Shifting toward Enterprise-grade AI

Resolving data and skills gaps to realize value

IBM Institute for Business Value

Executive Report

Artificial intelligence

In this report

Top-five business functions where AI is expected to drive value

How executives' views on AI have evolved in the past two years

Real-world examples of enterprise-grade AI initiatives

How IBM can help

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Achieving competitive advantage with AI

Artificial intelligence (AI) is moving beyond the hype cycle, as more and more organizations seek to adopt AI-related technologies. These organizations are focusing on prioritizing functional areas and use cases, placing a stronger emphasis on topline growth, taking up a renewed interest in their data infrastructure and articulating greater unease about the skills of their knowledge workers. This report explores how they are approaching strategic imperatives, defining value drivers, building foundational capabilities and improving access to talent—as well as how their efforts could drive exponential competitive advantage.

Introduction

AI capabilities are rapidly maturing. And so, too, is enterprise adoption. More executives than ever before are actively conceiving where and how to leverage AI. But executives are also more discriminating about their organizational priorities for AI and how these leading-edge technologies are rolled out.

While CEOs were experimenting broadly with AI across their organizations in 2016, they are now highly focused on five priority areas.[1] In 2016, executives deemed customer satisfaction and retention as value drivers for their AI investments – now that focus on customer and other growth metrics is even deeper. And while technology availability was the leading concern for most executives in 2016, now it's all about how they can best cultivate AI skills and use data most effectively.[2]

So what do these changes mean? Moving from experimentation to implementation is not straightforward, and many companies are struggling with the transition. However, some businesses are achieving AI at scale successfully – and they are disproportionately financial outperformers. Confronting data issues and bridging the AI skills gap are critical to scaling AI and realizing value in the enterprise.

Defining artificial intelligence and cognitive computing

For the purposes of this report, cognitive computing was defined for respondents as systems that understand, reason, learn and interact by continually building knowledge, understanding natural language, and reasoning and interacting more naturally with human beings than traditional programmable systems. AI systems have some, but not necessarily all, of the characteristics of cognitive systems (for example, speech, pattern recognition, decision making and learning by experience).

5 distinct functional priorities indicate a sharper focus for AI

Top 3 AI value drivers for outperformers are customer oriented

86% of outperformers now have enterprise-wide data governance

63% of respondents see skills as the top barrier to AI success in 2018

In 2018, we partnered with Oxford Economics to once again survey C-level executives and top functional leaders about AI and cognitive computing. (For more about the research, see the *Study approach and methodology* section.) Based on insights from more than 5,000 global executives, this report explores how organizational views on AI have evolved over the last two years, specifically in four key areas:

1. *Sharper Focus on AI:* Five functional areas have emerged as CEOs' top priorities, with 93 percent of outperformers* at least considering AI adoption.
2. *Heightened emphasis on topline growth:* Seventy-seven percent of outperformers* now cite customer satisfaction as a key value driver for AI.
3. *Growing importance of data:* Eighty-six percent of outperformers now have enterprise-wide data governance.
4. *Intensified concern about skills:* Sixty-three percent of all respondents now see skills as a top barrier to achieving success in AI.

**Outperformers are those organizations that self-identify as having outperformed their peers on revenue growth and profitability for private sector organizations or revenue growth and effectiveness at achieving objectives for public sector organizations.*

Sharper focus on AI

It's less about experimenting — more about doubling down

Eighty-two percent of enterprises — and 93 percent of outperformers — are now at least considering AI adoption. Comparing our recent data for all respondents with the 2016 data, we found 33 percent more organizations are beyond the AI implementing stage today.[3]

Successful organizations are moving beyond just testing and experimenting with proofs of concept. As evidenced by their top concerns in Figure 1, executives have shifted their attention from worrying about *whether* to adopt AI (availability of technology) to struggling with *how* to adopt AI (skills and data).

AI adoption is higher and will probably accelerate faster in more digitized industries like financial services, where 16 percent of companies already are operating or optimizing AI systems — but also in industries like automotive and healthcare payer. This appears to reflect continued optimism in the value AI can deliver.

In the past 18 months, organizations have become far more discriminating about which business functions they expect will realize the most value from AI initiatives. When we asked CEOs in 2016 to select business functions where AI could add the most value, all 13 functions were selected by at least 65 percent. In this study, the same question results in only three business functions selected by at least 65 percent of CEOs, pointing to a shift from experimentation to more focused investments (see Figure 2).[4]

Information technology (IT) and security (IS) functions are the highest priorities selected by the most CEOs. IT and IS can benefit from AI-enabled help desk virtual assistants, process automation and threat detection algorithms — and are often the functions responsible for the data initiatives needed to support AI. (See the *Growing importance of data* section for more on this topic.)

Figure 1

Barriers in implementing AI: 2016 versus 2018

	2016	2018
Availability of skilled resources or technical skills	**43%**	**63%**
Regulatory constraints	29%	**60%**
Legal/security/privacy concerns about use of data and information	36%	**55%**
Degree of organizational buy-in/readiness/cultural fit	36%	44%
Data governance and policies	35%	43%
Availability of data to draw context for decision making	33%	43%
Availability of technology	**46%**	**29%**
Degree of executive support	30%	27%
Degree of customer readiness	28%	22%

Source: IBM Institute for Business Value surveys on AI/cognitive computing in collaboration with Oxford Economics. 2016 and 2018.

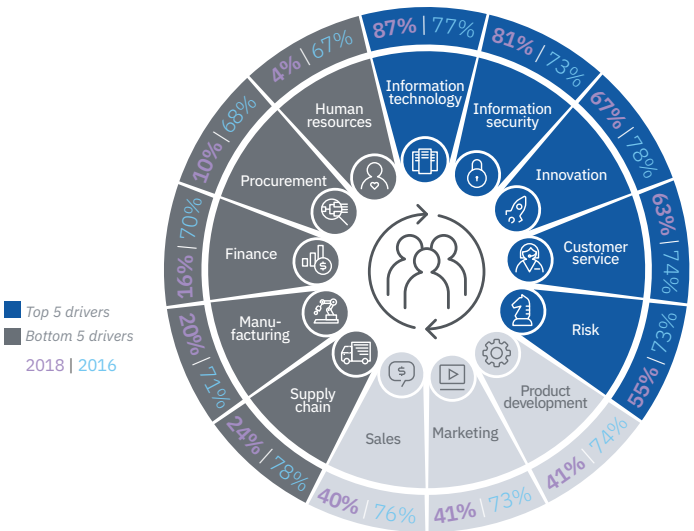
"Initially, AI will be implemented in customer service and risk so that the level and standard of interaction with customers can be upgraded and risk can be reduced."

Chief Procurement Officer, Insurance, Latin America

The remaining three priorities in CEOs' top five include innovation, customer service and risk. Innovation involves strategic opportunities and is often where an AI center of excellence resides. Customer service is an area in which many organizations have piloted virtual assistant capabilities. And in the area of risk, fraud prevention and detection are critical.

Figure 2

Functions where AI provides the most value: 2016 versus 2018 (CEO responses)



Source: IBM Institute for Business Value surveys on AI/cognitive computing in collaboration with Oxford Economics. 2016 and 2018. IBM Institute for Business Value analysis.

Note: Human resources represents less than 20 respondents in 2018.

For many companies, data-driven platforms are increasingly a tangible way of realizing the benefits of AI. Almost half of the more than 12,000 organizations from the most recent IBM Global C-suite Study are either investing in or considering the new platform business model.[5] The net impact of this commitment can be estimated at USD 1.2 trillion.[6] Moreover, more than 40 percent of respondents surveyed—and 65 percent of outperformers—view AI as a strategic platform play.

Charting new market entry strategy with AI-enabled innovation

To help patients with heart conditions better monitor their health, Toshiba Electronics Taiwan Corp, a subsidiary of Toshiba, Japan, turned to cognitive computing capabilities and the Internet of Things (IoT). Patients are given wearable devices equipped with biometric sensors that can collect a constant stream of data, such as heart rate and blood oxygen. Trained to read and interpret patterns in this data, the cognitive computing solution can distinguish between healthy and abnormal patterns with increasing accuracy. It accounts for individual health characteristics with a sophisticated algorithm that adjusts the expected normal range based on a patient's initial readings. In the event of abnormal readings, the system raises an alert to help patients and caregivers take preventive action.

In environments in which there is a shortage of doctors, caregivers can remotely monitor at-risk patients. By automating functions that are time-consuming for humans, the capabilities built for the new business help reduce reliance on doctors for routine readings and augment the work performed by caregivers. In turn, Toshiba, which operates in an already saturated market, has expanded into a new industry—consumer health and wellness.

"Our risk, innovation and IT departments will be fully operationalized with AI technology in the coming years. We are looking to automate some processes with AI technology to save cost and be more competitive."

Chief Technology Officer, Education, Australia

"AI is an important tool, and our organization will make changes in the ways it tackles problems in every area, as things will be easier when we can focus more closely on innovation and technology trends."

Chief Marketing Officer, Healthcare, Mexico

Many global executives surveyed for previous IBM Institute for Business Value studies were skeptical about the promise of AI but yielded to anticipation that the irrational exuberance eventually would be tempered and focused by continuous innovation. The year 2016 might be considered the peak of the AI hype cycle, as 47 percent of the executives surveyed that year indicated that AI was more hype than value. Yet somewhat paradoxically, 58 percent still expected AI to play a disruptive force in their industry, and 67 percent projected that it would play an important role in their organizations.[7]

Technology advances have certainly made deep industry and organizational impacts in the past—in the late 1990s with the global Internet boom, for example, as well as the rail transportation expansion of the 1840s.[8] A common thread running through both historical examples is the importance of sustained investment from governments, companies and entrepreneurs in foundational capabilities and underlying infrastructure of new technologies, as well as transnational standards setting.

In the case of AI, both China and Japan are making the new technology a centerpiece of their national growth and innovation strategies with USD billions of investments in AI capabilities and infrastructure anticipated. China aims to grow its AI industry to more than CNY 1 trillion (USD 150 billion) by 2030.[9] In Japan, the government has made AI and robotics top priorities of its revitalization strategy and is expected to increase AI spending by JPY 900 billion (USD 8 billion) by 2020.[10]

Other economies are embracing the AI opportunity as well. The U.S. government has prioritized funding for AI research and computing infrastructure, according to the 2018 White House Summit on AI for American Industry.[11] And the U.S. federal government's investment in unclassified R&D for AI and related technologies has grown by over 40 percent since 2015.[12]

The European Commission has called for total private and public investment in AI to reach at least EUR 20 billion by the end of 2020.[13] To meet that target, the Commission announced plans to boost investment in AI research to EUR 1.5 billion by 2020—an increase of around 70 percent.[14] In addition, the French government is predicted to spend EUR 1.5 billion over five years to support research in the field, encourage startups and collect data.[15]

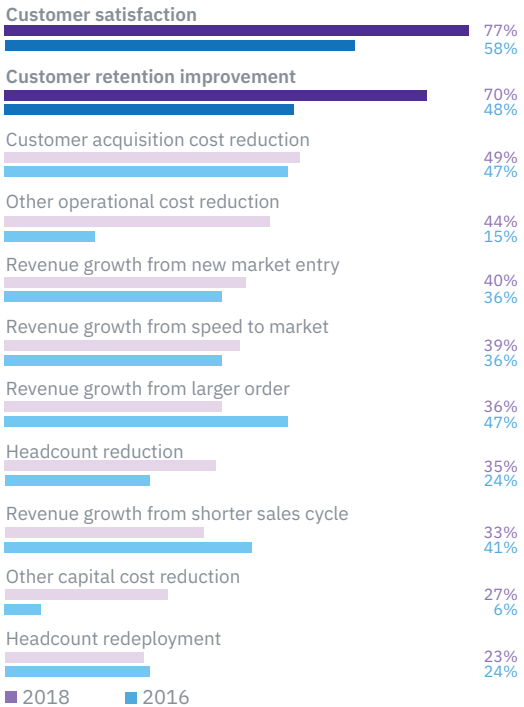
U.S. bank leverages AI to simplify customer service

A U.S. bank deployed cognitive computing customer care capabilities for its contact center transformation, which led to cost savings through reduced call volumes, lower average handle times, increased customer satisfaction and improved customer experience.

The bank's self-service virtual banker solution drives and services customer calls from start to finish and has serviced 700,000 calls already—equivalent to the amount of work done by 55 contact center reps. The AI-enabled solution also empowers contact center representatives to respond much faster to customer queries. The company is expecting USD 6.2 million in annualized benefits over five years with more than a 50 percent completion rate and 85 percent accuracy rate.

Figure 3

Topline value drivers for outperformers: 2016 versus 2018



Source: IBM Institute for Business Value surveys on AI/cognitive computing in collaboration with Oxford Economics. 2016 and 2018.

Heightened emphasis on topline growth

It's less about cost savings — more about the customer

The focus on topline growth has intensified in the past two years. Executives continue to rank customer satisfaction and retention as primary objectives of their AI investments — significantly above cost considerations (see Figure 3). Of course, that does not mean cost is unimportant. Anecdotally, many AI projects have a cost reduction element that underpins the business case — and total respondents ranked operational cost reduction third in importance. But that ranking may be driven more by the CFO and the finance function, where "hard-dollar" savings can be more credible in justifying investments than cost avoidance or revenue gains.

Moreover, many C-suite executives are placing greater emphasis on customer experience (68 percent) than traditional products and services (19 percent).[16] Indeed, among leading innovators surveyed in 2017, AI's impact on the customer experience outranked any other business model component including cost, organizational structure or capital investment.[17] Enhanced customer experience often relies on a company's customer-facing knowledge workers, where AI-enabled virtual assistants can augment existing expertise to deliver answers to customers' questions more quickly, accurately and cost effectively.

Growing importance of data

It's less about technology availability — more about data capabilities

Availability of technology is a far less important concern for executives than it was two years ago. Only 29 percent of respondents from our 2018 survey cited it as a potential barrier versus 46 percent in 2016, when availability of technology was the top factor. Recent studies point to the accelerating growth of data as executives' primary challenge. Organizations are attempting to distill every transaction and every inquiry — even every human interaction — to an essence of 1s and 0s.

So what is needed to optimize the value of AI? As highlighted in a 2016 IBM Institute for Business Value analytics report, "There is no reason to expect that the organizational fundamentals of data and analytics success — culture, leadership and governance — will change in the cognitive era."[18] From a data strategy perspective, a robust but flexible foundation driven by the core business strategy is critical, as well as an organizational culture supported by governance and policy that encourages adherence to common standards.

However, the proliferation of big data technologies does pose a risk of exacerbating the issue of data stored in multiple places. It's important that organizations understand the complete set of use cases they need to leverage data sources, so they are not bolting on new data repositories each time a need arises. They also must properly align the capabilities and technologies needed without generating unnecessary redundancy.

Restaurant leverages weather and location signals combined with machine learning to increase in-store visitation

A leading quick-serve restaurant deployed cognitive computing capabilities in an effort to drive increased store traffic. The company deployed an AI solution that processes weather, sales and footfall data specific to its store locations to predict increases in footfall traffic and allow the company to adapt and optimize media in real time. Leveraging location data to reach current and potential customers, the company witnessed a 15 percent lift in store visits, 49 percent more effectiveness in reaching and driving new/lapsed consumers after ad exposure, and a 53 percent reduction in campaign waste, with 7.9 million impressions reallocated to drive stronger media efficiencies.

"The key success factor for our organization is the data platform, which has evolved with time and significantly helped our organization gain well-defined insights regarding what decisions should be made and how these decisions will impact our operational and financial performance."

Chief Customer Officer, Telecommunications, United States

A robust data infrastructure aligned with business architecture that reflects a company's strategic direction is essential. Our 2018 research revealed that 65 percent of outperformers capture, manage and access business, technology and operational information on key corporate data with a high degree of consistency across the organization versus 52 percent of all others.

Infrastructure needs to be nimble enough to respond to new market dynamics, customer demands, strategic initiatives and user needs. Because AI and its decisions are grounded in data, the ability to recognize contextual data quality is crucial for successful operational execution. Recognizing the importance of metadata for business definition, approved usage, and measured data quality wrapped around data and interpretable through AI is fundamental.

Organizations must foster a culture that embraces using data differently, which means open collaboration across business units, functions and IT. They need to rationalize their data into structures that meet all priority use cases in a flexible, scalable and consistent store of data.

Companies ignore privacy issues at their peril. With new European Global Data Protection Regulation (GDPR) laws, fines from violations could exceed 4 percent of global revenue — for each incident.[19] Two of the top three barriers to AI adoption cited by executives surveyed in 2018 relate to this area: regulatory constraints (60 percent) and legal/security/privacy concerns about the use of data and information (55 percent).

Intensified concern about skills

It's less about labor productivity — more about talent development
AI has significant potential to dramatically increase the productivity of workers. And higher labor productivity can translate into proportionately increased labor income. But as with the introduction of any new technology, change can be initially disruptive even if the net result is positive.

In a 2016 IBM Institute for Business Value study on education and skills, 56 percent of global executives, educators and policy makers surveyed told us that AI/cognitive computing would have some impact on demand for skills.[20] Skills now reflect the biggest concern executives have about deploying AI, up one and a half times from 2016. Sixty-three percent of executives now cite the availability of skilled resources or technical expertise as the biggest barrier to implementing AI.

As the demand for data scientists and other AI experts increases, employee retention risks also rise. Startups are aggressively poaching AI talent from academia and established corporations. And while constrained candidate pools do not necessarily equate to a zero-sum game, organizations also will need to make more with what they already have. For example, approximately 55 percent of outperformers have a centralized analytics function (versus 42 percent of the rest) to provide more leverage from scarce talent.

Without a more sustained focus on developing the skills required, AI initiatives face a higher risk of delay between proof of concept, pilot and implementation. And the challenge extends beyond data scientists, AI technologists and IT professionals. Softer skills such as collaboration and innovation need to be infused throughout strategy, finance, operations and all business units. Reliance on external partners through business ecosystems may be an important stopgap that also provides broader benefits, but an external sourcing strategy may not sustain an organization indefinitely.

IBM continues to cultivate AI-skilled employees using IBM AI Academy

IBM is combining technical AI skills development with a new category called "applied AI skills," targeted at the employee population. After a three-month pilot run, the IBM AI Academy achieved a Net Promoter Score of 70, and employee engagement increased more than 7 points in some of the business units leveraging the platform.

Developing and retaining AI skills requires not only learning and development — it also requires a platform that can both match individuals with AI skills with jobs where they can use those skills and adjust their compensation to reflect their market value. In addition to training and education, IBM has developed strategies to further develop, retain and assign their AI skilled employees to the right missions.

"We are redesigning our organization to be more team centric through the adoption of AI in different units."

Chief Marketing Officer, Media and Entertainment, United States

Of course, AI is not the only contributor to a global skills crisis. Other top skills constraints identified by global executives in our global skills survey include advances in other non-AI related technologies, economic globalization, specialization, and changes in business models and regulatory frameworks.[21] We believe these forces need to be addressed holistically with proven, innovative solutions, not merely as a counterweight to the rise of AI technologies.[22]

Job creation and training required to address these skill gaps cannot come from the private sector alone. Public-private partnerships and government-led investment and policy setting can help address supply-side shortages of human capital in a nation's economic engine. Individual initiative and ingenuity are also increasingly recognized as essential.[23]

According to a recent report by the Economist Intelligence Unit, "Although there is little agreement on the likely net impact of AI and robotics on employment, there is a consensus that governments will need to take action... The lack of engagement between policymakers, industry, educational specialists and other stakeholders that must inform this action is therefore alarming."[24] This is a problem enterprise cannot solve alone.

Finally, the social contract also needs to include an emphasis on ethics — and inquiries that focus exclusively on that area in an AI context are increasing. In fact, we have embarked on a separate study focused on bias and ethics issues related to AI that will further explore these important aspects.

Getting started

Starting small, failing fast and scaling robustly apply equally to AI as to other areas of successful technology execution.[25] A key example of how to institutionalize the principles of executional agility in practice can be found by examining an innovation platform concept, which we introduced in the IBM Institute for Business Value executive brief "The Cognitive Enterprise: The finance opportunity."[26]

To implement an innovation platform , organizations need to advance through a series of specific steps. First, define an AI strategy to drive change that includes creating the right governance, operating model and roadmap. Create an innovation platform to drive innovation and develop a "factory" to industrialize and scale — both underpinned by an enterprise-wide AI platform.

As explained in the aforementioned executive brief, an innovation platform can support an organization through a business transformation "inside — out" by aligning to the company's strategic business imperatives. The innovation platform is supported by a governance model that helps ensure that initial outcomes propel adoption across the organization.[27]

Of course, this is only one approach to addressing the underlying imperatives to secure organizational buy-in to drive the case for change. However, the hallmarks of success — incorporating design thinking and agile development into a roadmap with operating teams driving re-engineered processes with new technology and built on a strategic platform — need to be infused into the designs and plans for all AI initiatives.

"We have connections with institutions that help us organize training and skill development programs whenever required."

Chief Analytics Officer, Banking and Financial Markets, Australia

At least 55 percent of executives responded that they are looking into training options and conducting workshops for up-skilling employees.

The flexibility inherent to an innovation platform model is a critical aspect of success. After all, being receptive to innovation in various forms can be more important than any specific idea or initiative. Organizations cannot necessarily anticipate the most impactful applications of AI, but creating an environment that fosters broader innovation and a scalable platform that reduces barriers to adoption — in a pragmatic context — is key to sustainable AI innovation.

Embracing the next stage of the AI journey requires an enterprise-wide commitment. We encourage organizations to follow a set of high-level tactics (from our joint study with HfS Research: "Making AI the Killer App for Your Data: A practical guide for leveraging data to enable your AI journey"):[28]

- *"Develop your AI-enabled business strategy.* The vision needs to come from the top with clear desired business outcomes and focus on permeating the mandate throughout the organization.
- *Bring the focus back to data.* Every enterprise has some data that is clean and useful. Don't let poor data quality or quantity be an excuse to put off the journey to AI. Instead, start with the data you have and then use AI as a catalyst for investing in a solid data platform that brings together external licensed and public data to drive broad data sets that enable the training of AI algorithms.

- *Quickly move from strategy to execution.* Pick a starting point that makes sense for your organization and your business objectives. Execute quickly, show iterative results and earn the right to scale. Communication with stakeholders is critical.
- *Build a path to scale with appropriate skills and change management practices.* Scale by building the team and skills required to grow and leverage AI through internal hires and use of strategic partners while practicing good stakeholder, cultural and change management in order to execute on the business transformation mandates set out by leadership."[29]

Indeed, anything less risks organizations remaining mired in the hype of the previous few years—and missing the opportunity to realize the full potential of enterprise-grade AI.

"AI and cognitive computing have increased our ability to propel innovation in our organization."

Chief Innovation Officer, Consumer Products, Denmark

Key questions

Focus: How do your strategic imperatives translate to a three-year roadmap?

Value: What are the top value drivers for your organization, and how do you plan to measure AI benefits?

Data: Who owns and maintains your data, and how strong is your organization's data expertise?

Organization: Where are your most significant skill gaps, and how will you manage the expected cultural change and social impact?

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IBM Institute for Business Value
The IBM Institute for Business Value (IBV), part of IBM Services, develops fact-based, strategic insights for senior business executives on critical public and private sector issues.

Study approach and methodology

In cooperation with Oxford Economics, the IBM Institute for Business Value surveyed 5,001 global executives representing 18 industries, including leaders of government agencies and educational institutions, and 19 functions. Roles of responding executives included C-level executives — CEOs, CFOs, CHROs, CIOs, CMOs and COOs — as well as heads of customer service, information security, innovation, manufacturing, risk, procurement, product development and sales.

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