corporate robo-advisors are coming to many parts of the organization, just as software has spread through the value chain over the last two decades. Robo-advisors have the potential to deliver a broader array of advice and there may be a range of specialized tools in particular decision domains. These robo-advisors may be used to automate certain aspects of risk management and provide decisions that are ethical and compliant with regulation. In data-intensive fields like marketing and supply chain management, the results and decisions that robotic algorithms provide is likely to be more accurate than those made by human intuition.

Finally, it is becoming clear that serious AI adopters with proactive business strategies based on it benefit from higher profit margins. In fact, a McKinsey survey suggests that these front runners report current profit margins that are 3 to 15 percentage points higher than the industry average in most sectors, and they also expect this advantage to grow in the future. In the next three years, these AI leaders expect their margins to increase by up to 7 percentage points more than the industry average.

Of course, traditional consultants and other providers of corporate advice are unlikely to disappear. Like the human advisors that still complement robo-advisors in the investment world, they can provide a number of key functions. Here are several ways existing corporate advisors can complement their future robot partners:

- **Integrate different online advice sources**, and help clients and investment firms to understand what systems to use for what purposes. Human advisors could also, like hedge fund managers, analyze the results from machine-advised decisions and advise clients on whether changes are necessary in the algorithms and logic employed by the machines.

- **Shift to providing advice on business models, not just strategy and operations. We suggested in** a recent article that pure advice from even the most elite consultants would be put at risk by machine learning. However, our research as well as others' suggest that consultants can focus on their clients' business models rather than just strategy, operations, and best practices to insure their future growth, relevance and success.

- **Deliver behavioral coaching**. As corporate strategy advice is increasingly disrupted by algorithms and artificial intelligence, corporate advisors could coach leaders on the best approach to success using their EQ skills. As with behavioral coaches in individual investing, corporate coaches could, for example, dissuade leaders and boards from buying companies at the top of the market or selling when the markets crash. They can help them with change management as smart machines provide new insights at increasing speeds.

While the details of adoption of automated advice from robo advisors in all industries are unclear, it is likely that the future will include automated advisors in many fields. They already exist in personal investing, driving navigation (Google Maps, Waze), matchmaking (EHarmony, Match.com), and healthcare (WebMD Symptom Checker). It seems only logical that they would extend into corporate strategy and finance. Financial services firms, financial advisors, and their clients were the first to witness substantial disruption, but they won't be the last. The days of only face-to-face discussions between client and consultant may not vanish altogether, but they shift from crunching the numbers to changing behaviors and nurturing relationships with clients. As Ian Dodd, Director of legal analytics firm Premonition, said to the BBC, "The knowledge jobs will go. The wisdom jobs will stay."

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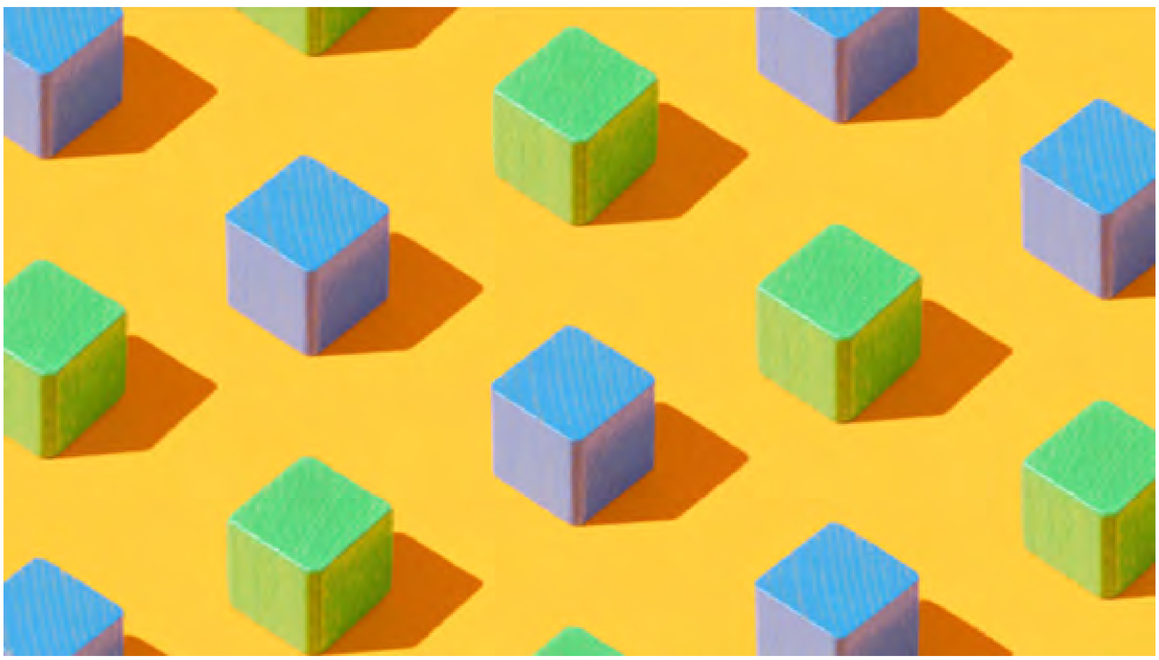
TECHNOLOGY

The 5 Things Your AI Unit Needs to Do

by Alessandro Di Fiore, Simon Schneider and Elisa Farri

JANUARY 15, 2018



Bogdan Dreava/EyeEm/Getty Images

Not a day goes by without the announcement of the appointment of a new VP of Artificial Intelligence (AI), a Chief Data Scientist, or a Director of AI Research. While the enthusiasm is undeniable, the reality is that AI remains an early-stage technology application. The potential is vast, but how managers cut through the AI hyperbole to use its power to deliver growth?

In our consulting work, we often encounter managers who struggle to convert AI experiments into strategic programs which can then be implemented. Michael Stern (not his real name), for instance, is the Head of Digital for a German Mittelstand office equipment company. Michael is used to starting new projects in emerging areas, but feels unable to fully understand what can AI can do for his business. He started a few experiments using IBM Watson, and these produced some clear, small tactical gains. Now Michael is stuck on how to proceed further. How can he create cross-functional teams where data experts work with product teams? And how will they pick project ideas that produce real ROI? Michael wonders if his firm even knows what new business models can be explored with their existing datasets — let alone which new ones might be made possible by AI.

Michael is not alone. As more and more companies invest in AI-driven units, many newly appointed managers face these challenges – especially in companies with little or no previous experience with cognitive technologies. Part of the trouble: in many companies, the role of these teams is undefined. Very little research has been done to design the mission and scope of these new units.

At the European Center for Strategic Innovation (ECSI), we examined numerous corporate AI initiatives among large organizations, and identified five key roles that can help AI units to develop the right mission and scope of work to succeed.

1. Scouting AI technology, applications, and partners. This role is about setting up a core team of "AI sensors" in charge of monitoring new trends, identifying disruptive technologies, and networking with innovative players — mainly startups. The automobile-parts supplier Bosch and the tech and engineering powerhouse Siemens are two prime examples of this. With a planned investment of $300 million, Bosch has established three AI corporate centers focused on IoT and other AI-related fields in Germany, India, and Palo Alto. Siemens, similarly, has included AI in the company's list of innovation fields to be monitored through its network of innovation outposts with offices in California, China, and Germany.

2. Experimenting with AI technology and applications. This role is about understanding through quick, small AI pilots how to develop or adopt cognitive technologies to the company's business and operational models. Although off-the-shelf AI tools and open-sourced systems are available, they have limited transformational potential compared to customized ones. At Deutsche Telekom, the development of its own AI solutions is an important priority. Instead of buying AI chatbots from vendors, Deutsche Telekom has its own developer teams. With the support of partners, they design, train, and fine-tune AI solutions for the company.

Rather than concentrating efforts on a single big win, AI units and teams should embrace a portfolio approach to their experiments. The power of AI should be tested across functions and business areas. There are three types of experiments that are worth paying particular attention to:

- *Experiments in the driver's seat* are typically conducted by the company's AI unit or internal developer teams. In the last few years, Deutsche Telekom has tested internally three different AI-backed chatbots and virtual assistants to improve the company's corporate and private customer services.

- *Experiments with others in the driver's seat* involve joining forces with innovative players such as start-ups, research centers, and universities. In general, such experiments are focused on cutting-edge technologies or applications requiring in-depth expertise and skills that companies do not have. This is a common strategy among large organizations: Mercedes-Benz entered a partnership with the Computer Science and AI Lab of MIT; Associated Press collaborated with Automated Insight, a specialized AI firm; Deutsche Telekom partnered with the German Research Centre for AI, called DFKI.
- *Experiments by learning from others* are common among companies interested in pioneering AI technology and applications, but too premature for their industry. Observing others translates into funding ventures or start-ups innovating at the frontier of AI. This is the case at German insurance company Allianz, which funded Europe's first global AI equity fund to position itself as a "pioneer in AI investments."

3. Supporting business units in applying AI technology. This role is about building internal capabilities through a specialized network of AI experts who can support business units in the integration and application of AI tools and solutions (from basic data visualization and chatbots to the automation of entire processes like claims management). The success of AI applications lies not in the technology *per se*, but in the ability of a company to align it with its business and operational models.

The Data and AI Lab is one of the most visible BNP Paribas' AI efforts. The Lab is responsible for the development of AI tools that can improve the internal processes. At BNP Paribas, the AI team is in charge of accompanying and supporting business units all along the way, from the identification of potential applications to the experimentation and fine-tuning. It's essential that these labs be tightly integrated into the organization, not in a far-off lab. Constance Chalchat, Head of Change Management at BNP Paribas says, "Data scientist teams need to work in close partnership with both the business and IT."

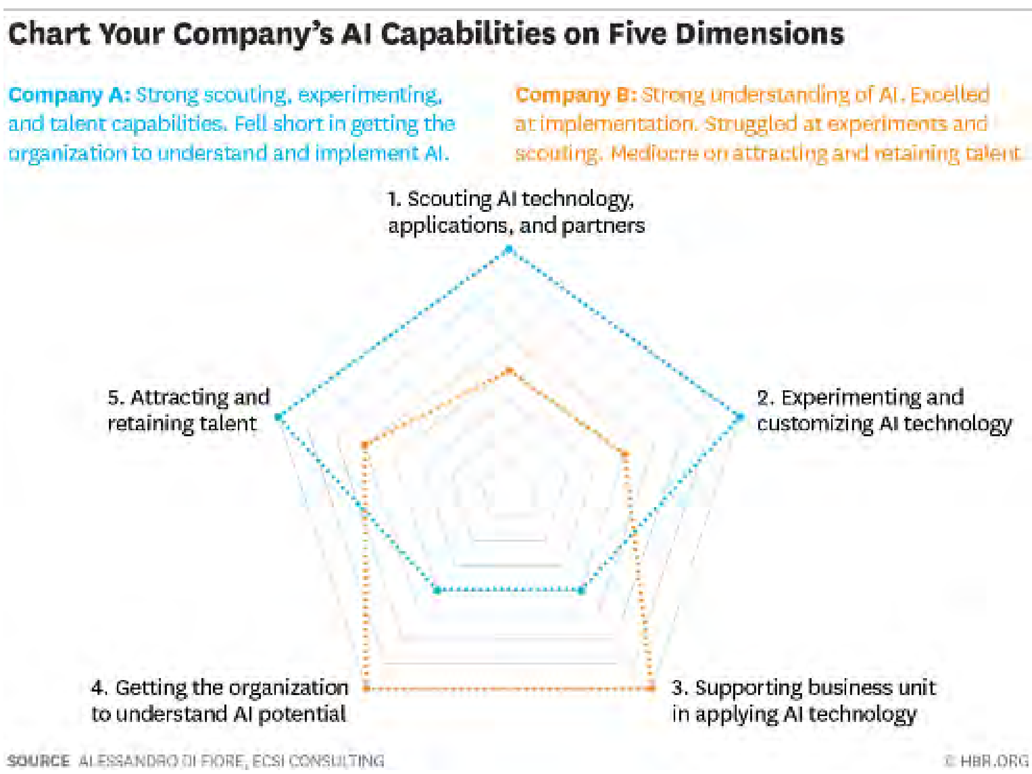
4. Getting the entire organization to understand AI. This role is about the ability of the AI team to educate the organization on the opportunity to harness the power of AI. Why? Because AI is ultimately a tool. Organizations need to build solid foundations that enable people to actually use and secure value from AI technology. As passion for AI is rising to the top of large organizations, this applies also to the C-suite and Board. Executives need support to cut through the complexity of AI-driven discussions and find ways to extract value.

Embedding AI in the company's culture and core skills set can be done at two levels. First, internal communication initiatives can help raising awareness and acceptance of AI technologies, in particular those with a high transformative potential, while creating a common AI language and culture. Second, targeted education efforts allow building basic, standard capabilities of people, who are not AI experts in the organization. AirBnB is a prime example of this. By setting up an internal Data University, AirBnB is teaching employees data science with the goal of making the transition to a more AI-aware organization easier and faster.

5. Attracting and retaining talent. This role is about addressing the AI skills gap. A dedicated AI unit should work in close cooperation with the HR department to identify the right skills and capabilities required, and define strategies for talent retention. Companies are currently adopting different AI talent acquisition strategies. Edouard d'Archimbaud, Head of the BNP Paribas Data and AI Lab is gradually expanding his 25-member team. "We're recruiting around ten people a year [...] we're very careful and only like to hire the right people," he explained. Other companies have invested more significantly. This is the case of Airbnb that recently "acqui-hired" a team of seven data engineers from Changecoin, a start-up with deep knowledge of blockchain technology.

The framework in action

Sometimes these newly created AI teams will be investing time and effort in all the five roles. The challenges at other companies can be quite different. Plotting the five roles on spider graphs like the one shown here can help companies figure out where they are currently focused and where they may need to increase or reduce their efforts. They can, for example, compare what they are currently doing with what they should be doing, given their company's strategic intent and their capability and organizational issues.



Each AI team should design its own spider-graph based on its existing context, goals, and constraints. Companies investing – or planning to invest – in AI units need to think strategically about where to focus their efforts.

Winning the AI revolution isn't about just the technology and the tools, it is about educating and getting your organization ready for the future. In the same way as Amazon didn't invent the technology that has made them a corporate titan, companies in the AI-age need to prepare their organization to be data-first in order to stay competitive in the long run.

Plotting the five roles can help align the company's strategic intent with the organizational context and constraints.

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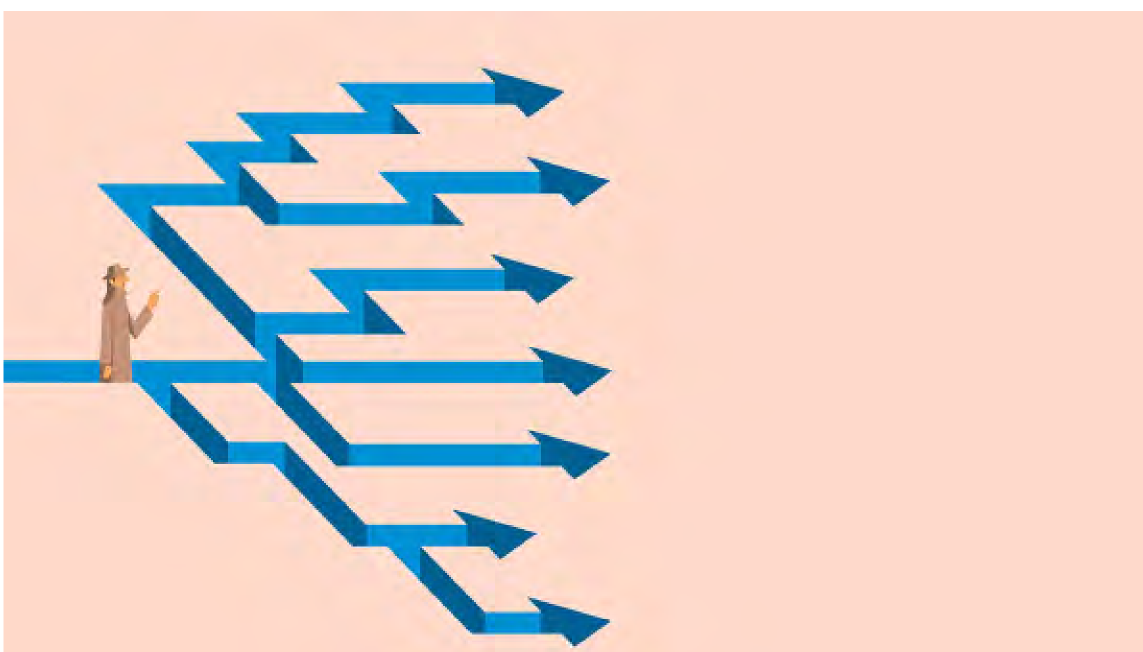
Harvard Business Review

COMMUNICATION

How Georgia State University Used an Algorithm to Help Students Navigate the Road to College

by Lindsay Page and Hunter Gehlbach

JANUARY 16, 2018



Yenpitsu Nemoto/Getty Images

As AI continues to develop, a major test of its potential will be whether it can replace human judgment in individualized, complex ways. At Georgia State University, we investigated a test case where AI assisted high school students in their transition to college, helping them to navigate the many twists and turns along the way.

From the perspective of an AI system, the college transition provides intriguing challenges and opportunities. A successful system must cope with individual idiosyncrasies and varied needs. For instance, after acceptance into college, students must navigate a host of well-defined but challenging tasks: completing financial aid applications, submitting a final high school transcript, obtaining immunizations, accepting student loans, and paying tuition, among others. Fail to support students on some of these tasks and many of them — particularly those from low-income backgrounds or those who would be the first in their families to attend college — may succumb to summer melt, the phenomenon where students who intend to go to college fail to matriculate. At the same time, providing generic outreach to all students — including those who have already completed these tasks or feel confident that they know what they need to do — risks alienating a subset of students. In addition, outreach to students who are on-track may inadvertently confuse them or lead them to opt out of the support system before they might actually need it.

Previous efforts to address summer melt have included individual counselor outreach or automated text-message outreach. Both strategies allowed students to communicate with advisors one-on-one and significantly improved on-time college enrollment. However, scaling these strategies requires significant staffing of human counselors to address the specific questions and personal needs of each student.

Artificial intelligence (AI) could dramatically change the viability of providing students with outreach and support if it can be tailored to address their personal needs. In collaboration with Georgia State University (GSU), we tested whether "Pounce," a conversational AI system built by AdmitHub and named for the GSU mascot, could efficiently support would-be college freshmen with their transition to college. Pounce features two key innovations. First, the system integrates university data on students' progress with required pre-matriculation tasks. Thus, rather than providing generic suggestions, Pounce matches the text-based outreach that students receive to the tasks on which data indicates they need to make progress and therefore may need help. For example, only students who did not complete the FAFSA would receive outreach from Pounce. These students could learn about the importance of applying for financial aid and receive step-by-step guidance through the process if they chose to. Those with completed FAFSA forms would never be bothered with these messages. In this way, the system provides students with individualized outreach. Second, the Pounce system leverages artificial intelligence to handle an ever-growing set of student issues, challenges, and questions (e.g., When is orientation? Can I have a car on campus? Where do I find a work-study job?). The system can be accessed by students on their own schedule 24/7. It can efficiently scale to reach large numbers of students, and it gets smarter over time.

Through an experimental study, we found that students planning to go to GSU who received Pounce outreach completed their required pre-matriculation tasks and enrolled on-time at significantly higher rates than those who received GSU's standard outreach. Pounce reduced GSU's summer melt by 21%. These impacts mirror previous summer melt interventions but with far fewer staff.

Beyond the success of this trial at GSU, the work has broader implications for the use of AI within institutions. First, AI can change an organization's relationship with its employees, clients, or customers from reactive to proactive. Summer melt represents a process that most colleges and universities address reactively. Their data systems note whenever students have lost track of one of the countless required bureaucratic steps and deadlines: paying bills, registering for classes, applying for financial aid, and on and on. Schools know which students have completed which requirements, but lack knowledge about what fiscal, behavioral, or informational barriers block further progress. An AI system can figure out which students need a simple reminder, further identify who needs detailed instructions, and provide a mechanism for others to reach out with questions. Thus, a thoughtfully designed AI system can allow an institution to become proactive instead of waiting for problems to arise. For Pounce, or any other AI system designed for human idiosyncrasies, handling this range of needs is essential.

Second, somewhat paradoxically, we found that AI-enabled communication systems can also make students more proactive. As Pounce pinged students with questions and reminders, the outreach primed students to think of and ask other questions that had been on their minds. Thus, the system provided students with a nudge to ask whatever they may have been worrying about and opened a new channel of communication. A key goal for an educational system — and most companies — is encouraging students (or employees) to take proactive steps to solve small challenges before they become big problems. Thus, a collateral benefit of support from Pounce was that as students were primed about certain tasks, they became more agentic in tackling other important tasks to prepare themselves for college.

Third, institutions that are savvy about using individualized data proactively and who create more proactive constituents can pursue core goals more effectively and efficiently. When institutions reach out to their employees, clients, and customers to make them better at completing tasks essential to their roles, the improved performance, in turn, can help the institution. Pounce helped GSU students manage a number of distinct tasks more successfully. This support boosted student enrollment (and therefore revenue) for the institution and likely engendered goodwill among students — who we suspect were happier to receive support to hit deadlines than to be assessed penalties for missing them. By spending less time and effort getting students matriculated at GSU, Pounce freed the institution's and the students' resources to enable greater focus on teaching and learning goals.

Combining data integration with artificial intelligence in the form of virtual assistants, such as Pounce, holds promise for sectors like education that rely heavily on communication. Of students who completed high school in 2014, for example, 68% — some two million individuals — transitioned directly to postsecondary education. The matriculation process and its corresponding challenges remain reasonably consistent over time. Thus, artificially intelligent systems such as Pounce have the potential to provide these transitioning students with personalized support to stay on track while not burdening universities with excessive costs or demands for staff time. Rather, this system minimizes the need for staff to respond to common questions, so that they can instead devote their time more fully to those issues that only humans can solve.

Further, AI systems that can be responsive to human changes in wants, needs, and feelings show substantial promise well beyond higher education. Just about any company with an on-boarding process to orient new employees will face similar tasks in which some employees need assistance while others feel confident that they can manage on their own. Businesses which have customers or clients with idiosyncratic needs may similarly benefit from AI systems that can tailor outreach and respond to incoming queries. In such cases, individualized, proactive outreach to support employees or clients is likely to make these constituents more proactive in ensuring that their own needs and questions are addressed. Thus, the foundation for a proactive feedback loop will be established — a genuinely intelligent move for any institution.

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DATA

Is Your Company's Data Actually Valuable in the AI Era?

by Ajay Agrawal, Joshua Gans and Avi Goldfarb

JANUARY 17, 2018

Carmen Martínez Torrón

/Hayon Thapaliya/Getty Images

AI is coming. That is what we heard throughout 2017 and will likely continue to hear throughout this year. For established businesses that are not Google or Facebook, a natural question to ask is: What have we got that is going to allow us to survive this transition?

In our experience, when business leaders ask this with respect to AI, the answer they are given is "data." This view is confirmed by the business press. There are hundreds of articles claiming that "data is the new oil" — by which they mean it is a fuel that will drive the AI economy.

If that is the case, then your company can consider itself lucky. You collected all this data, and then it turned out you were sitting on an oil reserve when AI happened to show up. But when you have that sort of luck, it is probably a good idea to ask "Are we really that lucky?"

The "data is oil" analogy does have some truth to it. Like internal combustion engines with oil, AI needs data to run. AI takes in raw data and converts it into something useful for decision making. Want to know the weather tomorrow? Let's use data on past weather. Want to know yogurt sales next week? Let's use data on past yogurt sales. AIs are prediction machines driven by data.

But does AI need *your* data? There is a tendency these days to see all data as potentially valuable for AI, but that isn't really the case. Yes, data, like oil, is used day-to-day to operate your prediction machine. But the data you are sitting on now is likely not that data. Instead, the data you have now, which your company accumulated over time, is the type of data used to *build* the prediction machine — not operate it.

The data you have now is training data. You use that data as input to train an algorithm. And you use that algorithm to generate predictions to inform actions.

So, yes, that does mean your data is valuable. But it does not mean your business can survive the storm. Once your data is used to train a prediction machine, it is devalued. It is not useful anymore for that sort of prediction. And there are only so many predictions your data will be useful for. To continue the oil analogy, data can be burned. It is somewhat lost after use. Scientists know this. They spend years collecting data, but once it has produced research findings, it sits unused in a file drawer or on back-up disk. Your business may be sitting on an oil well, but it's finite. It doesn't guarantee you more in the AI economy than perhaps a more favorable liquidation value.

Even to the extent that your data could be valuable, your ability to capture that value may be limited. How many other sources of comparable data exist? If you are one of many yogurt vendors, then your database containing the past 10 years of yogurt sales and related data (price, temperature, sales of related products like ice cream) will have less market value than if you are the only owner of that type of data. In other words, just as with oil, the greater the number of other suppliers of your type of data, the less value you can capture from your training data. The value of your training data is further influenced by the value generated through enhanced prediction accuracy. Your training data is more valuable if enhanced prediction accuracy can increase yogurt sales by $100 million rather than only $10 million.

Moreover, the ongoing value of data usually comes from the actions you take in your day-to-day business — the new data you accrue each day. New data allows you to *operate* your prediction machine after it is trained. It also enables you to improve your prediction machine through *learning*. While 10 years of data on past yogurt sales is valuable for training an AI model to predict future yogurt sales, the actual predictions used to manage the supply chain require operational data on an ongoing basis. And this is the important point for today's incumbent companies.

An AI startup that acquires a trove of data on past yogurt sales can train an AI model to predict future sales. It can't actually use its model to make decisions unless the startup obtains ongoing operational data to learn from. Unlike startups, large enterprises generate operational data every day. That's an asset. The more operations, the more data. Furthermore, the owner of the operation can actually make use of the prediction. It can use the prediction to enhance its future operation.

In the AI economy, the value of your accumulated data is limited to a one-time benefit from training your AI model. And the value of training data is, like oil or any other input, influenced by the overall supply — it's less valuable when more people have it. In contrast, the value of your ongoing operational data is not limited to a one-time benefit, but rather provides a perpetual benefit for operating and further enhancing your prediction machine. So, despite all the talk about data being the new oil, your accumulated historical data isn't the thing. However, it may be the thing that *gets you to* the thing. Its value for your future business prospects is low. But if you can find ways to generate a new, ongoing data stream that delivers a performance advantage in terms of your AI's predictive power, that will give you sustainable leverage when AI arrives.

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Harvard Business Review

TECHNOLOGY

The Future of Human Work Is Imagination, Creativity, and Strategy

by Joseph Pistrui

JANUARY 18, 2018

Juj Winn/Getty Images

It seems beyond debate: Technology is going to replace jobs, or, more precisely, the *people* holding those jobs. Few industries, if any, will be untouched.

Knowledge workers will not escape. Recently, the CEO of Deutsche Bank predicted that half of its 97,000 employees could be replaced by robots. One survey revealed that “39% of jobs in the legal sector could be automated in the next 10 years. Separate research has concluded that accountants have a 95% chance of losing their jobs to automation in the future.”

And for those in manufacturing or production companies, the future may arrive even sooner. That same report mentioned the advent of “robotic bricklayers.” Machine learning algorithms are also predicted to replace people responsible for “optical part sorting, automated quality control, failure detection, and improved productivity and efficiency.” Quite simply, machines are better at the job: The National Institute of Standards predicts that “machine learning can improve production capacity by up to 20%” and reduce raw materials waste by 4%.

It is easy to find reports that predict the loss of between 5 and 10 million jobs by 2020. Recently, space and automotive titan Elon Musk said the machine-over-mankind threat was humanity’s “biggest existential threat.” Perhaps that is too dire a reading of the future, but what is important for corporate leaders right now is to avoid the catastrophic mistake of ignoring how people will be affected. Here are four ways to think about the people left behind after the trucks bring in all the new technology.

The Wizard of Oz Is the Wrong Model

In Oz, the wizard is shown to run the kingdom through some complex machine hidden behind a curtain. Many executives may think themselves the wizard; enthralled by the idea that AI technology will allow them to shed millions of dollars in labor costs, they could come to believe that the best company is the one with the fewest people aside from the CEO.

Yet the CEO and founder of Fetch Robotics, Melonee Wise, cautions against that way of thinking: “For every robot we put in the world, you have to have someone maintaining it or servicing it or taking care of it.” The point of technology, she argues, is to boost productivity, not cut the workforce.

Humans Are Strategic; Machines Are Tactical

McKinsey has been studying what kind of work is most adaptable to automation. Their findings so far seem to conclude that the more technical the work, the more technology can accomplish it. In other words, machines skew toward *tactical* applications.

On the other hand, work that requires a high degree of imagination, creative analysis, and strategic thinking is harder to automate. As McKinsey put it in a recent report: “The hardest activities to automate with currently available technologies are those that involve managing and developing people (9 percent automation potential) or that apply expertise to decision making, planning, or creative work (18 percent).” Computers are great at optimizing, but not so great at goal-setting. Or even using common sense.

Integrating New Technology Is About Emotions

When technology comes in, and some workers go away, there is a residual fear among those still in place at the company. It's only natural for them to ask, "Am I next? How many more days will I be employed here?" Venture capitalist Bruce Gibney explains it this way: "Jobs may not seem like 'existential' problems, but they are: When people cannot support themselves with work at all — let alone with work they find meaningful — they clamor for sharp changes. Not every revolution is a good revolution, as Europe has discovered several times. Jobs provide both material comfort and psychological gratification, and when these goods disappear, people understandably become very upset."

The wise corporate leader will realize that post-technology trauma falls along two lines: (1) how to integrate the new technology into the work flow, and (2) how to cope with feelings that the new technology is somehow "the enemy." Without dealing with both, even the most automated workplace could easily have undercurrents of anxiety, if not anger.

Rethink What Your Workforce Can Do

Technology will replace some work, but it doesn't have to replace the *people* who have done that work. Economist James Bessen notes, "The problem is people are losing jobs and we're not doing a good job of getting them the skills and knowledge they need to work for the new jobs."

For example, a study in Australia found a silver lining in the automation of bank tellers' work: "While ATMs took over a lot of the tasks these tellers were doing, it gave existing workers the opportunity to upskill and sell a wider ranges of financial services."

Moreover, the report found that there is a growing range of new job opportunities in the fields of big data analysis, decision support analysts, remote-control vehicle operators, customer experience experts, personalized preventative health helpers, and online chaperones ("managing online risks such as identify theft, reputational damage, social media bullying and harassment, and internet fraud"). Such jobs may not be in your current industrial domain. But there may be other ways for you to view this moment as the perfect time to rethink the shape and character of your workforce. Such new thinking will generate a whole new human resource development agenda, one quite probably emphasizing those innate human capacities that can provide a renewed strategy for success that is both technological and human.

As Wise, the roboticist, emphasized, the technology itself is just a tool, one that leaders can use how they see fit. We can choose to use AI and other emerging technologies to replace human work, or we can choose to use them to augment it. "Your computer doesn't unemploy you, your robot doesn't unemploy you," she said. "The companies that have those technologies make the social policies and set those social policies that change the workforce."

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Harvard Business Review

ANALYTICS

Machine Learning Can Help B2B Firms Learn More About Their Customers

by Stephan Kudyba and Thomas H. Davenport

JANUARY 19, 2018

vincent tsui for hbr

Much of the strategic focus in the digital economy thus far has revolved around getting better insights into consumers. B2C firms have been the leaders in customer analytics initiatives. E-commerce, mobile commerce, and social media platforms have enabled businesses to better sculpt marketing and customer support initiatives and customer services. Extensive data and advanced analytics for B2C have enabled strategists to better understand consumer behavior and corresponding propensities as visitors and purchasers conduct daily activities through online systems.

But there is also an emerging capability to gain insights on business customers. B2B, or the process of marketing and selling product and service offerings to business customers, is experiencing an intensified focus with the increased availability of new digital data that describes businesses. Traditional B2B insight activities have involved such limited data as size of companies as measured by revenue, capitalization or employees, and industry type as formally classified by SIC codes.

The internet offers a much more detailed level of data, going well beyond standard industry categorization. Web content that provides robust, detailed descriptions of companies provides valuable descriptive information. However, these digital resources yield little value unless individual customers are identified and their detailed backgrounds and interests are analyzed to provide strategic insights for suppliers. And that's where AI techniques provide can help.

Neural networks and "deep learning" algorithms, along with other machine learning methods, enable data scientists to mine the gold in digital formats. These AI-based methods involve advanced search techniques that identify, categorize, and gather user-defined data elements corresponding to search criteria. For example, considerable business description information exists on LinkedIn. But how can organizations analyze each profile on the network? Well-designed AI-based algorithms are the key to extracting information from LinkedIn. These more structured data resources then provide the means for yet another application of AI-based algorithms, where the focus is on identifying patterns in data that ultimately provide the basis for predictive sales and marketing models. These can be used for scoring, forecasting, and classification capabilities. By helping B2B companies gather better data on their customers, AI will help them catch up with their B2C peers.

One company focusing on AI-based analytics for B2B applications has adopted a unique way of leveraging the extensive digital footprints that provide descriptive attributes of all types of firms. Its approach to leveraging data assets combines the art and science of producing analytic solutions. EverString Technology considers the diverse sectors of the web that contain descriptive information of businesses (for example, site domains and employee digital footprints) and incorporates input from expert practitioners in the B2B space to help further describe individual businesses. EverString deploys machine learning to identify, extract, and model a categorization scheme of companies so that users in the B2B space can more accurately identify opportunities.

B2B companies need to know, for example, how many companies exist in a given market space. How can they identify and access all those firms that fall into the market pertaining to their product or service? And which specific buyers should they target in those firms? By creating a micro-categorization scheme and applying guided AI to various sectors of the web, EverString can produce thousands of customer insights in a short period for its B2B customers. The company has created an intelligent system to augment customer data in the B2B space.

One B2B company that utilizes EverString's platform is Autodesk, a multinational software company that provides software for the architectural, engineering, construction, manufacturing, media, and entertainment industries. A major focus in Autodesk's approaches to B2B sales over the past several years has been on using more data for account selection and understanding. But in large design-oriented companies, it is often difficult to understand which individuals might have an interest in computer-aided design software.

Prior to working with EverString, Autodesk relied on field experience and customer buying histories. Now it relies increasingly on predictive analytics from EverString to identify likely customers. One key tool is the Enterprise Business Agreement Propensity Model, which suggests which executives in a large customer organization are most likely to engage in an enterprise-level agreement with Autodesk. The company also maintains an overall account potential model that makes use of EverString data and predictions.

The primary users of the data and models are, of course, the Autodesk sales force. They are given ranked recommendations and the raw scores created by the EverString models. The Global Sales Strategy organization within Autodesk manages the process and tries to ensure that the data and models check out.

It is early days for the use of these capabilities at Autodesk, but thus far both the sales teams and the Global Sales Strategy group feel that the EverString offerings are very helpful to the sales process. As Matthew Stevens, Autodesk's sales insights manager within Global Sales Strategy, told us:

> *EverString provides key inputs on analytics, which we convert into potential sales opportunities. It's early to judge the exact payoff, but it's difficult to imagine making a recommendation without these insights. We are challenged to respond to all the questions about accounts and scores, but at least we have data to support our recommendations now.*

Stevens also noted that there are many more activities to pursue in the future with this data-driven approach to sales:

> *Finding data on European and Asian companies is challenging due to privacy regulations and language differences. We're working with EverString to understand these opportunities better. Currently our EverString analytics and data are not connected with Salesforce, our CRM system. But we are at the first stage of a multistage journey to understand analytics and insights in sales. We are definitely moving in the right direction.*

New tools from organizations like EverString are enabling B2B-oriented firms like Autodesk to develop much-more-data-driven approaches to sales and marketing. The amount and quality of data on businesses may not yet approach that for consumers, but there is considerable progress being made in achieving parity.

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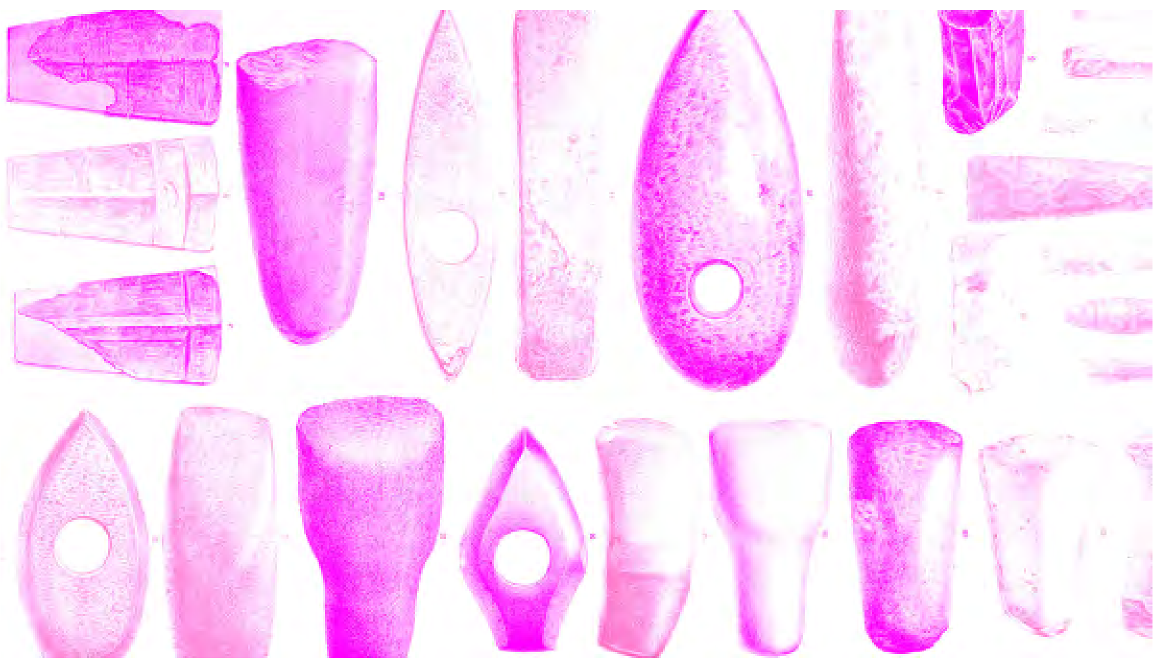
Harvard Business Review

TECHNOLOGY

As AI Makes More Decisions, the Nature of Leadership Will Change

by Tomas Chamorro-Premuzic, Michael Wade and Jennifer Jordan
JANUARY 22, 2018



The New York Public Library

It is tempting to regard artificial intelligence as a threat to human leadership. After all, the very purpose of AI is to augment, improve, and ultimately replace human intelligence, which is still widely regarded, at least by us humans, as our key competitive advantage. There is no reason to believe that leadership will be spared the impact of AI. Indeed, it is very likely that AI will supplant many aspects of the "hard" elements of leadership — that is, the parts responsible for the raw cognitive processing of facts and information. At the same time, our prediction is that AI will also lead to a greater emphasis on the "soft" elements of leadership — the personality traits, attitudes, and behaviors that allow individuals to help others achieve a common goal or shared purpose.

A shift from the hard to soft elements of leadership is not exclusive to the AI age. Meta-analytic studies reviewing 50 years of research suggest that personality traits such as curiosity, extraversion, and emotional stability are twice as important as IQ — the benchmark metric for reasoning capability — when it comes to predicting leadership effectiveness.

But to what extent can we rely on the many decades of scholarship that have sought to define the qualities, traits, and attributes of this soft side of leadership? On the one hand, leadership evolved through thousands of years, so its foundations are unlikely to change. On the other hand, one cannot deny the potent influence that environmental changes may have in reshaping the critical skills and behaviors that will make leaders effective (and ineffective). At some point in our history, probably with the advent of language, leadership acumen transitioned from physical to cognitive skills, putting a premium on intelligence and expertise at the expense of force and strength. By the same token, one would expect the current AI revolution to commoditize and automate the data-driven aspect of leadership, delegating the soft elements of leadership to humans. Consistently, our research suggests that, in an AI age characterized by intense disruption and rapid, ambiguous change, we need to rethink the essence of effective leadership. Certain qualities, such as deep domain expertise, decisiveness, authority, and short-term task focus, are losing their cachet, while others, such as humility, adaptability, vision, and constant engagement, are likely to play a key role in more-agile types of leadership. Here's a closer look at these competencies:

Humility. In an age of rapid change, knowing what you don't know is as valuable as knowing what you do. Unfortunately, leaders are often shielded from learning about new developments by the sheer volume and variety of new information that is captured daily. Leaders in the AI age need to be willing to learn and be open to seeking input from both inside and outside their organizations. They also need to trust others to know more than they do. This knowledge may well come from someone 20 years younger or three levels down the organizational hierarchy. In the AI age, an effective leader understands that someone having lower status or less experience doesn't mean they cannot make a key contribution.

Companies like Nestlé have implemented extensive reverse mentoring programs. These initiatives are meant to institutionalize the process of learning to accept, welcome, and leverage the knowledge of team members, peers, and employees for the benefit of the business. Being humble may sound inconsistent with the need to exude an image of confidence and authority. Yet there has always been a very weak relationship between confidence and actual competence, such that true experts are often more humble than individuals with very little or no expertise. As the British philosopher Bertrand Russell famously noted, "The trouble with the world is that the stupid are cocksure and the intelligent are full of doubt."

Adaptability. At an organizational level, adaptability means being ready to innovate and respond to opportunities and threats as they appear. At an individual level, it means being open to new ideas, changing an opinion even when it hurts or threatens one's ego, and being able to effectively communicate that revised opinion to relevant stakeholders, including peers, teams, and customers. In an AI age, changing one's mind, which can often be regarded as a sign of weakness or lack of conviction, should be perceived as a strength when it improves decision making. Adaptable leaders are not afraid to commit to a new course of action when the situation warrants, and their adaptability allows them to confront challenges with a focus on learning rather than being right.

Carlos Torres Vila, the CEO of Spanish bank BBVA, oversaw the transformation of the company from a traditional brick-and-mortar bank into one of the most successful financial services organizations of the digital era. He responded to industry disruption by fostering a transformative culture that encourages agility, flexibility, collaborative work, entrepreneurial spirit, and innovation.

Vision. Vision has always played an important role in effective leadership. But in an AI age characterized by rapid technology and business model disruption, a clear vision is even more pivotal, because there is less clarity among followers, subordinates, and employees about where one should go, what one should do, and why. Leaders with a clear vision have compelling, meaningful answers to these questions and are better at communicating them in an effective way. Furthermore, vision allows a leader to implement necessary organizational transformations without caving to short-term interests.

Many leaders of today's digital giants, such as Amazon, Tesla, Facebook, Tencent, Alibaba, and Google, have clearly articulated visions for their organizations, even in the face of huge short-term uncertainty.

Engagement. Lastly, to be successful in the AI age, a leader must remain constantly engaged with their surrounding environment so that they can be attuned to, and adapt to, the signals rather than the noise — which will either threaten (disruptors) or support (potential partners) their vision. Agile leaders need to stay engaged, but they also need to find ways to keep their teams engaged, particularly when the going gets rough and the path becomes challenging.

Engagement in an AI age can increasingly be accomplished using digital means. For example, German e-commerce giant Zalando has implemented a variety of digital tools for top management to capture and respond to topics of interest from all employees. These include zTalk, a live chat application; zLive, a company-wide social intranet; and zBeat, a tool that regularly surveys employees about their current work experiences.

Does all this suggest that leadership is radically different in the AI age? No, but there are two key distinctions. First, leaders' hard skills will continue to be eclipsed by smart machines, while their soft skills will become ever more important. Second, while timeless leadership traits like integrity and emotional intelligence will no doubt remain important, leaders in the AI age need to be humble about others' contributions, adaptable to the challenges that get thrown into their paths, steadfast in their vision of the ultimate destination on this path, and constantly engaged with the changing world around them.

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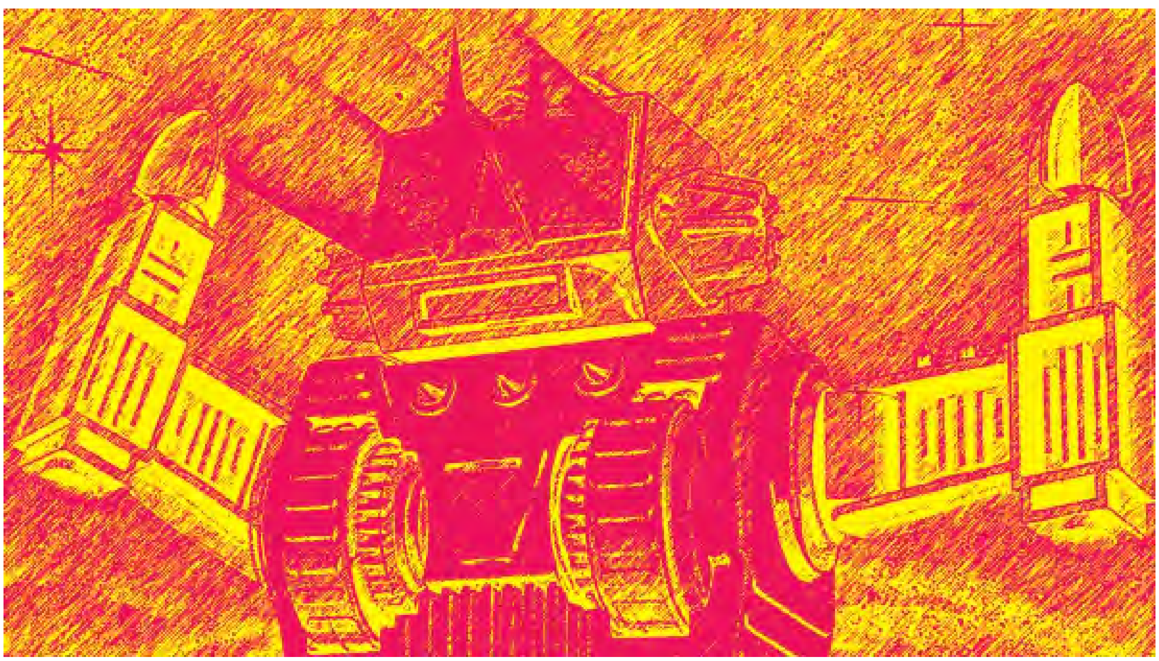
Harvard Business Review

PRODUCTIVITY

Is "Murder by Machine Learning" the New "Death by PowerPoint"?

by Michael Schrage

JANUARY 23, 2018



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Software doesn't always end up being the productivity panacea that it promises to be. As its victims know all too well, "death by PowerPoint," the poor use of the presentation software, sucks the life and energy out of far too many meetings. And audit after enterprise audit reveals spreadsheets rife with errors and macro miscalculations. Email and chat facilitate similar dysfunction; inbox overload demonstrably hurts managerial performance and morale. No surprises here — this is sadly a global reality that we're all too familiar with.

So what makes artificial intelligence/machine learning (AI/ML) champions confident that their technologies will be immune to comparably counterproductive outcomes? They shouldn't be so sure. Digital empowerment all too frequently leads to organizational mismanagement and abuse. The enterprise history of personal productivity tools offers plenty of unhappy litanies of unintended consequences. For too many managers, the technology's costs often rival its benefits.

It's precisely because machine learning and artificial intelligence platforms are supposed to be "smart" that they pose uniquely challenging organizational risks. They are likelier to inspire false and/or misplaced confidence in their findings; to amplify or further entrench data-based biases; and to reinforce — or even exacerbate — the very human flaws of the people who deploy them.

The problem is not that these innovative technologies don't work; it's that users will inadvertently make choices and take chances that undermine colleagues and customers. Ostensibly smarter software could perversely convert yesterday's "death by Powerpoint" into tomorrow's "murder by machine learning." Nobody wants to produce boring presentations that waste everybody's time, but they do; nobody wants to train machine learning algorithms that produce misleading predictions, but they will. The intelligent networks to counter-productivity hell are wired with good intentions.

For example, as Gideon Mann and Cathy O'Neil astutely observe in "Hiring Algorithms Are Not Neutral," their HBR article, "Man-made algorithms are fallible and may inadvertently reinforce discrimination in hiring practices. Any HR manager using such a system needs to be aware of its limitations and have a plan for dealing with them.... Algorithms are, in part, our opinions embedded in code. They reflect human biases and prejudices that lead to machine learning mistakes and misinterpretations."

These intrinsic biases — in data sets and algorithms alike — can be found wherever important data-driven decisions need to be made, such as customer segmentation efforts, product feature designs, and project risk assessments. There may even be biases in detecting biases. In other words, there's no escaping the reality that machine learning's computational strengths inherently coexist with human beings' cognitive weaknesses, and vice versa. But that's more a leadership challenge than a technical issue. The harder question is: Who's going to "own" this digital coevolution of talent and technology, and sustainably steer it to success?

To answer this question, consider the two modes of AI/ML that are most likely to dominate enterprise initiatives:

- *Active AI/ML* means people directly determine the role of artificial intelligence or machine learning to get the job done. The humans are in charge; they tell the machines what to do. People rule.

- *Passive AI/ML*, by contrast, means the algorithms largely determine people's parameters and processes for getting the job done. The software is in charge; the machines tell the humans what to do. Machines rule.

Crudely put, where active machine learning has people training machines, passive machine learning has machines training people. With the rise of big data and the surge of smarter software, this duality will become one of the greatest strategic opportunities — and risks — confronting leadership worldwide.

Active AI/ML systems have the potential to digitally reincarnate, and proliferate, the productivity pathologies associated with existing presentation, spreadsheet, and communications software. Individuals with relatively limited training and knowledge of their tools are being told to use them to get their jobs done. But most companies have very few reliable review mechanisms to assure or improve quality. So, despite the advanced technology, presentations continue to waste time, spreadsheet reconciliations consume weekends, and executives fall further behind responding to emails and chats.

Just as these tools turned knowledge workers into amateur presenters and financial analysts, the ongoing democratization of machine learning invites them to become amateur data scientists. But as data and smarter algorithms proliferate enterprise-wide, how sustainable will that be?

To be sure, talented power users will emerge, but overall, the inefficiencies, missed opportunities, and mistakes that could result have the potential to be organizationally staggering. To think that most managers will reap real value from AI/ML platforms with minimal training is to believe that most adults could, in their spare time, successfully turn litters of puppies into show dogs. This is delusional. Most likely, organizations will raise ill-trained software that demands inordinate amounts of attention, leaves unexpected messes, and occasionally bites.

For example, overfitting is a common machine learning mistake made by even experienced data scientists. In the case of overfitting, the AI is, literally, too precise to be true; the model incorporates too much noise, rather than focusing on the essential data. It fits *too well* with existing data sets and in turn becomes wildly inaccurate and/or unreliable when processing *new* data. For businesses, the predicted results could therefore be complete nonsense, leading to negative outcomes such as bad hires, poor designs, or missed sales forecasts. Overfitting, like spreadsheet errors, can of course be caught and corrected. But what happens when dozens of machine learning amateurs are making flawed investments or projections based on what they thought were accurate models? That's an algorithm for disaster.

The more data resources that organizations possess, the more disciplined supervision and oversight that active AI/ML will need. Smarter algorithms require smarter risk management.

Passive AI/ML, on the other hand, presents a different design sensibility and poses different risks. For all intents and purposes, this software acts as manager and coach, setting goals and guidelines even as it offers data-driven advice to get the job done. The personal productivity promise is compelling: texts and emails that write their own responses; daily schedules that reprioritize themselves when you're running late; analytics that highlight their own most important findings; and presentations that make themselves more animated. Enterprise software innovators from Microsoft to Google to Salesforce to Slack seek to smarten their software with algorithms that reliably learn from users. So, what's the problem?

The most obvious risk, of course, is whether the "smarter software" truly gives its people the right commands. But top management should have that firmly under review. The subtler and more subversive risk is that passive AI/ML is too rooted in human compliance, adherence, and obedience. That is, workers are required to be subservient to the AI to make it succeed. This sort of disempowerment-by-design may invite employee resistance, perfunctory compliance, and subtle sabotage. For example, a customer service rep might tell an unhappy customer, "I'd love to help you, but the software forbids me from giving you any kind of refund."

In other words, the value of the human touch is deliberately discounted by data-driven decisions. Workers are expected to subordinate their judgment to their algorithmic bosses, and the system will discipline them if they get out of line.

While there's no solution to the enumerated challenges, there are approaches that strike a healthy balance between the risks and opportunities. Certainly, the more successful organizations will embrace "data governance" and hire the best data scientists they can. But culturally and operationally, they'll need to publicly enact three interrelated initiatives to mitigate risks**:**

1. Write a declaration of (machine) intelligence. Not unlike Thomas Paine's *Common Sense* or the Declaration of Independence, a Declaration of (Machine) Intelligence would define and articulate principles related to how the organization expects to use smart algorithms to drive performance and productivity. The document typically describes use cases and scenarios to illustrate its points. It aims to give managers and workers a clearer sense of where AI/ML will augment their tasks and where it may replace or automate them. The declaration is very much about expectations management, and it should prove required reading for anyone in the company.

2. Employ radical repository transparency. Review, verification, and validation are essential principles in data-rich, AI/ML enterprise environments. Sharing ideas, data, and models between communities of practice should be a best practice. Big corporations increasingly use repositories that encourage people and teams to post their data sets and models for review. At times, these repositories grow out of data governance initiatives. At others, they're byproducts of data science teams trying to get greater visibility into what various groups are doing digitally. The clear aspiration is to expand enterprise-wide awareness without constraining bottom-up initiative.

3. Create a trade-off road map. Data science, artificial intelligence, and machine learning are dynamically innovative fields that rapidly and opportunistically evolve. Yesterday's active machine learning implementation may become tomorrow's passive AI/ML business process. As legacy organizations look to data, machine learning, and digital platforms to transform themselves, their road maps will suggest where management believes active AI/ML investments will be more valuable than passive ones. For example, customer-oriented AI/ML systems may merit different talent and trade-offs that focus on internal process efficiency.

Churn management makes an excellent case study: At one telecom giant, an analytics team explored using machine learning techniques to identify the customers most likely to leave and switch to another service provider. Successfully testing retention offers would be a big win for the enterprise, and having ML reduce customer churn would dramatically improve internal process efficiencies. But several of the more customer-centric analysts believed that simply keeping a customer wasn't enough; they thought a portion of possible churners could be upsold to new and additional services if the offers were framed correctly. They wanted the data and machine learning algorithms to be trained to identify customers who could be upsold, not just saved. It turned out this was a very good data-driven, customer-centric idea.

Like the Declaration of (Machine) Intelligence, the road map of trade-offs is meant to manage expectations. But it looks to and draws on radical repository transparency to see what internal AI/ML capabilities exist and what new ones need to be cultivated or acquired.

Simply put, leaders who are serious about leading AI/ML transformations are investing not just in innovative technical expertise but also in new organizational capabilities. As they do so, they'll need to take great care not to recreate the productivity mistakes of the past.

Michael Schrage, a research fellow at MIT Sloan School's Center for Digital Business, is the author of the books *Serious Play* (HBR Press), *Who Do You Want Your Customers to Become?* (HBR Press) and *The Innovator's Hypothesis* (MIT Press).

Harvard Business Review

TECHNOLOGY

How Will AI Change Work? Here Are 5 Schools of Thought

by Mark Knickrehm

JANUARY 24, 2018 UPDATED JANUARY 25, 2018

Yaroslav Kushta/Getty Images

The future of the workforce is one of the biggest issues facing CEOs today. It's abundantly clear to all that artificial intelligence, big data analytics, and advanced robotics make it possible for machines to take on tasks that once required a person to do them. How should companies prepare, strategically, to thrive in this world?

Views on what to expect vary dramatically. By some accounts, almost half of all jobs in the U.S. economy could be made obsolete. Others have described how intelligent machines will actually create jobs — including entirely new categories of jobs. Some people even talk about a world of superabundance where work will be about pursuing your passion, on your own terms.

It's critical for companies to understand the range of opinions on this issue, because implicitly or explicitly, they will influence the way business leaders create the workforce of the future. And while a lot will shake out in years to come, this issue is already front and center. Companies are making decisions today that will matter hugely to their ability to compete tomorrow and throughout the 2020s.

Most companies are already moving rapidly to acquire new capabilities. In a new Accenture survey ("Reworking the Revolution," which published on January 23rd) of 1,200 C-level executives worldwide, 75% say that they are currently accelerating investments in AI and other intelligent technologies. And 72% say they are responding to a competitive imperative — they recognize the need for new tools to keep up with rivals, both by improving productivity and by finding new sources of growth. Some companies are transforming themselves into "intelligent enterprises," in which all processes are digitized, decisions are data-driven, and machines do the heavy lifting — both physical and cognitive.

So, there's a great deal at stake in the debate over productivity and jobs. Leaders must understand the debate and be prepared to address tough questions: What kind of new skills do we need? How should we be organized? How do we define jobs? How can we bring our people along with us, in a way that benefits everyone?

Through research, we've identified five schools of thought in this debate.

The Dystopians
Position: Man and machine will wage a Darwinian struggle that machines will win. AI systems will take on tasks at the heart of middle- and high-skill jobs, while robots will perform menial work that requires low-skill labor. The result will be massive unemployment, falling wages, and wrenching economic dislocation. Falling incomes will have grave consequences in places like the United States and Europe, where consumption accounts for 56% or 69% of GDP, respectively, requiring new social supports, such as a universal basic income.

The Utopians
Position: Intelligent machines will take on even more work, but the result will be unprecedented wealth, not economic decline. AI and computing power will advance in the next two decades to achieve "the singularity" — when machines will be able to emulate the workings of the human brain in its entirety. Human brains will be "scanned" and "downloaded" to computers and billions of replicated human brains will do most of the cognitive work, while robots will do all the heavy lifting. Economic output could double every three months. The singularity may even lead to a world where

little human labor is required, a universal income program covers basic needs, and people apply their talents to meaningful pursuits.

The Technology Optimists
Position: A burst of productivity has already begun but is not captured in official data because companies are still learning how intelligent technologies can change how they operate. When companies do take full advantage of intelligent technologies, a leap in productivity will produce a digital bounty — creating both economic growth and improvements in living standards not counted in GDP, such as consumer surplus (from better, cheaper products) and the value of free apps and information. However, based on current trends, the bounty won't be distributed evenly, and many jobs will be displaced. To avoid negative income and employment effects, there will be a need to invest in education and training alongside investments in technology.

The Productivity Skeptics
Position: Despite the power of intelligent technologies, any gains in national productivity levels will be low. Combine that with headwinds from aging populations, income inequality, and the costs of dealing with climate change, and the United States will have near-zero GDP growth. In the end, there isn't much to do except brace for stagnant growth in advanced economies.

The Optimistic Realists
Position: Digitization and intelligent machines can spur productivity gains that match previous technology waves. Productivity will advance rapidly in certain sectors and for high-performing companies. New jobs will be created, but intelligent technologies may exacerbate the trends of the recent past, in which demand rose for both high- and low-skill workers whose jobs could be easily automated, while demand for middle-skill workers fell. With no simple solutions, more research is needed into the true relationship between productivity, employment, and wages to uncover effective responses.

Three Actions for Shaping the Future

Our crystal ball for what things might look like in 10 years is cloudy. What we do know is that business leaders must take steps now to shape their workforces for the emerging intelligent enterprise. Our research and experience point to three critical imperatives:

Use technology to augment human skills and reinvent operating models. Companies that think beyond labor substitution and cost savings will see a much greater payoff. For example, a new class of adaptive robots can function safely alongside workers and can take on difficult and tedious work. Consider this example: At BMW's Spartanburg, S.C. plant, robots are installing door-sealing gaskets, an awkward and tiring job for workers. This speed up the line, improves quality, and gives workers more time to do higher-value work. Researchers estimate that using adaptive robots this way could cut time wasted on non-value-added work by 25%. Employee surveys show that workers have more positive views of the new robots, which they regard as useful helpers. Away from the factory, companies are using AI to offload routine work from employees and to give them new analytical tools to improve customer experience and discover new possibilities for products, services, and business models that drive growth.

Take the opportunity to redefine jobs and rethink organizational design. Companies cannot optimize their investments if they have the same old job descriptions and organizational structures. Executives should assess the tasks that need to be done, anticipate which ones will be transferred to machines, then reconfigure jobs by adding new tasks or creating entirely different roles that are needed for managing intelligent technologies. A factory worker, for example, can be trained to run robots. AI systems also need human help to train and correct algorithms and override fallible machine judgment. For example, at Stitch Fix, an online clothing subscription service, 3,400 human stylists work with an AI recommendation engine to make personalized suggestions for customers. The machines give stylists the speed they need to be productive, and the stylists provide the additional judgment needed for accurate recommendations (and fewer returns). To function effectively, an intelligent enterprise should have a non-hierarchical organization, in which employees collaborate across functional and operational silos. This enables the intelligent enterprise to act quickly on the insights from data-crunching machines and deploy human talent to swarm on problems, experiment, iterate, and get solutions into the market.

Make employees your partners in building the intelligent enterprise. To strike the right balance between investing in intelligent technologies and maintaining existing businesses, companies need help from their employees. In our (above-referenced) research, we have found that employees are far more willing — even eager — to master new technologies than employers appreciate. They want to learn new skills, not least because they know they will need them to remain employed. Investments in both technology and training will help companies make a smooth transition to the intelligent enterprise. Companies that do this stand to outperform competitors because they will unleash the human talents that machines still can't match and that are essential to growth — creativity, empathy, communications, adaptability, and problem-solving. "As basic automation and machine learning move toward becoming commodities," says Devin Fidler, research director at the Institute for the Future, "uniquely human skills will become more valuable."

The debate over technology and jobs will rage on. Business leaders must follow this debate — and participate in it, too. And much more research is needed to fully understand the implications of intelligent technologies on work. In the meantime, companies that actively seize control of what can be done to prepare will position themselves to thrive in this exciting new era.

The author thanks his colleagues in Accenture Research, Svenja Falk, David Light, and Geoffrey Lewis, for their contributions to this article.

Editors' note: We've updated this article with the correct number of human stylists at Stitch Fix.

Mark Knickrehm is group chief executive for Accenture Strategy.

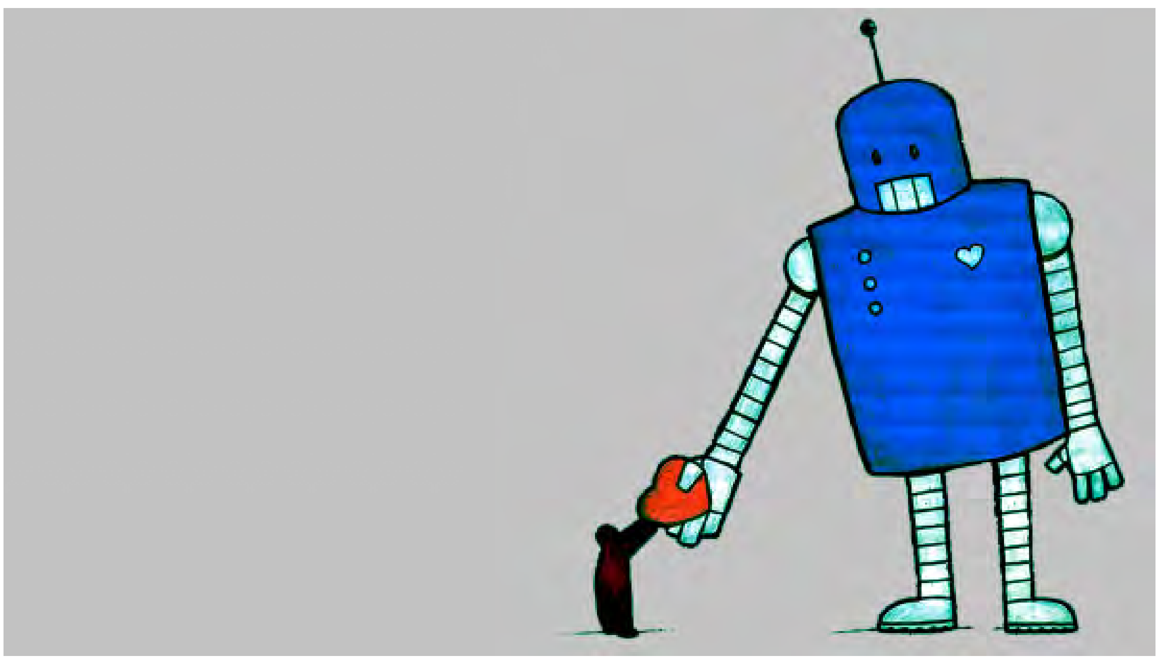
Harvard Business Review

TECHNOLOGY

How to Get Employees to Stop Worrying and Love AI

by Brad Power

JANUARY 25, 2018



tyler garrison/Getty Images

David Maister was angry. He had been surprised and annoyed to learn that his company had set up a new AI-based marketing system that was doing most of what he thought was his job as digital marketing manager at Global Consumer Brands: deciding what ads to place where, for which customer segments, and how much to spend. And when he found that the system was buying ads for audiences that didn't fit the company's customer profile, he stormed in to his boss's office and yelled, "I don't want men and women over 55 buying our product! It's not our audience!" Maister demanded that the system vendor modify it to enable him to override its recommendations for how much to spend on each channel and for each audience target. The vendor scrambled to give him the controls he wanted. However, after being given the reins on budgeting and buying decisions, Maister saw his decisions were degrading results. For example, despite the company's younger customer profile, men and women over 55 were buying gifts for their children, nieces, and grandchildren, making them, in fact, a very profitable audience.

Maister returned control to the system and results improved. Over the ensuing weeks, he began to understand what the system did well, and what he could do to help it. He learned to leave decisions about where to spend and whom to target to the system. He focused on introducing more strategic parameters, such as the aggressiveness of a campaign, or a limit on spending, and on testing different approaches to execution. The results continued to improve throughout 2017 as the system learned and got smarter, while Maister learned how to improve the brand's strategy in response to the insights produced by the AI. Within the first three months of using the system in new channels, the brand saw a 75% increase in purchases from paid digital channels, a 77% increase in purchase value, a 76% increase in return on add spend, and a significant decrease in cost per acquisition.

The names in this story have been changed, but the moral is clear: If you give control over AI experiments to employees to keep them involved, and to allow them to see what the AI does well, you can leverage the best of both humans and machines.

Unfortunately, companies will be unable to take full advantage of the huge potential of AI if employees don't trust AI tools enough to turn their work over to them and let the machine run. This problem of low AI adoption rates is increasing as businesses of all kinds are seeing successful applications of AI and realizing it can be applied to many data-intensive processes and tasks even as AI technology — once only available at large companies like Google, Amazon, Microsoft, and IBM — is now becoming less expensive and easier for smaller companies to access and operate, thanks to AI-as-a-Service.

Resistance to disruptive, technology-driven change is not unusual. Specifically, many people resist AI because of the hype surrounding it, its lack of transparency, their fear of losing control over their work, and the way it disrupts familiar work patterns.

Consider these cases where humans interfered with an AI initiative, and the reasons behind them:

Loss of control. A retailer implemented a website advertising optimization tool. The marketing team could upload a few different key banners or messages to the most prominent location on the website and, after gathering some experience, the system would decide which message produced the highest visitor engagement. It would then offer that up to future visitors. But the marketing team struggled with allowing the system to take control, and often intervened to show a message they preferred, undercutting the value of the tool.

Disruption of plans. The CEO of a global lending institution was quickly sold on the financial benefits and operational efficiencies of introducing an AI-enabled system to take over lending decisions. But the vice president of analytics saw the new system as a diversion from his plans for his analytics teams and the company's technology investments. He scrambled to derail consideration of the new system. He described in detail what his analysts did, and concluded, "There's no way this system is ever going to be able to produce the kinds of results they are claiming."

Disruption of relationships. The head of e-commerce for a regional product group at a consumer products company stuck his neck out to get permission from global headquarters to run an experiment with an AI-enabled system on some of his product's ad campaigns. Initial tests demonstrated unprecedented results. In 2017, sales improved 15% due to the campaigns. But adoption beyond the regional group and the one product line stalled due to the resistance of people with long-standing, friendly relationships with the agencies that ran the company's ad campaigns, who would lose work to the machine.

So, what can companies do to help employees become more comfortable working with AI systems?

Being able to visualize the way an AI-enabled system arrives at its decisions helps develop trust in the system — opening the black box so people can see inside. For example, Albert, a provider of an AI-based tool that helps marketers make better advertising investment decisions and improves campaign performance, developed a visualization tool ("Inside Albert") for its users to see where and when their brand is performing best, what ad concepts are converting the most customers, who the ideal customer is in terms of gender, location, and social characteristics, and the total number of micro audience segments the system has created (often in the tens of thousands). Clients realized that they couldn't micromanage one set of variables, such as ad frequency, because the system was wading through and factoring in a vast number of variables to decide pace and timing. Though users initially felt like the system was not aware of what they believed to be their best performing days and frequency, they learned that the system was finding high conversions operating outside of their previously established assumptions. "Inside Albert" let marketers better understand how the system was making decisions, so they ultimately didn't feel the need to micromanage it.

To overcome the resistance of stakeholders who may not be willing to engage with the new system, such as the VP of analytics at the lending institution, another approach is to build political momentum for a new AI-enabled system by mobilizing stakeholders who benefit from its adoption. For example, Waymo has partnered with Mothers Against Drunk Driving, The National Safety Council, The Foundation for Blind Children, and the Foundation for Senior Living to rally these constituencies in support of self-driving cars.

As AI is increasingly deployed throughout your company's decision-making processes, the goal should be to transition as quickly as possible. As the examples of Albert and Waymo illustrate, you can overcome AI resistance by running experiments, creating a way to visualize the decision process of the AI, and engaging constituencies who would benefit from the technology. The sooner you get people on board, the sooner your company will be able to see the potential results that AI can produce.

Brad Power is a consultant who helps organizations that must make faster changes to their products, services, and systems in order to compete with start-ups and leading software companies.

Harvard Business Review

TECHNOLOGY

How AI Could Help the Public Sector

by Emma Martinho-Truswell

JANUARY 26, 2018 UPDATED JANUARY 29, 2018

omair khan/unsplash

Last Thanksgiving, I watched my father-in-law evaluate over one hundred exams for the high school class he teaches on the U.S. government. They were mostly short answer questions: matching different provisions of the U.S. Constitution, and explaining the contents of the Bill of Rights. The grading was tedious and time consuming, and took him hour after hour during what should have been a holiday. I started to wonder whether there could be a faster way.

Automatic computer grading could do exactly that, learning from previous answers and getting better as it goes — and it is already being used in some universities and for large online courses (MOOCs). It could grade bundles of student papers quickly, perhaps flagging those with unusual elements that need a bit of human oversight. Teachers would get time back to plan new lessons, give extra tutorials to students who are struggling, do extra reading, or simply get their holiday time back.

A public school teacher grading papers faster is a small example of the wide-ranging benefits that artificial intelligence could bring to the public sector. A.I could be used to make government agencies more efficient, to improve the job satisfaction of public servants, and to increase the quality of services offered. Talent and motivation are wasted doing routine tasks when they could be doing more creative ones.

Applications of artificial intelligence to the public sector are broad and growing, with early experiments taking place around the world. In addition to education, public servants are using AI to help them make welfare payments and immigration decisions, detect fraud, plan new infrastructure projects, answer citizen queries, adjudicate bail hearings, triage health care cases, and establish drone paths. The decisions we are making now will shape the impact of artificial intelligence on these and other government functions. Which tasks will be handed over to machines? And how should governments spend the labor time saved by artificial intelligence?

So far, the most promising applications of artificial intelligence use machine learning, in which a computer program learns and improves its own answers to a question by creating and iterating algorithms from a collection of data. This data is often in enormous quantities and from many sources, and a machine learning algorithm can find new connections among data that humans might not have expected. IBM's Watson, for example, is a treatment recommendation-bot, sometimes finding treatments that human doctors might not have considered or known about.

Machine learning program may be better, cheaper, faster, or more accurate than humans at tasks that involve lots of data, complicated calculations, or repetitive tasks with clear rules. Those in public service, and in many other big organizations, may recognize part of their job in that description. The very fact that government workers are often following a set of rules — a policy or set of procedures — already presents many opportunities for automation.

To be useful, a machine learning program does not need to be better than a human in every case. In my work, we expect that much of the "low hanging fruit" of government use of machine learning will be as a first line of analysis or decision-making. Human judgment will then be critical to interpret results, manage harder cases, or hear appeals.

When the work of public servants can be done in less time, a government might reduce its staff numbers, and return money saved to taxpayers — and I am sure that some governments will pursue that option. But it's not necessarily the one I would recommend. Governments could instead choose to invest in the quality of its services. They can re-employ workers' time towards more rewarding work that requires lateral thinking, empathy, and creativity — all things at which humans continue to outperform even the most sophisticated AI program.

Deciding who qualifies for unemployment benefits, for example, is an important task with major consequences. Machine learning applications might speed up decisions, either giving a clear answer or indicating which cases need a human to take over. Sometimes, a citizen's most valuable response from her government is a fast "yes" or "no." At other times, the question might be more complicated. Perhaps someone has been unemployed for several months, and wants a longer conversation that includes some coaching, advice, and encouragement. A human will do this far better than a computer, and it might also be the best part of a public servant's job: he gets to think about a new problem, and to truly help someone. On the other hand, asking a human to act like a computer, processing simple claims and hiding empathy or creativity, creates a tedious job for the government worker and a depressing experience for the citizen interacting with government.

Writing as a former government worker — and now a full-time consultant for governments — I am very familiar with the high proportion of government work that is mundane. Complicated processes that leave little room for new ideas turn enthusiastic new public servants into cynics (and encourage them to leave government work). This is bad for public servants, but more importantly, it is bad for government. Regular surveys of trust in government, including by the OECD and Edelman, show that trust in government is low, and falling. Increasing the space for government workers to use their more human skills — empathy, creativity, and lateral thinking — may help. Humans are much better at this kind of thinking (and feeling) than machines are, and it is often the meaningful connection, the good sense, and the understanding that citizens are seeking when they deal with their government.

If they are used well, artificial intelligence programs can make our government services faster and more tailored. The critical decision to be made by governments is how the time won by the best technology can be given back to citizens. At a time when many industries and jobs will change quickly, citizens may find that opportunities to have longer conversations with more engaged public servants may be much more important than a cheaper government.

With thanks to Richard Stirling and Antone Martinho-Truswell.

Editor's note: this article has been updated to clarify the role of IBM Watson in making treatment recommendations.

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Harvard Business Review

DATA

As AI Meets the Reputation Economy, We’re All Being Silently Judged

by Sophie Kleber

JANUARY 29, 2018

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In the *Black Mirror* episode Nosedive, the protagonist, Lacie, lives in a saccharine world of pleasantries in which every personal or business interaction is scored. Everything depends on the social score, and everyone is desperate to move up in the rankings. But the omnipresent rating game has one big catch: ranking up is incredibly hard, while ranking down is rapid and easy, like a free-fall.

Welcome to the reputation economy, where the individual social graph — the social data set about each person — determines one's value in society, access to services, and employability. In this economy, reputation becomes currency.

The reputation economy is based on the simplistic, but effective star ratings system. Anyone who's ever rated their Uber driver or Airbnb host has actively participated. But what happens when algorithms, rather than humans, determine an individual's reputation score based on multiple data sources and mathematical formulas, promising more accuracy and more flexibility via machine learning?

70% of U.S. companies currently use social media to screen employees. And many AI-enabled startups are competing in the HR assessment market, using AI to crawl potential candidates' social media accounts to filter out bad fits.

In 2012, Facebook applied for a patent that would use an algorithm to assess the credit ratings of friends, as a factor in one's eligibility to get a mortgage. And China is aiming to implement a national social score for every citizen by 2020, based on crime records, their social media, what they buy, and even the scores of their friends.

When AI starts determining an individual's social worth, the stakes are high. As Kim Darah writes in *The New Economy*: "Far from being neutral and all-knowing decision tools, complex algorithms are shaped by humans, who are, for all intents and purposes, imperfect." We must ask ourselves: How good is the data? How good is the math? How ready is society to be judged by AI? And what could possibly go wrong?

Bad data

Algorithms learn by extracting patterns from large historical data sets, and then applying those patterns to predict the future. When the data set is flawed, the prediction will be wrong.

In 2012, the state of Idaho cut Medicaid benefits for 4,000 people with developmental and intellectual disabilities by a whopping 20-30%. After the American Civil Liberties Union (ACLU) sued to get insights into the algorithm used to determine the cuts, they found that two thirds of the historical data had been corrupt, resulting in a predictive algorithm that was based on an still mildly flawed subset of one third of the existing data. Bad data led — amongst other things — to bad results.

The potential reputation economy data is equally flawed. 79% of online Americans use Facebook, but only 32% are on Instagram, and 24% are on Twitter. This variance in penetration of social networks makes triangulation of data from multiple networks possible for only a subset of users; it's an incomplete data set. Furthermore, fragmentation across communication channels makes weighing connections by true level of affiliation impossible.

But the bigger issue is the proven fact that one's digital presence is seldom reflective of one's true self. People post things they think will make them look good, and depending on affiliation and life stage, that can result in exaggeration — in any direction. This skew makes the use of social media data questionable in lots of cases.

Bad math

Algorithms don't have a conscience; they repeat what they learn. When algorithms repeat and perpetuate bias or opinion, we need to consider mathwashing.

Unintended mathwashing occurs when the algorithm is left unchecked, and, learning from historical data, amplifies social bias. The U.S. justice system uses an algorithm called COMPAS to determine a criminal's likelihood to re-offend. COMPAS has been proven by Pro Publica to predict that black defendants will have higher rates of recidivism than they actually do, while white defendants are predicted to have lower rates than they actually do.

Deliberate mathwashing occurs when the algorithm is tweaked in order to course correct or skew the bias. Facebook allegedly mathwashed when it routinely suppressed conservative news in 2016.

Unconscious bias is deeply ingrained in America's social fabric. Continuing to let algorithms perpetuate social bias would be irresponsible, and basing life-changing decisions on that information could slow progress toward true equality.

Unintended consequences on society

Social pressure is a powerful and subtle form of control. And when this social pressure is amplified by an obscure algorithm presumably watching every digital move, freedom of speech can be jeopardized. People may simply be afraid to speak out, for fear of the affect it might have on their ability to obtain employment, goods, or services. Such "social cooling" describes a culture of self-censorship, where people (voluntarily) adjust their behavior to conform to a social norm, out of fear that their digitally monitored behavior could affect their reputation.

Successful Uber drivers are practicing social cooling by adapting to fit a common expectation of service: As one Uber driver described in an interview with *The Verge*: "The servant anticipates needs, does them effortlessly, speaks when spoken to, and you don't even notice they're there."

Airbnb exhibits social cooling in its host/guest review system, where generic words of highest praise mirror the hosts' and guests' reluctance to judge or be judged.

Due to the abstract and obscure nature of machine learning, people feel they never know when they are being judged (How is the ecosystem connected?), or by whom (Who has access to the data?), or how (What's the algorithm?). This leads to risk aversion — which could suppress the expression of non-conformist ideas, and could kill creativity. Taken to the extreme, this creates a society where people are afraid to speak their minds.

Where do we go from here?

As we continue to awaken to our new digital reality, the reputation economy will become a reality for all of us. And opting out is not a viable option, when 57% of employers say that if they can't find a candidate online, they skip to the next. Our reputations will indeed become currency.

Lawmakers and civil rights groups alike are grappling with the question of how to regulate the use of algorithms, and how to maintain quality control over the formulas. Efforts like the EU's General Data Protection Regulation (GDPR) aim to put the user back in control of their own personal data.

Meanwhile, individuals will need to become vigilant about their personal data online. For many teens, online reputation management is a daily reality that they're well versed in. Their profiles are often private, regularly groomed, and highly curated. Their need for uncensored self-expression and the opportunity to make mistakes is — for now – outsourced to ephemeral platforms like SnapChat. As AI continues to infiltrate the reputation economy, discipline in how we interact and in how we judge online will be required of all of us.

If we expect to gain access to employment, goods, and services in the future, social platforms can no longer be a playground for the ego. Our online reputations will precede us all.

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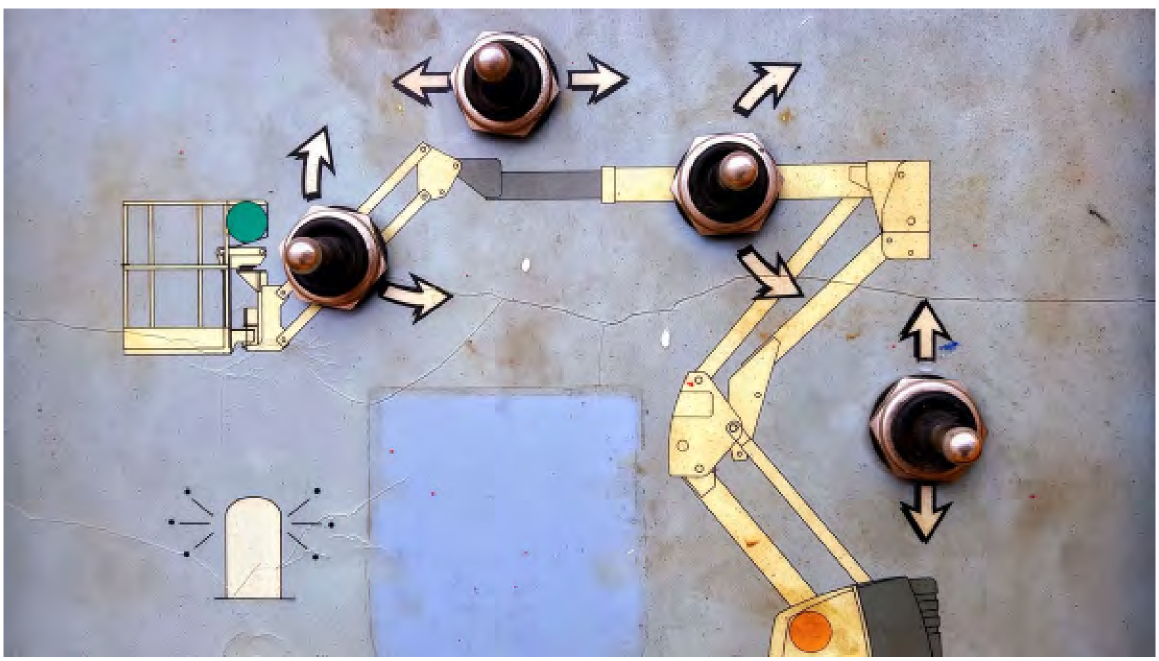
Harvard Business Review

TECHNOLOGY

What Changes When AI Is So Accessible That Everyone Can Use It?

by H. James Wilson and Paul Daugherty
JANUARY 30, 2018



Bernard Van Berg/EyeEm/Getty Images

Mazin Gilbert has an ambitious goal. As vice president of advanced technologies at AT&T, Gilbert wants to make AI technologies widely available throughout the corporation, especially to those who might not have a computer science background and may not even know how to program. Call it the "democratization of AI." To accomplish that goal, AT&T is building a user-friendly platform with point-and-click tools that will enable employees — up to one-quarter of the company's workforce — to build their own AI applications.

AT&T and a host of other companies are trying to address a crucial issue in business: the severe shortage of AI talent. According to some estimates, only about 10,000 programmers in the world have the necessary expertise to develop advanced AI algorithms. But that's barely a drop in the bucket for what companies will need in their future workforces. Tools like AT&T's platform will help spread AI technologies well beyond just a limited number of "haves" and reach the "have nots" that may lack the technical knowledge and experience.

This democratization of AI will happen in two ways. First, it will enable employees across a large organization like AT&T to develop their own AI applications to make them better at their jobs. But it will also allow smaller firms to deploy some of the same AI capabilities that have heretofore been limited to large corporations. Think of how spreadsheets like Lotus 1-2-3 and Excel helped democratize data analysis, enabling even mom-and-pop shops to perform invaluable "what-if" analyses.

Some Assembly Required

AT&T's in-house platform contains AI "widgets" that can be assembled together to create working applications. A marketer at AT&T might, for example, connect a widget for natural language processing together with other components to create an app for gathering and analyzing unstructured data from social media. In the future, AT&T says that it might begin offering the AI platform as a product to other companies.

Somewhat similar tools are already on the market. Consider DataRobot Inc., a Boston-based startup that has developed an automated machine learning platform that enables users to build predictive models that deploy various AI techniques. The firm has more than 100 customers in insurance, banking, and other industries. The product might be deployed, for example, to analyze a huge customer data set to predict which mortgage applicants are most likely to default. Farmers Insurance, for one, is using the DataRobot platform to uncover insights about customer behavior and to improve the design of the company's different products. Another similar vendor is Petuum, which offers a machine learning platform with a visual interface that enables people to build AI applications quickly without any coding. The company is now working on deploying that general platform to specific industries like manufacturing and health care. And at our company, Accenture, we've invested in developing Accenture Insights Platform, which can combine and simplify the tools from the major AI platforms. We've seen, firsthand, how democratization increases the capabilities and speed of our professionals using AI in developing business solutions.

AI in the Cloud

Meanwhile, high-tech giants Google and Microsoft have been busy adding AI to their cloud services. Initially, the tools were for relatively rudimentary tasks like image classification and voice recognition, but over time, the company will likely increase the technical sophistication of its offerings. In Google's AutoML project, the company is building a machine learning system that will be able to develop other machine learning applications. The goal, according to Jeff Dean and Fei-Fei Li, leading engineers at Google, is to open up the use of AI from thousands of companies to millions. For its part, Microsoft has released tools to help people build deep neural networks, which can be difficult to develop and train. "We are eliminating a lot of the heavy lifting," says Joseph Sirosh, a vice president at Microsoft. Salesforce, a leader in sales automation, has a similar goal. The company offers myEinstein, a suite of tools that enables customers to build their own chatbots and predictive marketing models without having to do any coding.

And even companies outside of the traditional high-tech industry are getting into the action. Uber, for one, is now offering Michelangelo, a platform that provides machine learning as a service. Included in the platform are the capabilities to manage data; to train, evaluate, and deploy AI predictive models; and to make and monitor predictions based on those models. According to the company, employees have been using Michelangelo in-house for more than a year now, with dozens of teams building and deploying models on the platform. One early success was Uber Eats, an application that predicts how long a takeout order will take, including the time needed to prepare the food (taking into account how busy a restaurant currently is as well as the complexity of the order) and the time required to deliver the meal (taking into account the route and traffic, among other factors). The company says it wants to make "scaling AI to meet the needs of business as easy as requesting a ride."

Uber's ambitious goal notwithstanding, it will take considerable advances in the field before AI can be offered to companies as a utility, similar to databases and software testing platforms. But what's clear is that the democratization of AI is under way, and the competitive advantage could soon be shifting from those companies with advanced in-house AI expertise to those firms with the most innovative worker ideas for utilizing that technology. Rather than displacing workers, AI is actually empowering nontechnical people to use AI to fill today's growing shortage of technical talent.

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Harvard Business Review

ECONOMY

The Question with AI Isn't Whether We'll Lose Our Jobs — It's How Much We'll Get Paid

by Lori G. Kletzer

JANUARY 31, 2018

anucha sirivisansuwan/Getty Images

The basic fact is that technology eliminates jobs, not work. It is the continuous obligation of economic policy to match increases in productive potential with increases in purchasing power and demand.

Otherwise the potential created by technical progress runs to waste in idle capacity, unemployment, and deprivation. —National Commission on Technology, Automation and Economic Progress, Technology and the American Economy, Volume 1, February 1966, pg. 9.

The fear that machines will replace human labor is a durable one in the public mind, from the time of the Luddites in the early 19th century. Yet most economists have viewed "the end of humans in jobs" as a groundless fear, inconsistent with the evidence. The standard view of technical change is that some jobs are displaced by the substitution of machines for labor, but that the fear of total displacement is misplaced because new jobs are created, largely due to the technology-fueled increase in productivity. Humans have always shifted away from work suitable for machines and to other jobs. This was true in the 1930s, when the shift was away from agriculture, through the 1990s and early 2000s, when the shift was largely out of manufacturing.

However, the expansion of what can be automated in recent years has raised the question: Is this time different?

It doesn't have to be. Yes, there are reasons for concern, both technical and political. Machines are now able to take on less-routine tasks, and this transition is occurring during an era in which many workers are already struggling. Nonetheless, with the right policies we can get the best of both worlds: automation without rampant unemployment.

Is This Time Different?

To date, automation has meant industrial robots and computer hardware and software designed to do predictable, routine, and codifiable tasks requiring physical strength and exertion, and the repetition of logical tasks, such as calculation. With robotics, artificial intelligence, and machine learning, what we call automation seems poised to take on a greater share of high-productivity jobs and a range of tasks that were previously the domain of humans. These are tasks requiring problem solving, decision making, and interaction within a less-than-fully-predictable environment. Automation of this sort includes self-driving cars and diagnosing disease.

Automation anxiety is made more acute by a labor market that has tilted against workers over the last 30 years, with increasing income inequality and stagnant real wages. Wage growth has not kept up with productivity growth; labor's share of GDP has fallen and capital's share has risen. The social contract established after World War II, where hard work and loyalty to the firm were met with rising wages, benefits, skills training, and economic security from firms no longer characterizes much of the American workplace. The "fissured workplace" — where firms focus on their core competencies and contract out everything else — results in low pay, few benefits, and job insecurity for workers. The share of workers in alternative work arrangements, as independent contractors, franchisees, and in the gig economy, is growing substantially, from 10.7% in 2005 to 15.8% in 2015. The old structures of the postwar labor market are not up to the task of the 21st-century wave of automation, particularly for the low- and middle-skill workers already disadvantaged by previous skill-biased technological change and globalization. While technology and globalization have spurred competition, efficiency, and dynamism, the gains have not been shared by all. The unequal distribution of the gains is not a technical destiny; it is the work of institutions, business, and governments.

Will Robots Take All the Jobs?

Currently, most automation involves routine, structured, predictable physical activities and the collection and processing of data. Generally, these tasks form the basis of occupations in manufacturing, professional and business services, food service, and retail trade. Looking ahead, these tasks will continue to have the highest potential for advanced automation. Currently, less than 5% of occupations are entirely automated, and about 60% of occupations have at least 30% of tasks that can be automated. Based on these estimates, there is considerable potential for the spread of advanced automation. What is less knowable is how many new jobs will be created by automation-related productivity growth and how humans and machines will work together.

It's likely that humans will continue to dominate machines in a variety of skills, including creativity, interpersonal relations, caring, emotional range and complexity, dexterity, mobility. Luckily, we know there will be ample opportunities in these jobs. The Bureau of Labor Statistics issues periodic occupational growth projections, and in its most recent report, for the time period 2016 to 2026, 11 of the top 25 fastest-growing occupations are health care–related, where human-dominant skills are essential. These occupations include home health aides, personal care aides, physician assistants, nurse practitioners, physical therapy assistants, and aides. Some of these occupations require a four-year degree and post-baccalaureate training (nurse practitioners, physician assistants), but some require on-the-job training and certification with a high school diploma (home health aides, personal care aides, physical therapy aides).

However, even though jobs where humans have absolute advantage may be narrowing, there is little reason to expect an end to human work. The reason stems from a classic idea in economics: comparative advantage.

Even in a world where robots have absolute advantage in everything — meaning robots can do everything more efficiently than humans can — robots will be deployed where they have the greatest *relative productivity advantage*. Humans, meanwhile, will work where they have the smallest disadvantage. If robots can produce 10 times as many automobiles per day as a team of humans, but only twice as many houses, it makes sense to have the robots specialize and focus full-time where they're *relatively* most efficient, in order to maximize output. Therefore, even though people are a bit worse than robots at building houses, that job still falls to humans.

That means that the relevant question is "Will the jobs where humans have comparative advantage pay well and have good working conditions?" As we know from displacement due to globalization and increasing international trade, there is nothing that guarantees that humans displaced from jobs will be reemployed in new jobs that pay as well as their old jobs, or even pay well enough to maintain middle-class status.

What We Can Do

Though there is still much we don't know about how this wave of automation will proceed, there are several areas of action we can identify now.

Education and training are at the top of the list. Human capital investment must be at the center of any strategy for producing skills that are complementary to technology. The current workforce — including the unemployed — needs opportunities for re-skilling and up-skilling, with businesses taking an active role both in determining the skills needed and in providing the skill training. Workers need opportunities for lifelong learning, and employers will be key. An extensive research literature documents the high returns to workers and firms from employer-based training. Workplace training helps bridge gaps between school learning and the application of these skills in the workplace and to specific occupations.

Schools will have to change too. Anticipating future skill needs and demands adds to the urgency of addressing the many challenges in K-12 and higher education, including achievement and opportunity gaps by race and socioeconomic status in K-12 schooling, and improving access, affordability, and success in post-secondary education. The education system must also do more to produce STEM workers and to ensure that workforce is diverse.

But education alone will not be sufficient. Policy makers should focus on cushioning the necessary transitions following job loss by strengthening the social safety net. In the U.S., this means strengthening unemployment insurance (ensuring benefit adequacy, including durations of eligibility), Medicaid, Supplemental Nutrition Assistance Program, and Transitional Assistance to Needy Families. A wage insurance program for all displaced workers will help encourage people to remain attached to the labor force.

In 1966 the final report of the National Commission on Technology, Automation and Economic Progress stated, "Constant displacement is the price of a dynamic economy. History suggests that it is a price worth paying. But the accompanying burdens and benefits should be distributed fairly, and this has not always been the case." The Commission recommended responses that manage the overall health of the economy (managing and strengthening aggregate demand), promote educational opportunity, provide public employment, and secure transitional income maintenance. Fifty years later, these areas remain the basic road map for public policy response. The solutions, and any obstacles, are political, not economic or technical.

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Harvard Business Review

ANALYTICS

You Don't Have to Be a Data Scientist to Fill This Must-Have Analytics Role

by Nicolaus Henke, Jordan Levine and Paul McInerney

FEBRUARY 05, 2018

Artur Debat/Getty Images

It's no secret that organizations have been increasingly turning to advanced analytics and artificial intelligence (AI) to improve decision making across business processes—from research and design to supply chain and risk management.

Along the way, there's been plenty of literature and executive hand-wringing over hiring and deploying ever-scarce data scientists to make this happen. Certainly, data scientists are required to build the analytics models—including machine learning and, increasingly, deep learning—capable of turning vast amounts of data into insights.

More recently, however, companies have widened their aperture, recognizing that success with AI and analytics requires not just data scientists but entire cross-functional, agile teams that include data engineers, data architects, data-visualization experts, and—perhaps most important—translators.

Why are translators so important? They help ensure that organizations achieve real impact from their analytics initiatives (which has the added benefit of keeping data scientists fulfilled and more likely to stay on, easing executives' stress over sourcing that talent).

What exactly is an analytics translator?

To understand more about what translators are, it's important to first understand what they aren't. Translators are neither data architects nor data engineers. They're not even necessarily dedicated analytics professionals, and they don't possess deep technical expertise in programming or modeling.

Instead, translators play a critical role in bridging the technical expertise of data engineers and data scientists with the operational expertise of marketing, supply chain, manufacturing, risk, and other frontline managers. In their role, translators help ensure that the deep insights generated through sophisticated analytics translate into impact at scale in an organization. By 2026, the McKinsey Global Institute estimates that demand for translators in the United States alone may reach two to four million.

What does a translator do?

At the outset of an analytics initiative, translators draw on their domain knowledge to help business leaders identify and prioritize their business problems, based on which will create the highest value when solved. These may be opportunities within a single line of business (e.g., improving product quality in manufacturing) or cross-organizational initiatives (e.g., reducing product delivery time).

Translators then tap into their working knowledge of AI and analytics to convey these business goals to the data professionals who will create the models and solutions. Finally, translators ensure that the solution produces insights that the business can interpret and execute on, and, ultimately, communicates the benefits of these insights to business users to drive adoption.

Given the diversity of potential use cases, translators may be part of the corporate strategy team, a functional center of excellence, or even a business unit assigned to execute analytics use cases.

What skills do translators need?

The wide range of responsibilities—leader, communicator, project manager, industry expert—inherent in the translator role makes the following skills essential:

Domain knowledge

Domain knowledge is by far the most important skill for any translator. Translators must be experts in both their industry and their company to effectively identify the value of AI and analytics in the business context. They must understand the key operational metrics of the business and their impact on profit and loss, revenue, customer retention, and so on. Additionally, knowledge of common use cases (e.g., predictive maintenance, supply chain management, inventory management, personalized marketing, churn prediction, etc.) in their domain is important.

The Analytics Translator Role

At each step of the analytics initiative, the translator has an important role to play:

Step 1. Identifying and prioritizing business use cases
Translator role: Works with business-unit leaders to identify and prioritize problems that analytics is suited to solve.

Step 2: Collecting and preparing data
Translator role: Helps identify the business data needed to produce the most useful insights.

Step 3: Building the analytics engine
Translator role: Ensures the solution solves the business problem in the most efficient and interpretable form for business users.

Step 4: Validating and deriving business implications
Translator role: Synthesizes complex analytics-derived insights into easy-to-understand, actionable recommendations that business users can easily extract and execute on.

Step 5: Implementing the solution and executing on insights
Translator role: Drives adoption among business users.

General technical fluency

In addition to their domain knowledge, translators must possess strong acumen in quantitative analytics and structured problem solving. They often have a formal STEM background, or self-taught knowledge in a STEM field. And while they don't necessarily need to be able to build quantitative models, they do need to know what types of models are available (e.g., deep learning vs. logistic regression) and to what business problems they can be applied. Translators must also be able to interpret model results and identify potential model errors, such as overfitting.

Project management skills

A mastery of project management skills is a must. Translators should be able to direct an analytics initiative from ideation through production and adoption and have an understanding of the life cycle of an analytics initiative and the common pitfalls.

An entrepreneurial spirit

In addition to these "teachable" skill sets, translators also should have an entrepreneurial mind-set. They need the enthusiasm, commitment, and business savvy to navigate the many technical, political, and organizational roadblocks that can emerge. This is often less teachable – or at least less straightforwardly so – and the availability of entrepreneurial individuals can depend in part on the organization's culture.

Where can organizations find translators?

Given the urgent need for translators, hiring externally might seem like the quickest fix. However, new hires lack the most important quality of a successful translator: deep company knowledge. As a result, training existing employees often proves to be the best option for filling the translator void.

Of course, this route presents its own challenges, considering there are currently no certifications or degrees for translators. In response, many companies have created their own translator academies. One global steel company, for example, is training 300 managers in a one-year learning program. At McKinsey, we've even created an academy in our own firm, training 1,000 translators in the past year.

Academy curricula frequently ranges from exploring the art of the possible to studying specific AI techniques and methods. Formats include both courses and immersion.

Some organizations train translators through apprenticeships in multifunctional, agile teams on real AI and analytics transformation projects. These companies often combine apprenticeship programs with an academy, designing deliberate learning journeys, typically a year in length, for each individual.

Who is currently responsible in your organization for connecting AI and analytics with business goals? In many organizations, data professionals and business leaders often struggle to articulate their needs in a language that the other can execute on.

Translators bring a unique skill set to help businesses increase the return on investment for their analytics initiatives. They're instrumental in identifying, from the myriad possible opportunities, which are the *right* opportunities to pursue, and they can help ensure that all participants, from data professionals to business executives, work in harmony to realize the promise these technologies offer.

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Harvard Business Review

COMPETITION

Are the Most Innovative Companies Just the Ones With the Most Data?

by Viktor Mayer-Schönberger and Thomas Ramge

FEBRUARY 07, 2018

viktor vasicsek/unsplash

Do you still use Yahoo? Do you still remember MySpace? Compaq? Kodak? The cases of startups with superior ideas dethroning well-established incumbents are legion. This is the beauty of "creative destruction" – the term coined by innovation prophet Joseph Schumpeter almost a century ago. Incumbents have to keep innovating, lest they be overtaken by a new, more creative competitor.

Arguably, at least in sectors shaped by technical change, entrepreneurial innovation has kept markets competitive far better than antitrust legislation ever could. For decades, creative destruction ensured competitive markets and a constant stream of new innovation. But what if that is no longer the case?

The trouble is that the source of innovation is shifting – from human ingenuity to data-driven machine-learning. Google's self-driving cars are getting better through the analysis of billions of data points collected as Google's self-driving cars roam the street. IBM Watson detects skin cancer as precisely as the average dermatologist because it has been training itself with hundreds of thousands of skin images. Siri and Alexa are getting better at understanding what we say because they never stop learning. Of course, it takes plenty of talented, creative people to build these products. But their improvement is driven less by a human "aha-moment" than by data and improvements in how machines learn from it.

Sometimes companies have to go out and collect a specific kind of data – think of Google's cars roaming the streets of Silicon Valley. And sometimes companies pay for access to data so that their systems can learn. But more often than not, the data that fuels innovation is being generated by users interacting with an existing digital service. When we accept Siri's suggestion, it's feedback to Siri that she got it right. And when we surf away from Amazon's product recommendation, it's another feedback signal that we weren't so happy. It's the same when a driver in a Tesla takes over from assisted driving, or when we accept (or don't accept) Google auto-completing our search query. This feedback data is incredibly valuable because it is the raw material feed into machine learning tools; it's the very resource that fuels data-driven innovation. And the more you have, the better you get. Take self-driving cars as an example. During 2016, self-driving cars by major international car manufacturers improved by roughly a third. That's a significant jump. But Google collected far more data per car to feed a more advanced machine learning system, and its cars improved by 400%– an amazing jump in innovation, and more than ten times as much as cars utilizing less data.

But if innovation is founded on data rather than human ideas, the firms that benefit are the ones that have access to the most data. Therefore, in many instances, innovation will no longer be a countervailing force to market concentration and scale. Instead, innovation will be a force that furthers them.

This would be a fundamental change to competition, and could cause market after market to become concentrated – as has already been happening in the U.S. If this happens, conventional antitrust measures won't be much help, because they restrain uncompetitive behavior – but large companies using their data to learn and innovate isn't illegal. In fact, they're acting perfectly efficiently, using the benefits of their scale to squeeze novel insights out of troves of data.

The specter of companies with access to data becoming data-driven innovation leaders, leaving smaller competitors and startups behind in the dust, should concern policymakers intent on ensuring that markets stay dynamic and competitive. Their challenge is less to realize the problem than to devise a solution that keeps markets competitive without stifling data-driven innovation on the whole.

Most business leaders, on the other hand, face a very different challenge in this world of data-driven innovation. To compete against digital champions, they will have to overcome not just scale and network effects but especially these new data-driven feedback effects. For many innovative companies, the next few years will be a time of reckoning: as the power of data-driven innovation increases, these more conventional innovators will have to find access to data to continue to innovate. That necessitates at least two huge adjustments. First, they need to reposition themselves in the data value chain to gain and secure data access. That's difficult if, for instance, all the data is captured upstream in the data value chain. Just ask suppliers in car manufacturing, or book publishers. Second, as innovation moves from human insight to data-driven machine learning, firms need to reorganize their internal innovation culture, emphasizing machine learning opportunities and putting in place data exploitation processes. This is hard because it often runs counter to an engineering culture that has long championed human ingenuity.

The adjustment will be so severe that numerous innovative firms will falter in the coming years, overtaken by more data-savvy competitors. And those that succeed will look very different than they do today. But firms wanting to stay innovative have no other choice. You may be doing well with your innovative company today, but as the source of innovation shifts, you will need to as well.

Viktor Mayer-Schönberger is professor at Oxford. His new book with Thomas Ramge, *Reinventing Capitalism in the Age of Big Data*, is being published by Basic Books in February.

Thomas Ramge is technology correspondent for brand eins and also writes for the Economist. His new book with Viktor Mayer-Schönberger, *Reinventing Capitalism in the Age of Big Data*, is being published by Basic Books in February.

WEBINAR SUMMARY

Artificial Intelligence for the Real World

PRESENTER:

Tom Davenport, President's Distinguished Professor of Information Technology and Management, Babson College

MODERATOR:

Gardiner Morse, Senior Editor, *Harvard Business Review*

Overview

Artificial intelligence (AI) and cognitive technologies have the potential to deliver real business value and companies are taking a variety of approaches to integrate AI into their operations, products, and services. Some firms are diving in, some are taking a more moderate approach, and others are carefully testing the waters. As organizations strive to develop greater proficiency with cognitive and AI technologies, Tom Davenport recommends a four-step framework based on understanding the technologies, identifying a project portfolio, launching pilots, and scaling up. Focusing on projects that capture "low-hanging fruit" is a proven way to generate meaningful benefits from AI.

Context

Davenport discussed what it means to be a cognitive company and offered advice on building cognitive capabilities.

Key Takeaways

Large companies report varying degrees of AI experience and capabilities.

Recent research projects have explored the use of AI and cognitive technologies by U.S. enterprises. The 2017 Deloitte State of Cognitive Survey gathered information from 250 "cognitive aware" senior managers in large companies. Tom Davenport's January-February 2018 HBR article, "Artificial Intelligence for the Real World," analyzed data from 152 consulting projects and 30 company interviews.

The companies in these studies fall into three segments, based on their AI experience and capabilities:

FAST LANE (42%)	SLOW LANE (34%)	WADERS (24%)
Experienced, expert users of cognitive and AI technologies.	Less experienced AI users which have invested less money in cognitive initiatives. Taking a more measured approach.	Least experienced with AI and cognitive technologies. Rely heavily on vendors.

AI is a constellation of technologies. Robotic process automation and statistical machine learning are the most commonly used.

More than half of survey respondents (59%) are using robotic process automation (RPA) and statistical machine learning (58%) to support AI initiatives. These are called "gateway" technologies for AI. RPA is a relatively inexpensive, entry-level technology that typically delivers a fast return on investment. Statistical machine learning is a seasoned technology in use for many years.

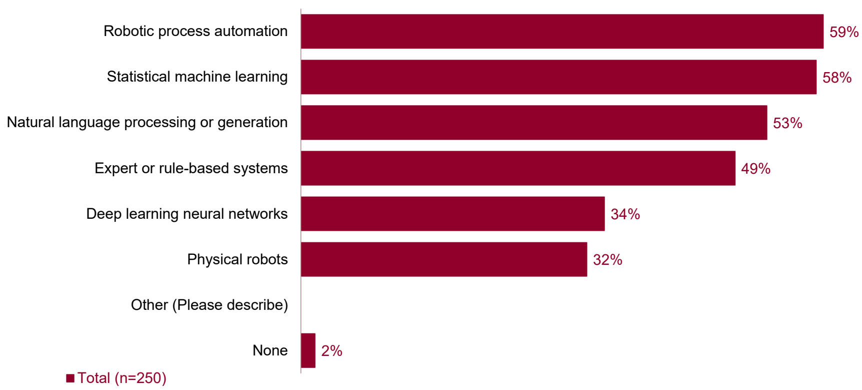


FIGURE 1: AI AND COGNITIVE TECHNOLOGIES

Cognitive technology projects focus on robotics and cognitive automation, cognitive insights, and cognitive engagement.

The 152 cognitive technology projects Davenport studied fell into three categories:

ROBOTICS & COGNITIVE AUTOMATION (71 projects)	COGNITIVE INSIGHTS (57 projects)	COGNITIVE ENGAGEMENT (24 projects)
Project focused on routine and data-intensive administrative tasks. Example: transferring data from email and call center speech to other systems.	Project gathered granular statistical insights and detected patterns from structured data. Example: identifying credit/claims fraud at banks and insurers in real time	Project focused on language or image-based interaction with customers or employees. Examples: virtual assistants for customer service, and internal HR or IT service sites for employee questions.

AI and cognitive technologies are delivering benefits to early adopters.

The benefits derived from AI vary based on the perspective and experience of the organization.

- **Most companies see AI as a business imperative.** Most survey respondents (92%) feel that cognitive technology is important for their internal business processes. More than three quarters (87%) believe it will play a significant role in improving their products and services, and looking ahead, 89% see cognitive technology playing a larger role in shaping company strategy.

  Among Fast Lane companies, 71% say AI will become “much more” important to their company’s strategy in the next three years. In comparison, only 31% of Slow Laners and 24% of Waders feel AI will play a much more important role in their company’s future strategy.

- **As the number of AI deployments increases in an organization, the benefits grow.** More than three quarters of respondents (83%) indicated they have already achieved moderate (53%) or substantial (30%) benefits from working with cognitive technologies.

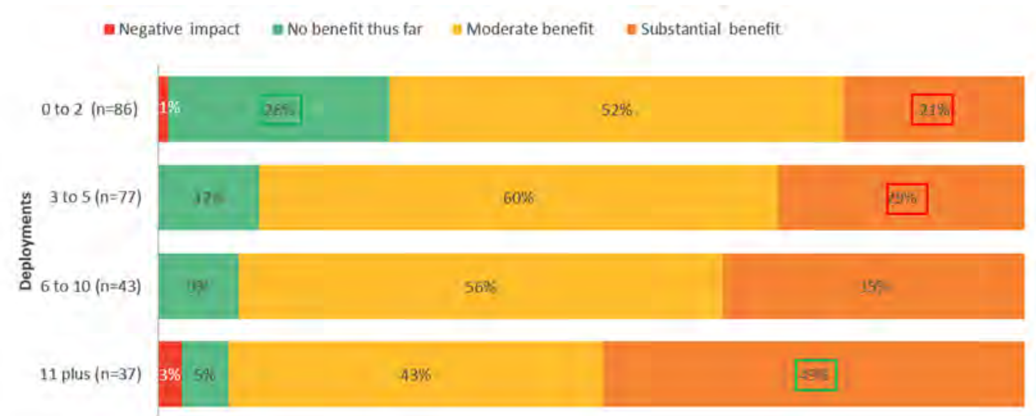


FIGURE 2: RETURNS FROM AI AND COGNITIVE TECHNOLOGIES

- **Organizations view AI as a way to improve products, decisions, and operations.** Driving the business forward is the key benefit of AI, rather than reducing labor. Fewer than one quarter of respondents (22%) suggested that the primary benefit of AI for their organizations was to reduce headcount through automation.

> “Although some benefits from cognitive and AI will be prosaic and invisible, I think we’ll see some interesting products and services develop as well.”
> —Tom Davenport

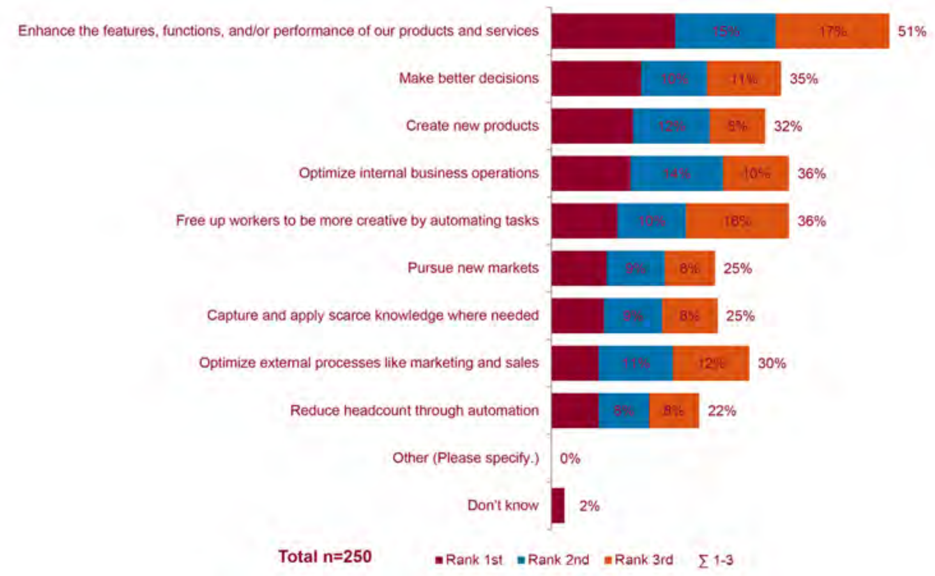


FIGURE 3: HOW COMPANIES ARE APPLYING AI

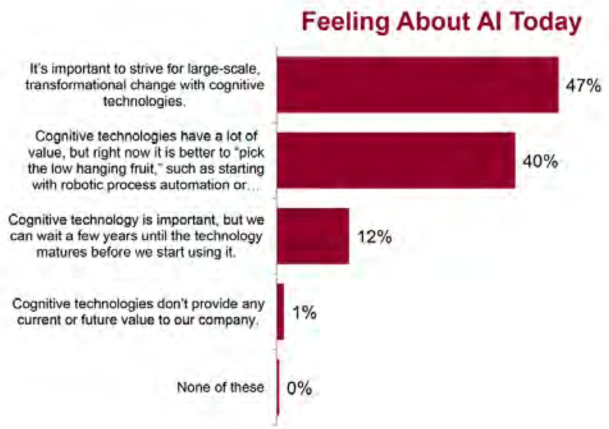
An incremental approach is lower risk than large-scale transformational change.

Organizations can take two different approaches to adopting cognitive technologies: large-scale, transformational changes (i.e. "moon shots"), or smaller-scale, incremental projects (i.e. "low-hanging fruit").

MD Anderson Cancer Center's experience with both types of projects suggests that organizations may derive greater benefits from low-hanging fruit initiatives. It started a highly ambitious "moon shot" project involving IBM Watson. The CEO-driven project had high media visibility and required $62 million in investment. Ultimately, no patients were treated and integration with the electronic health record system never occurred. The project was put on indefinite hold.

In contrast, MD Anderson Cancer Center also initiated "low-hanging fruit" projects using CognitiveScale technology to improve patient satisfaction, operational efficiency, and financial returns. These CIO-driven projects created a "care concierge" for patients' families, identified patients needing help with bills, and assisted staff with IT problems. As a result, the organization has increased patient satisfaction and improved the organization's financial position. MD Anderson Cancer Center has since established a Cognitive Center of Excellence and has many similar projects now under way.

Survey respondents had mixed feelings about whether to focus on moon shots or low-hanging fruit. Close to half (47%) thought it was important to strive for large-scale, transformational change, while 40% thought it was better to focus on low-hanging fruit. Perhaps not surprisingly, 62% of the respondents advocating for moon shot projects were from Fast Lane organizations.



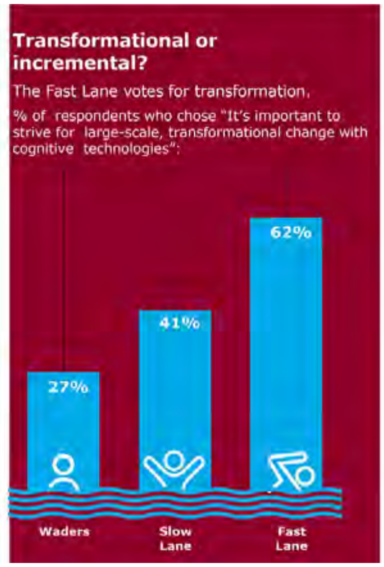


FIGURE 4: MOON SHOTS OR LOW-HANGING FRUIT?

Fast Lane, Slow Lane, and Wader companies pursue different AI strategies.

Strategies each segment is following are:

1. **Fast Lane.** These companies are most bullish on AI's potential. They spend the most on AI, launch the most pilots, and have the most deployments. Fast Lane companies often use open source tools and build AI themselves. They are more likely to pursue transformative projects than low-hanging fruit.

2. **Slow Lane.** These companies are moving cautiously. The majority (64%) have seen "moderate" benefits from AI and cognitive technologies. They are inclined to embrace "low-hanging fruit" projects.

3. **Waders.** These companies are just sticking a toe in the waters of AI and cognitive. They are heavily reliant on external vendors and more likely to use proven, "gateway" technologies like rule-based systems and robotic process automation.

AI is expected to produce some job losses, but companies are already retraining employees.

In the near future (three years from now), AI's major role is expected to be augmenting human workers. Over time, however, AI is expected to both displace workers due to automation and generate new jobs.

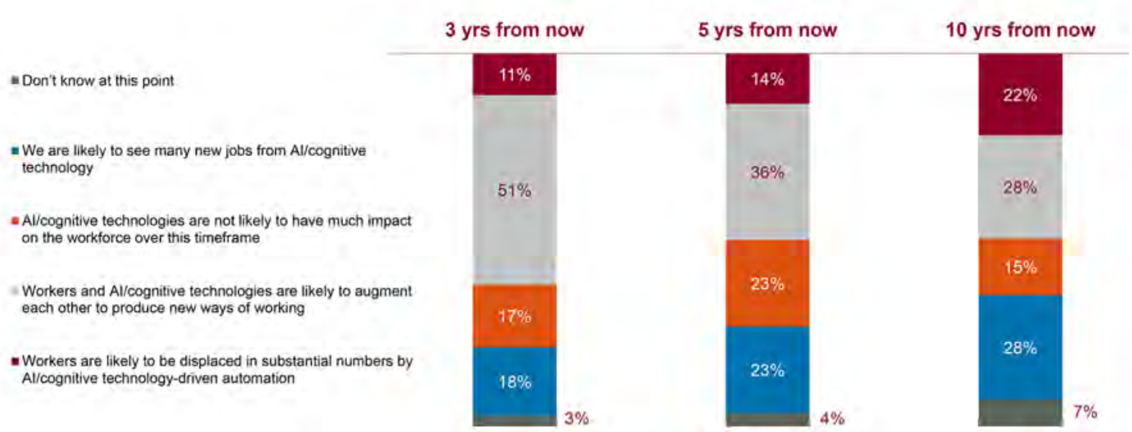


FIGURE 5: JOB LOSS OR JOB SHIFT?

In anticipation of these shifts, companies are retraining employees for new roles and skills related to AI and cognitive technologies. Close to two thirds of survey respondents (63%) already have programs under way and 32% plan to create programs.

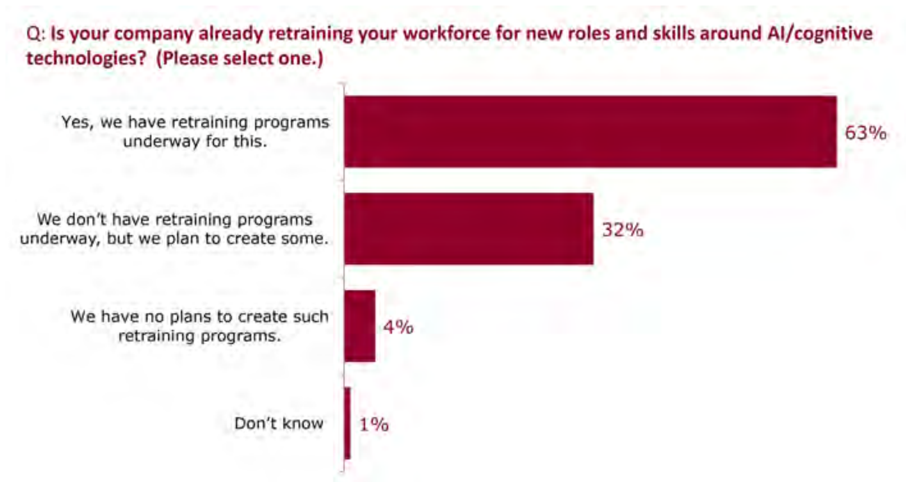


FIGURE 6: THE STATE OF EMPLOYEE RETRAINING

"Looking ahead, massive job losses are unlikely anytime soon. However, there will be lots of job changes and retraining."
—Tom Davenport

Major enterprise AI challenges include integration with existing processes and systems, as well as finding talent.

As organizations consider what capabilities to build in support of enterprise AI, it can be useful to review challenges companies face with these technologies.

- **Integration with existing processes and systems is difficult.** This could lead to the rebirth of business process reengineering. Integration issues are minimized when companies buy products from vendors that already have AI technology built in.

- **Technologies and expertise are too expensive.** This will likely change over time. Some companies are using free open source technologies, but AI experts are still rare and expensive.

- **Managers don't understand cognitive technologies and how they work.** Smart organizations are developing internal training to bring leaders up to speed on AI.

- **Companies can't hire enough people with cognitive expertise.** Finding data scientists with AI expertise will continue to be difficult. Although many analytics master's programs now exist, most don't have faculty members with experience to teach students deeply about cognitive technologies.

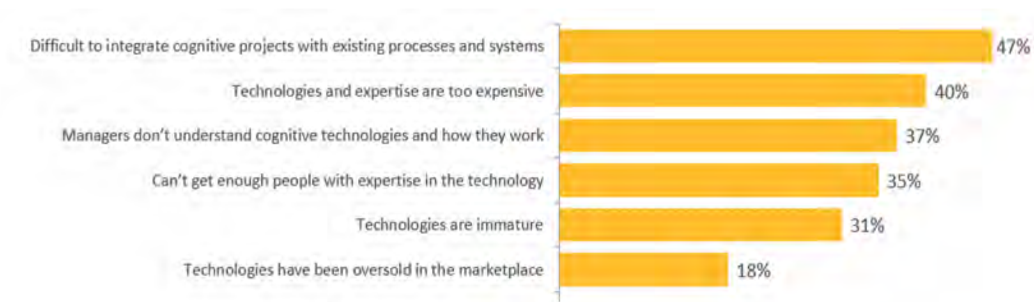


FIGURE 7: PRIMARY CHALLENGES WITH ENTERPRISE AI

More than half of survey respondents (58%) indicated that they use a mix of internal resources and consultants/vendors to implement AI projects. Davenport believes this is a smart approach, as it enables companies to build knowledge in-house while also tapping outside expertise. Fast Lane companies are more likely to use a mixture of inside and outside resources, or all internal resources, compared to Slow Lane and Wader counterparts.

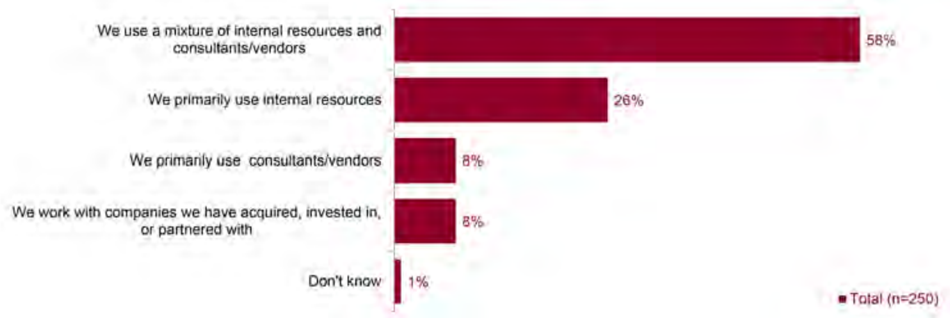


FIGURE 8: WORKING WITH VENDORS/CONSULTANTS

To become a cognitive company, organizations can benefit by following a clear framework.

By following Davenport's four-step framework, organizations can transform themselves into cognitive companies:

1. **Understand the technologies.** Executives must know what AI does, as well as its benefits and risks. Education may be needed to bring leaders up to speed.
2. **Identify a portfolio of projects.** This may include a mix of transformative moon shots and low-hanging fruit.
3. **Launch pilots.** Pilots allow organizations to try multiple technologies. Multiple small projects can collectively generate a large impact. Creating a Cognitive Center of Excellence is one way to support pilots.
4. **Scale up.** Scaling up requires change management. Integrating AI with existing processes and systems can be a challenge.

Other Important Point

- **Predictions for the future of enterprise AI.** Tom Davenport made several predictions for the future of enterprise AI. These include: the amount of investment and number of new projects will continue to grow, as will the financial benefits from these investments and projects. Some benefits will be invisible. Some projects, however, will result in interesting products and services. Massive job losses are unlikely anytime soon, but employees will face changes to their jobs, requiring retraining.

Tom Davenport is the President's Distinguished Professor of Information Technology and Management at Babson College, the co-founder of the International Institute for Analytics, a Fellow of the MIT Center for Digital Business, and a Senior Advisor to Deloitte Analytics. He teaches analytics and big data in executive programs at Babson, Harvard Business School, MIT Sloan School, and Boston University.

Gardiner Morse is a senior editor at *Harvard Business Review* where he focuses on marketing, innovation, and technology. He has developed articles on a wide range of topics including marketing technologies, data privacy, health care management, and smart products strategy. Before coming to HBR, Morse served for 15 years in a range of editorial and business roles with the publishers of the *New England Journal of Medicine*. There he developed and launched numerous publications for physicians and the general public, and served as executive editor of *Hippocrates*, a journal for primary care physicians.

WEBINAR SUMMARY

Is Your Company Ready for Artificial Intelligence?

PRESENTER:

Nick Harrison, senior partner, Oliver Wyman

Deborah O'Neill, partner, Oliver Wyman Labs

MODERATOR:

Angelia Herrin, editor, Special Projects and Research, *Harvard Business Review*

Overview

Companies are rushing to invest in and pursue initiatives that use artificial intelligence (AI). Some hope to find opportunity to transform their business processes and gain competitive advantage and others are concerned about falling behind the technology curve. But the reality is that many AI initiatives don't work as planned, largely because companies are not ready for AI.

However, it is possible to leverage AI to create real business value. The key to AI success is ensuring the organization is ready by having the basics in place, particularly structured analytics and automation. Other elements of AI readiness include executive engagement and support, data excellence, organizational capabilities, and completion of AI pilots.

Context

Nick Harrison and Deborah O'Neill discussed why some AI initiatives fail while others succeed. They explained what organizations must do to ensure AI success.

Key Takeaways

There is tremendous AI hype and investment.

Artificial intelligence is software that can make decisions without explicit instructions for each scenario, including an ability to learn and improve over time. The term "machine learning" is often used interchangeably with AI, but machine learning is just one approach to AI, though it is currently the approach generating the most attention. Today in most business situations where AI is relevant, machine learning is likely to be employed.

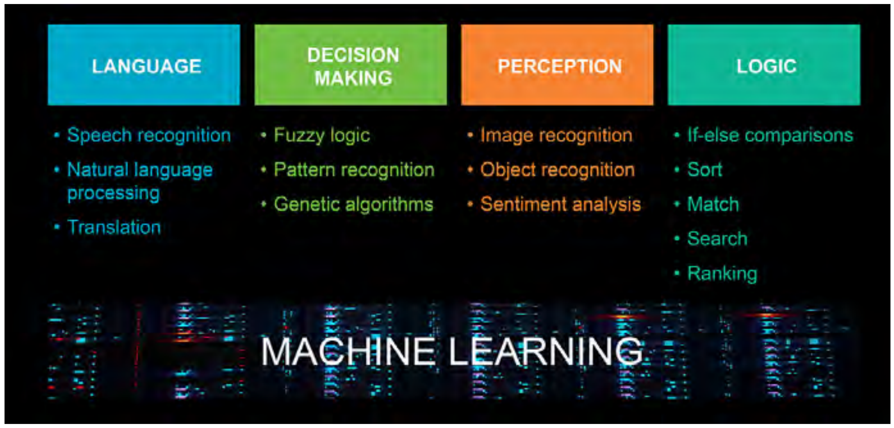


FIGURE 1: MACHINE LEARNING – A TYPE OF AI

The hype around AI is tremendous and has accelerated in the last few years. It is rare to read a business-related article these days that doesn't mention AI.

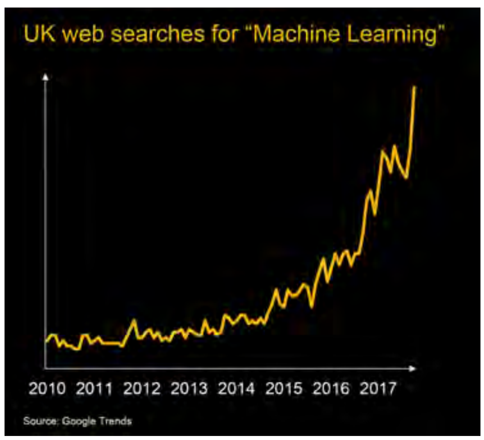


FIGURE 2: AI HYPE

The AI hype is being accompanied by massive investments from corporations (like Amazon, Google, and Uber), as well as from venture capital firms.

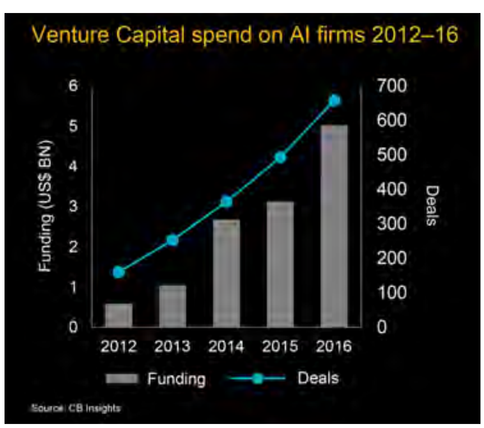


FIGURE 3: VENTURE CAPITAL INVESTED IN AI

Because organizations often pursue AI without fully understanding it or having the basics in place, many AI initiatives fail.

The AI fervor is causing companies to hurriedly pursue AI. There is a rush to capitalize on AI, but significant frustration when it comes to actually delivering AI success. AI initiatives are often pursued for the wrong reasons and many AI initiatives experience pitfalls.

> "Companies rush to capitalize on AI because of boardroom pressure. They want to keep up with the competition, or feel like they should be doing something in that space, but they come to a point where they have huge frustration."
> —Deborah O'Neill

Some key pitfalls are:

- Expensive partnerships between large companies and startups without results.
- Impenetrable black box systems.
- Open source toolkits without programmers to code.

The root cause for these failures often boils down to companies confusing three different topics: automation, structured analytics, and artificial intelligence.

AUTOMATION	STRUCTURED ANALYTICS	AI
• Replicates process actions • Performs actions taken by humans • Capable of executing multi-step processes Best for: Repetitive, rules-based tasks relying on structured data	• Provides comprehensive historical view on data and performance • Serves as a foundation for decision support upgrade • Applied to various functions in organizations Best for: Decision support capabilities upgrade for better decisions	• Combines smart data & smart algorithms • Decision making based on machine learning & synthesis of large datasets • Bots interact, exchange information, and take actions Best for: Language interaction, processing and dealing with high amounts of unstructured data

TABLE 1: DIFFERENCES BETWEEN AUTOMATION, STRUCTURED ANALYTICS, AND AI

Despite the challenges, some organizations are experiencing success with AI.

While the hype around AI is overblown, there are organizations having success by leveraging AI to create business value, particularly when AI is used for customer support and in the back office.

USE	EXAMPLES
Personal assistants	Apple Siri, Amazon Alexa, Google Assistant
Self-driving cars	Google Waymo, Uber ATC, GM Cruise Automation
Online customer support chatbots	KLM Messenger, TDAmeritrade Ted, H&M Kik
Purchase predications and recommendation	Amazon Recommendations, Netflix, Spotif , Pandora
Financial analysis	America Express Fraud Detector, Wealthfront Investments, JP Morgan COIN
Front-line sales support	Einstein AI Cloud platform from Salesforce.com

TABLE 2: AI CREATES VALUE IN CONSUMER SUPPORT AND THE BACK OFFICE

> "Companies are driving value for consumers and savings in back office functions"
> —Deborah O'Neill

The key to AI success is first having the basics in place.

In assessing AI successes and failures, the presenters drew three conclusions:

1. There is a huge benefit from first getting the basics right: automation and structured analytics are prerequisites to AI.
2. The benefits from AI are greater once these basics have been done right.
3. Organizations are capable of working with AI at scale only when the basics have been done at scale.

> "AI is the icing on the cake, which is not much use without the cake itself."
> —Nick Harrison

GETTING THE BASICS RIGHT

The most important basics for AI are automation and structured analytics.

- **Automation:** In most businesses there are many examples of data processes that can be automated. In many of these examples, there is no point having advanced AI if the basics are not yet automated.
- **Structured analytics** means applying standard statistical techniques to well-structured data. In most companies there is huge value in getting automation and structured analytics right before getting to more complicated AI.

"If your company is not good at analytics, it is not ready for AI."
—Nick Harrison

Examples of how businesses use structured analytics and automation include:

- **Competitor price checking.** A retailer created real-time pricing intelligence by automatically scraping prices from competitors' websites.
- **Small business cash flow lending product.** Recognizing the need for small business customers to acquire loans in days, not weeks, a bank created an online lending product built on structured analytics.

BENEFITS WHEN THE BASICS ARE IN PLACE

Once the basics of structured analytics and automation are in place, organizations see more value from AI—when AI is used in specific situations.

AI IS GOOD FOR...	AI IS NOT GOOD FOR...
• Unstructured datasets	• Understanding the "why"; getting intuitive explanations
• Automatic classificatio	• Situations where there are many external factors involved
• Many data sources and dynamic systems	
• Forecasting and prediction	

TABLE 3: WHEN TO USE AI

Examples of how adding AI on top of the basics helps improve business results are:

- **New product assortment decisions.** Adding AI on top of structured analytics allowed a retailer to predict the performance of new products for which there was no historic data. With this information, the retailer was able to decide whether or not to add the product to the stores.

FIGURE 4: ADDING AI HELPS PREDICT THE PERFORMANCE OF NEW PRODUCTS

- **Promotions forecasting.** A retailer was able to improve forecasting of promotional sales using AI. Within two months of implementation, machine learning was better than the old forecasts plus the corrections made by the human forecasting team.
- **Customer churn predictions.** A telephone company used AI and structured analytics to identify how to keep at-risk customers from leaving.
- **Defect detection.** An aerospace manufacturer used AI to supplement human inspection and improve defect detection.

AI AT SCALE AFTER THE BASICS ARE AT SCALE

Once an organization proves it can work with automation and structured analytics at scale, it is ready for AI at scale. Readiness for AI at scale goes beyond completing a few AI pilots in defined but isolated areas of capability; the basics need to be in use across the business.

> "Learning how to do basic analytics at scale is the best training for doing complex analytics at scale."
> —Nick Harrison

Before undertaking AI, organizations need to assess their AI readiness.

To be successful, organizations need to be ready for AI. Readiness consists of multiple elements, including executive engagement and support, data excellence, organizational capabilities, and an analytical orientation. Organizations often struggle with data excellence and organizational capabilities.

> "The whole organization has to believe that this agility and development of new analytics is the way to go."
> —Deborah O'Neill

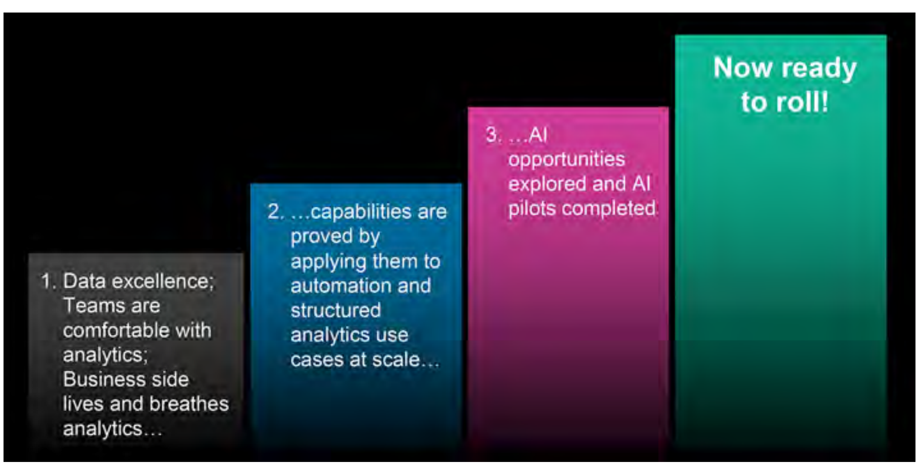


FIGURE 5: ARE YOU READY FOR AI?

HOW ORGANIZATIONAL READINESS FOR AI LOOKS.
• Senior engagement and leadership on the value of analytics
• Data excellence, and data valued as an asset
• Data science/analyst teams in place and connected with the business side
• Basic data processes have been automated
• Business decisions increasingly led by analytical insights; structured analytics are driving value
• Comfort with agile decision support systems: "Agility not Stability"
• Strong feedback loop from business outcomes back to analytics and data team
• Clear measurement of the value driven by analytics

TABLE 4: HOW ORGANIZATIONAL READINESS FOR AI LOOKS.

Nick Harrison is a senior partner with Oliver Wyman and co-leads the Retail Practice globally. He focuses on transformation and growth and has led large projects in many retail clients, including in turnaround, profit improvement, and strategic growth situations. Nick also has experience in other industry sectors including retail financial services, travel & leisure, telecommunications.

Nick works across EMEA and the US. He holds an MA and a PhD in Physics from Cambridge University.

Deborah O'Neill is a partner within Oliver Wyman Labs focusing on financial services. During her time at Oliver Wyman, she has worked for a range of clients around the globe to deliver change and impact within retail and investment banks. Deborah's particular interests lie in the areas of insight and reporting, risk management, and customer centricity.

Prior to her role in OW Labs, Deborah worked in Oliver Wyman's Finance and Risk Practice, where she contributed to a number of high-profile programs with central banks in Europe and further afield.

Deborah holds a BSc in physics from Imperial College London.

Angelia Herrin is the editor for special projects and research at *Harvard Business Review*. Her journalism experience spans 25 years, primarily with Knight-Ridder newspapers and *USA TODAY*, where she was the Washington editor. She won the Knight Fellowship in Professional Journalism at Stanford University in 1990. She has taught journalism at the University of Maryland and Harvard University. Prior to coming to HBR, Angelia was the vice president for content at womenConnect.com, a website focused on women business owners and executives.

WEBINAR SUMMARY

How AI Could Boost Your Top and Bottom Line

PRESENTER:
Michael Chui, partner, McKinsey Global Institute
Brian McCarthy, partner, McKinsey & Company

MODERATOR:
Angelia Herrin, editor, Special Projects and Research, *Harvard Business Review*

Overview

The buzz about artificial intelligence is widespread. Although AI investments are growing, many organizations remain uncertain about how to profitably deploy this technology. McKinsey recently conducted worldwide research with executives about leveraging AI and turning it into a competitive advantage. This work revealed that broad leadership support is required for AI transformation. Other keys to success include partnerships for capability and capacity, joint business and technical leadership of AI initiatives, and a focus on last-mile adoption. Purposeful investments combined with portfolio strategies drive higher profits.

Context

Michael Chui and Brian McCarthy discussed the value of AI to organizations, as well as best practices for successful deployment of AI.

Key Takeaways

While AI is still early, it can significantly affect organizations' top and bottom lines.

AI refers to machines' ability to perform cognitive tasks. AI investments are growing, but McKinsey's research found that most companies are still early in adoption. To date, a small percentage of companies have deployed AI in a core business process or at scale, and most AI projects have been undertaken by technology giants. Over half of AI investments (60%) are in advanced machine learning capabilities. Although AI is in the early stages of adoption, the potential to affect organizations' top and bottom lines is great.

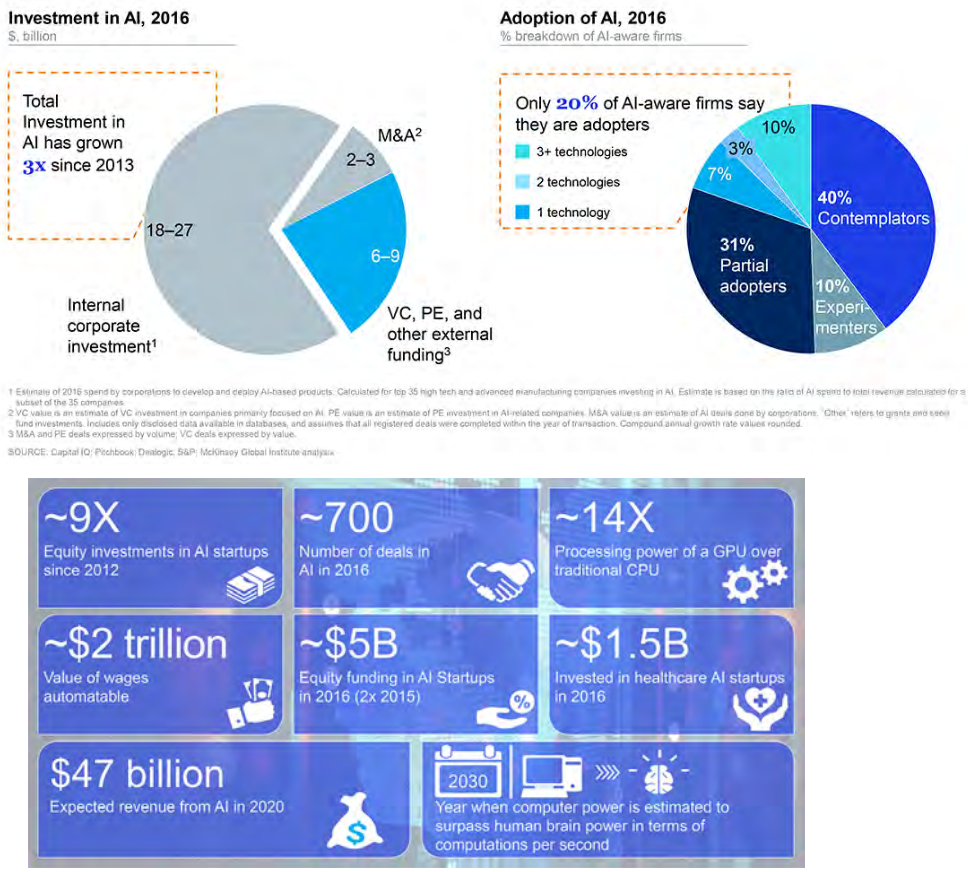


FIGURE 1: AI INVESTMENT, ADOPTION, AND OPPORTUNITY

Successful AI transformations require senior support, a commitment to change, and tech expertise.

Best practices associated with AI transformations include:

- **C-level buy-in.** Companies that successfully adopt AI have alignment at the top and commit significant resources. A pitfall is "tacit approval delusion" where AI projects are started because people agree it's the right thing to do, but the transformation is sidelined or "pocket vetoed."
- **AI is part of the DNA.** Early adopters feel AI is part of the organization's cultural fabric. They recognize that AI will fundamentally change the organization.
- **A data-driven mindset and technical expertise.** A data-driven mindset is necessary but not sufficient. It's hard to leapfrog to AI without technical skills to support implementation.

"When it comes to AI, you need to move along the maturity curve. It's hard to take shortcuts and leapfrog straight to AI unless you have technical expertise and data-driven processes."
—Michael Chui

Culture change is necessary for AI adoption.

Culture change, change management, communication, experimentation, and proper incentives are all critical elements of driving organization-wide AI adoption:

- **Different decisions require different change management approaches.** Strategic decisions are usually made at the C-level. AI can support facilitated decision making and champion/challenger models. Operational and tactical decisions are made by hundreds or thousands of people throughout an organization. AI can help people through tools like recommendation engines. To create value, organizations must leverage both the power of the machine and workers' experiences.

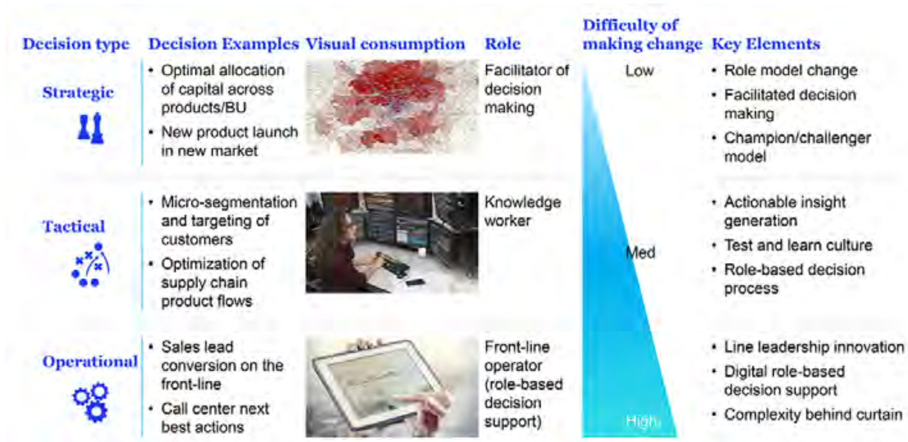


FIGURE 2: AI AND ORGANIZATIONAL DECISION MAKING

- **Communication is a key.** It is important to increase knowledge and understanding about AI, as well as promote a vision that shows where things are going.

- **Experience and experimentation with AI can accelerate cultural change.** Work is often needed to increase employee trust in AI. As people see that machines support better decisions and outcomes, they develop trust.

- **Employee performance metrics and incentives may need to change.** In retail banking, for example, manager promotions are often based on customer knowledge and intuition. At one company, employees resisted a machine that provided better customer targeting for cross-sell and upsell opportunities. In response, McKinsey recommended a "WIIFM" (what's in it for me?) approach that showed how machine information could be combined with branch manager knowledge to improve revenue, profitability, and customer experiences.

Scaling AI means leveraging a broader ecosystem.

Scaling AI is a company-wide transformation. Even if an organization plans to outsource or acquire some capabilities, it must develop enough organic capabilities to be a savvy client. Creation of ecosystems is important to help organizations scale AI. Modern ecosystems leverage cloud capabilities and APIs, and often involve "coopetition" (cooperation with potential competitors).

Collaboration opportunities exist at the intersection of industries. For example, a bank, a telco, and a retailer might come together to share data to get a better view of consumers.

> "From the coopetition perspective, we're seeing ecosystems emerge with interesting collaboration opportunities at the intersection of industries. We think this will continue to happen."
> —Brian McCarthy

Collaborative teams and a portfolio approach help firms derive value from AI.
As companies pursue AI, they must assemble teams with diverse skills. It is essential to have co-leadership from a business and technical perspective, as well as data scientists who mediate between analytics and the technology.

A best practice is assembling collaborative teams. Teams may be composed of five to seven people with different skills working on a common problem and developing solutions in an agile fashion. Agile teams help organizations go fast with AI.

To maximize value, a portfolio approach is helpful. The most successful companies develop a comprehensive view of AI opportunities. They then map AI opportunities against the size of the reward and the timeframe to achieve value. Observations about successfully investing in AI are:

- **A portfolio approach enables multiple purposeful investments.** Investments may be divided into short-term quick wins, medium-term high-value technologies, and long-term game-changing technologies. In many cases, AI extends existing analytic use cases to another level.

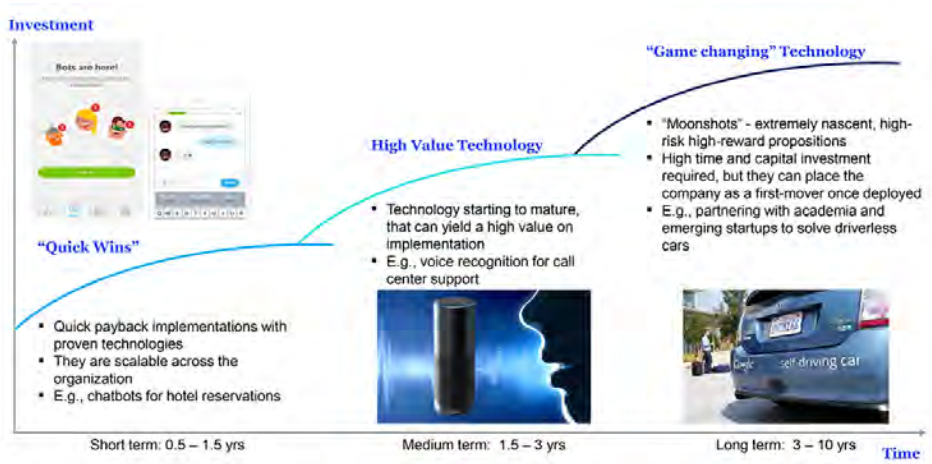


FIGURE 3: A PORTFOLIO-BASED APPROACH TO AI ADOPTION

- **Identify use cases where the organization is trying to drive value.** Once the use cases are clear, the organization can determine the best fit-for-purpose technologies for each. No single technology will support all use cases. Firms will experiment with different "plug and play" technologies over time. A robust underlying data architecture is essential.

- **AI technologies are increasingly accessible to companies of all sizes.** Many machine learning technologies are open source and available through the cloud. If companies have the right talent and access to data, AI technologies are deployable even for small firms.

To get quick wins with AI, organizations must pilot with a view to scale.

Many companies suffer from “pilot-itis”—they conduct successful AI pilots but never scale. It is important to pilot not to prove that AI projects are technically possible, but with a view to scale. Successful pilots meet four criteria:

1. They focus on areas of value.
2. They are feasible to execute.
3. The organization has data of reasonable quality.
4. There is support and sponsorship within the business.

Piloting to scale helps teams learn about the operating model. Key questions include how adoption can be increased across the company, which roles are affected by the pilot, and how those roles will need to change. Pilots can address organizational resistance.

Companies with higher levels of digitization are better positioned to capture value from AI.

McKinsey’s research revealed that certain industries, such as high tech, telecom, automotive and assembly, and financial services, are taking the lead with AI. These industries have a foundation of data and are digitizing processes. A correlation exists between organizations’ ability to capture value from AI and the degree to which the enterprise is digitized.

AI early adopters are driving significant performance improvements. As they see success, they increase their AI investments. These companies continue to push the envelope in terms of where they can apply AI in their business models.

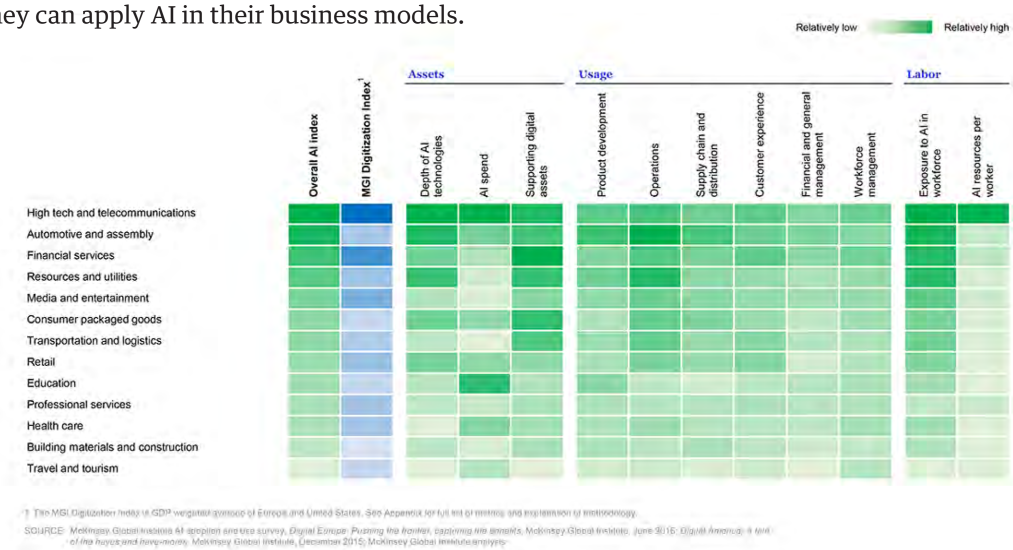


FIGURE 4: AI ADOPTION AND DIGITIZATION

To support AI, companies must develop a clear talent strategy.
As companies develop AI plans, they must decide whether to build talent from within, recruit or buy talent from outside the organization, or partner. AI talent strategies will vary by company and by strategy. To access the best AI talent, organizations often locate near tech centers or universities.

Many forward-thinking companies are developing programs so employees can get up to speed on AI. Some firms only permit leaders to reach certain levels if they demonstrate analytical acumen.

Other Important Points

- **AI and cyber risk.** While cyber risk is a concern in implementing AI initiatives, it is not a reason to go slow. In fact, machine learning and natural language processing can identify cyberattacks.
- **Retail and supply chain trends.** Many online retailers are deploying AI for "next product to buy" and personalized marketing. In supply chains, forecasting has become more micro and targeted with AI—down to the SKU level for location replenishment.

Michael Chui is a partner at the McKinsey Global Institute (MGI), McKinsey's business and economics research arm. He leads research on the impact of disruptive technologies and innovation on business, the economy, and society. Michael has led McKinsey research in such areas as data & analytics, social & collaboration technologies, the Internet of Things, and artificial intelligence, robotics & automation. Michael is a frequent speaker at major global conferences, and his research has been cited in leading publications around the world.

As a McKinsey consultant, Michael served clients in the high-tech, media, and telecom industries on strategy, innovation and product development, IT, sales and marketing, M&A, and organization. He is also a member of the board of Asia Society Northern California.

Prior to joining McKinsey, Michael served as the first chief information officer of the city of Bloomington, Indiana. Before that, Michael was founder and executive director of HoosierNet, Inc., a nonprofit cooperative Internet service provider.

Brian McCarthy is a thought leader and seasoned consultant, with more than 20 years' experience leading insight-driven enterprise transformations. He has worked with executives across the banking, insurance, retail, consumer goods, and telecommunications sectors to deploy sophisticated analytics to inform strategic decisions.

As an advisor to executives, Brian helps define a compelling vision for analytics transformation and then leads the resulting change journey. He leads the knowledge development agenda for McKinsey Analytics.

Brian closely tracks innovations at the intersection of advanced analytics, artificial intelligence, machine learning, design thinking, and behavioral decision making. A frequent speaker at industry events, he has numerous publications and holds two patents.

Before joining McKinsey in 2017, Brian worked at Accenture, where he held several leadership roles and launched Accenture Analytics in 2009.

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The recent McKinsey report which found that broad leadership support is essential for AI transformation to be successful is right on target. Time and time again, technological advances seem to only take root and become transformative when they create value by solving business problems or realizing opportunities, and AI is no different.

With all the hype surrounding AI, figuring out how AI can be applied in practical and reliable solutions can be challenging. The key is to focus on ensuring that the strategy around it feeds into your larger business strategy, always taking into account the convergence of people, process and technology.

People. First and foremost, humans are the most important resource an organization has. You must invest in data scientists who have skills focused around machine learning to build your applications; systems engineers who ensure the appropriate infrastructure is in place to support those applications; solution architects who oversee enterprise implementation; and business advisers who understand unique factors within the data and the business value that will be derived from the application.

Process. Consider what organizational (and possibly cultural) changes will have to be made within your business. There must be cohesion between developers and IT to ensure that models are able to be put into production in a timely manner. There are expectations within both groups that must be clearly defined and agreed upon. A great deep learning model has no value if it cannot be put into production. And, you need lots of rich data. You must identify what data you want to analyze, what factors must be captured in your data collection and the method you will use to bring that data into your AI system. Make sure that users understand the expectations of working with output from the AI applications, and create a simple process for capturing input so the solution can be tailored for more accuracy and increased relevance to meet each business need. Technology. Finally, technology can seem the simplest part of a strategy only because barriers to adoption and implementation often sit within people and processes. Our view is that a single analytics platform that enables the full lifecycle from data to discovery and deployment offers the most advantages. And ongoing innovation and value creation from AI deployments are maximized when they are part of a trusted, scalable and flexible data and analytics ecosystem.

Advances in machine learning have allowed us to create computers that can see, hear and speak to us in a very human way. Indeed, computers can learn, understand and make assessments about the world based on information we provide to them. But we have evolved beyond telling these machines what to do with our data. Now, machines can learn from patterns and anomalies they find in data on their own – in essence fulfilling the promise of AI. A computer's strength comes from its ability to reliably, efficiently and accurately analyze large volumes of data without fatigue. Yet it still requires humans to take those insights and determine what role they will play in a larger strategy that accomplishes our identified objectives.

And that's precisely how AI could boost your top and bottom line — by pairing the respective strengths of machines and the humans that run them to solve real business problems and realize the opportunities before us.

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