



Technology, media, and telecom get smarter

Cognitive computing aims to make companies
both more effective and more efficient

Our Cognitive Advantage offerings are designed to help organizations transform decision-making, work, and interactions through the use of insights, automation, and engagement capabilities. Our offerings are tailored to be industry-specific and powered by our cognitive platform. Read more about our Cognitive Advantage services at <https://www2.deloitte.com/us/en/pages/deloitte-analytics/solutions/cognitive-analytics.html>.

CONTENTS

Introduction | 2

Beyond hype

Transforming how work gets done | 4

Transforming how decisions get made | 6

Transforming interactions | 8

What telecom, media, and tech execs say about AI | 10

Endnotes | 13

Introduction

Beyond hype

TECHNOLOGY breakthroughs, remarkable as they can be, all too frequently come with a handmaiden: hype. Cognitive computing (a term we use here interchangeably with artificial intelligence) is without any doubt a prime example. For every story about a truly astonishing AI triumph—such as Google’s DeepMind beating the world’s champion *go* player¹—there is a bushel of breathless press releases claiming that the AI that’s built into product X will straightaway transform your company into an industry leader.

Separating AI’s wheat from its chaff poses a challenge for business leaders anxious to take advantage of a new generation of cognitive computing tools. And it’s easy to get sucked into the hype of those press releases and begin discussing which AI-based products sound most exciting. So before you sign any purchase orders, it’s essential to consider what you can expect AI tools to accomplish in the first place.

We aim to help. From working with hundreds of clients, vendors, and frontline AI researchers, we’ve developed an understanding of AI that allows us to weed out the hype and identify the business cases in which cognitive computing will deliver the most value. While many AI tools are new and rapidly evolving, these are use cases for which even cautious man-

agers can apply AI technology today without fear of finding themselves stuck on the bleeding edge.

First of all, we believe that AI has very real applications, today:

- AI applications can help automate back-end business processes, lowering costs and freeing up staff for the sort of value-added analytical work they typically are now too swamped to undertake. We call this *robotic and cognitive automation*.

- AI-based tools allow businesses to mine the mountains of data they are now collecting, from the Internet and elsewhere, to generate cognitive insights and make sharper, faster decisions.

- And AI technology can aid companies with cognitive engagement, helping them better connect with customers, anticipating their needs and spotting potential problems before they pop up on social media.

Separating AI’s wheat from its chaff poses a challenge for business leaders anxious to take advantage of a new generation of cognitive computing tools.

Again, we believe that the key to deriving value from AI applications is understanding how cognitive computing works and how the technology can augment business processes. So, first of all, consider the terminology: Cognitive computing is a set of technologies that can process, evaluate, and respond to text and images in ways that previously required human input, and that can handle unusually large and less rigidly structured

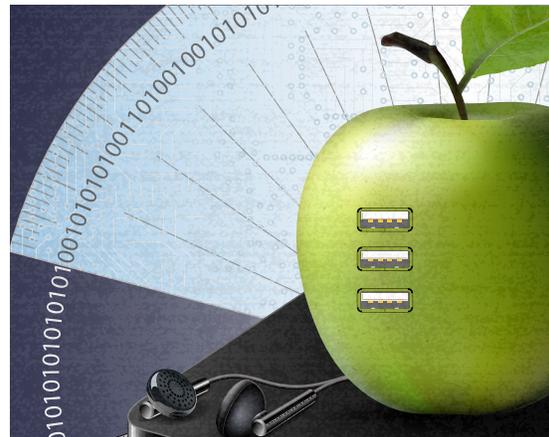
data sets. Notwithstanding hype, AI technology is largely evolutionary—there is rarely a clear demarcation between an application that is “artificially intelligent” and one that isn’t—and the capabilities of even the most advanced cognitive technologies remain far narrower than those of humans. AI-based products aim to perform specific, well-defined tasks, and often it takes considerable patience and prodding to get them to do even those. Synthesizing human judgment and common sense remains a sci-fi conceit; true “thinking machines” are a long way off.

All this said, just because cognitive technologies can’t replace humans altogether doesn’t mean they can’t dramatically improve some functions’ speed, efficiency, and scope. A recent Deloitte survey of early adopters found that three-quarters of them expect AI-based applications to significantly contribute to their business within three years.² And the way to make cognitive technologies valuable is to properly integrate them into a well-designed system. After all, with AI, as with any technology, automating an inefficient process simply speeds up the inefficiency.

We see AI applications in the technology, media, and telecom space as falling into three categories: *cognitive automation*, *cognitive insights*, and *cognitive engagement*. We’ll explain more shortly.

Why technology, media, and telecom companies are proving grounds for AI

Analysts expect companies in nearly every sector to integrate cognitive technologies. But technology, media, and telecom leaders have an especially compelling rationale for AI-based applications, based on the industry’s unique data-analysis needs and business model challenges.



- While nearly every company is grappling with a data explosion, the issue is especially pronounced in the technology sector. Consider the semiconductor industry, which every few years unveils new chips with double the parts count of the previous model. (Intel chips are closing in on 10 billion transistors each.³) While semiconductor design and manufacturing have historically driven computer-aided design methodologies, companies are turning to machine learning to increase efficiency.⁴
- Media companies face unique challenges, including the deterioration of traditional business models, the proliferation of new distribution channels, and questions about what sorts of new content they should expend resources producing—and how to best match that content with an increasingly fragmented customer base.⁵
- Telecom companies find themselves dealing with users who are increasingly willing to change suppliers, intensifying familiar problems such as engaging customers and managing churn. They also face vexing infrastructure management problems as new networks, both wired and wireless, increase in complexity.⁶

Transforming how work gets done

ROBOTIC and cognitive automation (R&CA) has much in common with its blue-collar cousin in the factory. But instead of using computer-controlled devices to assemble disparate parts into, say, an automobile, AI-based automation works with *information*, gathering bits of data from multiple sources and assembling them into, say, an invoice. Both forms of automation have the same rationale: relieving humans of tedious and repetitive work while speeding production and guaranteeing error-free end products. But manufacturers have been working to perfect factory automation since the 19th century, while developers have only begun to tackle modern R&CA applications. And rapid AI advancements have taken automation far beyond its simple clerical roots; now, certain applications make highly trained white-collar professionals anxious.

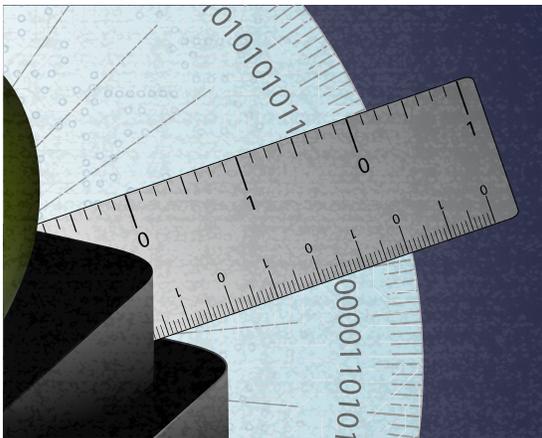
Business already widely uses first-generation automations, largely because of the applications' relative simplicity. When you call your bank to activate a new credit card or cancel a stolen one, an R&CA system is working in the background on the relatively straightforward task of constantly updating customer records. Another common use case

involves processing invoices, which invariably requires accounting departments to gather information from a number of documents: the date from one, the payee's address from another, the amount due from a third. An R&CA system can be easily trained to routinely fetch these for itself. If the information already exists in some digital form, and if the format and location of the data are consistent, the task is a simple one. In fact, it's little more complicated than an Excel macro, albeit one that works across many different applications.

Difficulties arise when the documents exist in paper form, in which case an *optical character recognition* system must convert them to text, a step that usually requires a modicum of human oversight to check for and correct errors made in the transcription process. Even more complexities are encountered when the data isn't presented consistently; a simple matter of differently formatted dates can throw off a rudimentary automated process.

This is where cognitive computing comes in. One of the hallmarks of AI is allowing computers to deal with unstructured data—for instance, a large business's receivables operation, receiving invoices in a variety of formats—as easily as they handle information neatly arranged in rows and columns.

The complexity of automations, and the associated built-in AI functionality, grow from there. For example, end-of-quarter financial reporting involves gathering information from a drawerful of different documents, a "swivel chair" task that can often require a team of accountants. Doing so requires locating, say, every business unit's quarterly sales figures, even though they may be listed in different currencies and different languages. Newer R&CA systems have the smarts to be able to clear such hurdles. As a result, they are moving beyond accounting into adjacent back-office functions, including tax preparation and human resources.



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They have become especially popular in offshore operations centers.

Many cutting-edge R&CA systems resemble nothing so much as full-blown AI systems, so much so that some question whether the somewhat prosaic term *robotic process automation* still applies to them. Some of the best examples are from the field of law. Machine learning-based platforms now have the ability to search emails—thousands every second—and pull out those relevant to a discovery order. Law firms can search libraries of case studies to find cases with issues similar to ones they are currently litigating. Patent attorneys facing a dispute find the software especially useful in sifting through countless, virtually identical filings.

To be sure, all of this work got done before, by entry-level legal workers. And no software application can yet plan a legal strategy or write a compelling brief, much less make a court appearance. But the technology is beginning to nibble away at the edges of legal employment: Lawyers expect automation to reduce billable hours over the next five years between 2.5 and 13 percent.⁷ Indeed, many observers have raised concerns about AI-based automation displacing labor—and have suggested that rather than using technology to look first at staff reductions, leaders should consider redeploying freed-up resources to make their overall operations smarter and more proactive.

CASE STUDY: ROBOTIC AND COGNITIVE AUTOMATION

Technology: As a *Fortune* 50 global technology company, Dell faces a formidable set of regular accounting and reporting challenges. To help improve these finance functions, Deloitte worked with Dell on a robotic process automation system that would increase Dell's control over the reporting function as well as allow it to close its books in a shorter time period and at lower cost. The system was created using Agile software techniques, which minimize development risks by providing constant stakeholder feedback about a project's current state. In just eight weeks, the team was able to develop a set of automated processes that had a combined value opportunity of three FTEs and that established a pathway for extending the automated processes into other Dell reporting functions.

Media: While welcoming reader comments on news stories, some newspapers such as *The New York Times* first screen them to make sure they don't violate any of the paper's guidelines. Until recently, the company had 14 human moderators, who could process only 12,000 comments a day, limiting comments to 10 percent of *Times* articles. But Jigsaw, a machine learning tool from Google, was able to speed the process, flagging potentially troublesome remarks; as a result, comments now accompany fully a quarter of articles.⁸

Telecommunications: ComRes Telecom is a South Florida-based provider whose customer footprint spans the globe. Its customers are effectively out of business if ComRes's systems go down, meaning that configuring its IT systems, backing up accounts, and the like are top priorities. Those tasks were once done manually, requiring more than half of the IT staff's workday. An AI-based automated solution reduced the operation to a fraction of the time, and with much greater reliability.⁹

Transforming how decisions get made

IT'S widely appreciated that connected technology—most notably, Internet of Things (IoT) applications—is generating overwhelming quantities of data, to the point where many companies are struggling to efficiently store it all, much less put it to productive use. *Cognitive insights* technology offers a suite of tools that allows companies to not only manage the torrent of information they collect every day—from the field, business reporting tools, supply chains, social media, IoT sensors, and elsewhere—but also to use that information to generate real-time insights aimed at creating business value.

Imagine a situation such as the following. A telecom customer walks into a store with questions about her account. The sales rep can immediately access the customer's complete history with the company, including recent queries into its call center, and can quickly ascertain if her issues had been resolved, moving to take care of any that weren't.

If the customer's experience had been unsatisfactory, machine learning software trained on the company's customer base could recommend actions—

perhaps a waiver of a portion of a monthly bill—that have been shown, via tracking net promoter scores, to improve customers' feelings. With that bit of lingering unfinished business taken care of, the sales rep can move to assisting the customer with the reason for her store visit, confident that she will be in a better state of mind than when she walked in the door.

This example is typical of the robust, real-time inquiries that companies implementing cognitive insights will be able to make in all aspects of their operations. Is a vendor on track for its next shipment? Are there indications from a CRM system that a crucial customer may be reconsidering an important order? Are there signs that sales of a particular product are slowing with a key demographic, suggesting a special promotion if not a redesign?

To be effective, a world-class cognitive insights program must be able to draw on multiple data sets to give answers in real time. Just as important, though, is that the queries must be able to originate with the line managers most in need of the information. The days when routine data requests needed to be routed through the IT department—usually hopelessly backlogged with its own priorities—are long gone. For such a program to be of optimum value, not only must firms be able to tap cognitive insights rapidly—leaders should distribute access to them throughout the organization.

Consider the remarkable results that one marketing department was able to accomplish with this new tool set. To improve its email campaigns, Caesars Entertainment implemented a cognitive insights system combining machine learning and natural language processing. The system knew enough about each customer's personality to know which words or phrases would inspire that particular customer to

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open the email and click on the ad. Caesars increased the rate of opened emails by as much as 24 percent and improved click-through rates by as much as 46 percent.¹⁰

For companies that generate revenue from digital ads, even incremental improvements in click-throughs can deliver stunning returns. A recent report from a major technology firm showed that it could generate hundreds of millions of dollars in additional earnings by improving the accuracy of click-through predictions by a mere 0.1 percent. As it happened, the company's AI-based system was so advanced that it was able to improve click-throughs by nine times that amount.¹¹

Being this agile with cognitive insights requires rethinking a company's strategies in both hardware and software. Traditional siloed data—sales in one location, billing in another, social media activity elsewhere still—needs to be integrated, preferably into a single “data lake.” Analytical software must be upgraded from the relatively static tools of an earlier generation—the sort responsible for the infrequently updated “executive dashboards” that

were once considered state-of-the-art—to machine learning-influenced tools.

As with many AI-based applications, cognitive insights are most obviously suited to tackling discrete issues, such as predicting a particular customer's likely behavior and anticipating her reaction. But this is not to suggest that cognitive insights can't shed light on the sorts of big questions that every executive faces. No current system can offer a management team definitive, comprehensive counsel on, say, whether a given merger is worth pursuing. But to the extent that management has collected data associated with the decision, cognitive insights can be used to mine that data, looking for trends and patterns. While human managers may well have already noticed some of the trends that a system spots, it's likely that other connections will have been buried beneath layers of seemingly random data, their excavation possible only due to a generation of hardware and algorithms that are changing the face of business wherever they are deployed.

CASE STUDY: COGNITIVE INSIGHTS IN TMT

Technology: With Amazon's Web Services becoming a core part of the Seattle tech company's suite of offerings, Amazon has turned to machine learning techniques to track its order pipeline more accurately, sparing the expense of adding computing power when not needed, or of being caught short-handed when demand suddenly spikes. The system catches the sorts of signals that even the most alert human might miss, such as an enterprise sale being dragged out longer than usual.¹²

Media: Few decisions are more important for a film studio than deciding which films to greenlight. While even the most advanced AI can't predict the next blockbuster or flop, Disney is tapping technology for as much decision-making help as it can offer. For instance, a Disney-developed system known as *factorized variational auto-encoders* uses deep learning and facial scanning software to track the emotions of audience members in real time. The system is Big Data in action: Using it on a few thousand test subjects generated more than 16 million data points for later analysis.¹³

Telecommunications: One of the keys to resolving a customer issue on the first call is for a service rep to have relevant information instantly available. Verizon developed a cognitive platform that monitors data continuously from a plethora of unstructured sources, using high-performance analytical and decision engines; the system is able to home in on correlations to help tease out a consumer's intent and anticipate solutions. The result: improved customer service and a sharp boost in first-call resolution rates.¹⁴

Transforming interactions

SPEND any time as an anthropologist watching Millennials, and you will notice two behavioral patterns right away: They seldom allow even a few minutes to pass without consulting their smartphone, and they rarely use the device for anything as mundane as an actual phone call. Their preferred medium of communication is texting,¹⁵ whether with a roommate on the other side of the living room or a favorite brand located on the other side of the world.

Millennials prefer texting to talking, and this sociological shift, more than any other factor, is responsible for the massive disruption in customer engagement that companies across all industries are beginning to feel. With *cognitive engagement* technology, computers handle customer support functions traditionally routed to call centers, often but not always in text-based interactions. This allows companies to deliver uniform, high-quality customer support at scale.

To be sure, AI-style technological advances, especially in natural language processing, play a crucial enabling role in making cognitive engagement possible. But absent the behavioral change of a significant part of the population, it's doubtful that customers would be as receptive to cognitive engagement as they appear to be.

The umbrella technology associated with cognitive engagement carries the name of *chatbot*—an unfortunate one, since for many non-Millennials, especially those who spend more time on desktop computers than on smartphones, the term conjures up a window that pops up at the bottom of an e-commerce page with an offer of assistance that's usually unwelcome and nearly always ignored.

In fact, chatbots represent a suite of increasingly sophisticated AI-based tools that, as far as users are concerned, can have all manner of appearances. A chatbot might resemble the familiar e-commerce text box, perhaps with an animated avatar to increase the sense of the encounter being personalized.

Or it might be implemented as a smartphone chat experience, albeit one with a computer rather than a person responding on the other end. A particular form of chatbot is embedded in home automation products such as Siri, Google Home, and Amazon Echo that are swiftly becoming ubiquitous. Chatbots might even take the form of a telephone voice response system, albeit one vastly more robust than the primitive “Press 1 for account information” solutions that gave these products' first incarnations such a bad reputation.

One of the core enabling technologies for a cutting-edge cognitive engagement solution is natural language processing, which involves the extraordinarily complex task of getting a computer to do what human beings accomplish effortlessly: figuring out what someone *means*. The field has seen remarkable progress during the last decade; it is now possible for a chatbot to understand that, “There is

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a charge I don't understand,” “Why is this month's bill so high?”, and, “How come I owe you \$20 more than I did in April?” are different forms of the same customer issue.

When dealing with voice inputs, there is an additional challenge of speech-to-text conversion: making sure the user's words are accurately transcribed into text. That, too, is a vexing AI problem that has seen astounding progress in recent years, but it's separate from the issues associated with the semantic problem of extracting the essential meaning of transcribed sentences.

Of course, understanding a question has value only if you can provide an answer. Doing so with chatbots involves having some sort of database—very broadly defined—of the relevant company policies and procedures. There are many different approaches that companies can take to developing

these data sets. In simple cases, with few variations and permutations, the process might be done manually, with staffers creating a simple matrix of possible answers.

As the processes involved grow more complicated, so do the technologies that can be employed to deal with them. Sophisticated machine learning techniques can be tapped to process and organize vast quantities of both text and data. That was how one insurance company was able to create a chatbot that was so proficient in answering customer queries about term life policies that its bot allowed customers to sign up for products without ever leaving the chatbot app.¹⁶

CASE STUDY: COGNITIVE ENGAGEMENT IN TMT

Technology: Ticketbis is an eBay-owned service that creates an online secondary market in which ticket-holders for sporting and cultural events can resell their tickets. Growing use of the site created customer support challenges, which led to Ticketbis teaming up with a vendor, Inbenta, for a chatbot self-service feature that assists customers with requests and queries. Customers are welcomed by an interactive and animated help window that uses natural language processing technology, among other techniques, to field questions and develop automated responses. The system is “smart” enough to know when to hand off an interaction to a human customer service agent. The technology is sufficiently robust that Ticketbis can use it to handle 85 percent of its customer service requests.¹⁷

Media: Modern streaming content providers such as Netflix are constantly releasing new material, much more than any customer can keep up with. As a result, one of their biggest challenges is keeping users abreast of new programs that might particularly interest them. Netflix has pioneered using technology for developing these “recommendation engines.” In 2009, it famously conducted a crowdsourcing competition that invited outside programmers to develop recommendation algorithms more efficient than in-house solutions. More recently, Netflix has taken advantage of the new breed of machine learning technologies to further improve its recommendation process. The company also actively participates in Silicon Valley's AI ecosystem, hosting sessions at which experts from companies such as Google and Facebook exchange ideas. The business value of a finely tuned recommendation engine is readily apparent to Netflix, which says that the technology adds roughly \$1 billion to annual revenues by way of reduced churn.¹⁸

Telecommunications: Every major mobile carrier faces the problem of a massive customer base that regularly has service and engagement issues, necessitating large call-center staffs to field complaints and questions at all hours. So effective chatbots—systems that swiftly deal with customer concerns without causing irritation—are decidedly welcome. Vodafone has embarked on a program to give its chatbot, TOBi, increased functionality, for example by offering customers a voice activation option that automatically authenticates their identity the next time they call in. A customer records a word or phrase; on subsequent calls, voice recognition technology is used to ensure that it is the same speaker. (The alternative is the usual gauntlet of security questions, such as date of birth and mother's maiden name.) The company is also expanding the bot's knowledge base—now it can drill down into highly technical areas, such as the ins and outs of roaming plans.¹⁹

What telecom, media, and tech execs say about AI

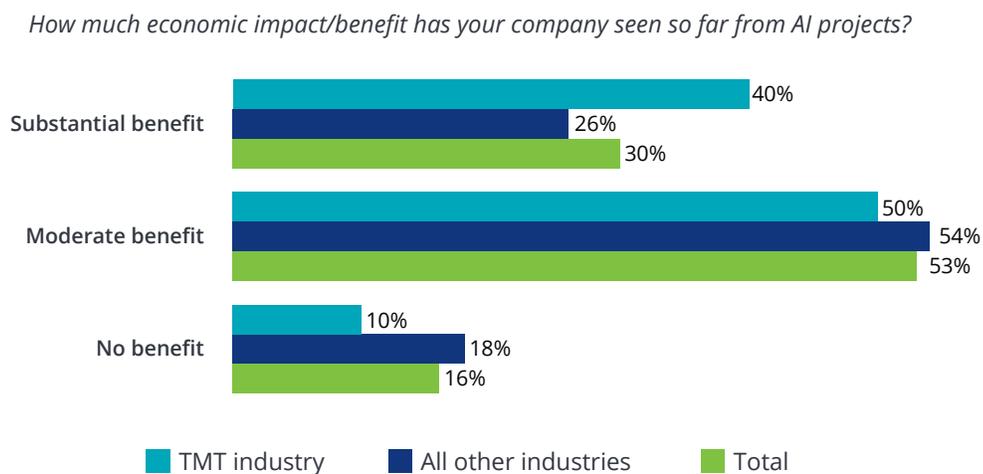
TO better understand how frontline managers see AI unfolding, Deloitte recently conducted a survey that included responses from early adopters at companies across industries, including technology, media, and telecommunications companies. The biggest takeaway, by far: Business leaders who have already begun using AI technology are highly enthusiastic about the transformative role it will play in their companies. They foresee sweeping, across-the-board changes touching all facets of their operations, from developing basic business models to interacting with long-term customers.²⁰

Much of that enthusiasm comes from the economic benefits companies are receiving from their

cognitive investments, with TMT companies leading the way. Forty percent of executives at these companies say they have garnered “substantial” benefits from cognitive technologies, while 26 percent of companies across all other industries make the same claim (see figure 1).

Experience with cognitive technologies is responsible, at least in part, for the strong early returns TMT companies are getting. Around 41 percent of TMT companies (versus 32 percent for other industries) have launched at least six cognitive pilots, and 40 percent (versus 28 percent) have implemented at least six full-scale cognitive implementations. Cognitive technologies require

Figure 1. TMT companies surveyed are seeing early economic returns from cognitive technology



Total sample size = 250; TMT = 72; Others = 178

Source: Deloitte State of Cognitive Survey, August 2017.

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some hands-on experience to prioritize the right projects, and to integrate those technologies with existing business processes and systems. Practice makes perfect, in other words. Positive ROI makes additional investments more attractive: A quarter of TMT companies have spent \$10 million or more on cognitive technologies, compared to 7 percent in other industries.²¹

TMT leaders grasp cognitive technologies’ potential to improve their operations. Fifty-seven percent of executives call cognitive technologies “very important” to their strategies for improving internal business processes; 46 percent say the same for improving the products and services they sell. Forty-three percent of TMT executives strongly agree that their ability to use AI internally differentiates them from competitors. More than three-quarters expect cognitive computing to “substantially transform” their companies within the next three years.²²

Although TMT leaders see cognitive technology as critical for internal transformation, they differ from other industry executives in the emphasis they place on using it to create new products. Forty percent of executives see new product development as a top benefit of AI-based technology. By contrast, just 29 percent from industries including consumer and industrial products, energy, and financial services feel the same way.²³ (See figure 2.)

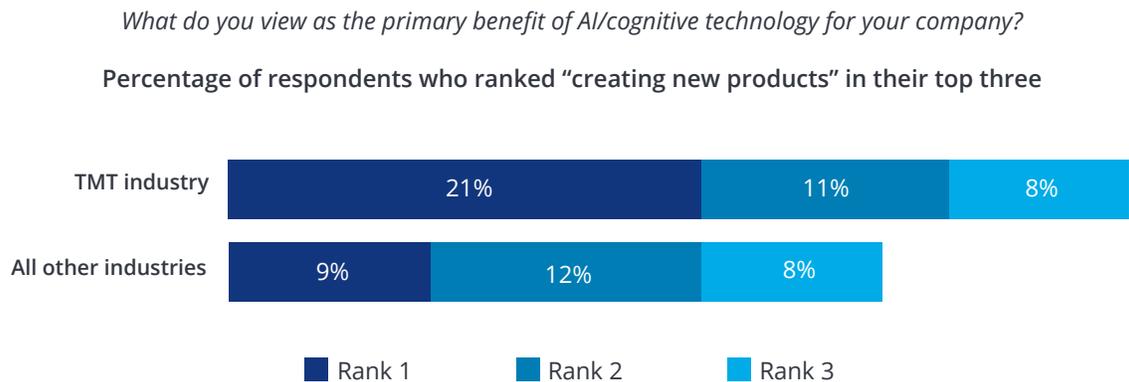
The emphasis on new product development and innovation makes sense if we consider the dual nature of the TMT executives surveyed: Their companies are, after all, the developers of many of the AI solutions that this article describes as well as organizations that stand to benefit from AI-based efficiencies. Tech giants such as Amazon, Facebook, Google, and Microsoft are incorporating cognitive technology into not only their products but their customer-facing operations; they are also investing billions acquiring AI companies. Against such an elite group of cutting-edge competitors, even early adopters in TMT may feel at a disadvantage and must sprint to catch up.

This leads to a question that clients ask whenever the topic of AI technology comes up—which these days is in nearly every conversation. “We understand why Google is going big into AI,” we hear. “But that’s because it’s their product. What about us? We’re nowhere close to selling AI. Are you saying we have to become an AI company too?”

The honest answer, from the survey and from our thousands of client interactions, is, “Yes . . . in a manner of speaking.”

Now, this doesn’t mean you need to go on a hiring binge and bring on board a team of deep learning experts, and then look around for something for them to do. What it does mean is that every compa-

Figure 2. TMT companies are using cognitive technologies to develop new products



Total sample size = 250; TMT = 72; Others = 178

Source: Deloitte State of Cognitive Survey, August 2017.

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ny needs to have some form of in-house AI expertise, enough for leaders to keep up with developments in the field and to understand how cognitive solutions can help in the transformation of even those companies not yet moving to productize it. Remember, practice makes perfect.

This article has laid out three areas in which cognitive computing can deliver significant business advantages; more are surely on the way. TMT companies need to have the in-house experience to be able to assess which of these incoming technologies will be useful, and to then be able to successfully implement those that make the cut. Since this will usually occur with outside vendors' assistance, companies need to be confident that they, and not their vendors, are the ones calling the shots.

Our survey made clear the relationship between in-house AI expertise and effective use of the technology: Companies exposed to AI technology via

their R&D work consistently report having a much easier time putting it to good use improving their operations. Again, successful use of cognitive technologies involves much more than bolting on some vendor product with little regard for the organization's underlying structure and processes. Cognitive competence developed in product development usually spreads, as if by osmosis, to other parts of the company. A company that has experience with incorporating Big Data-style cognitive insights technology into its products will have a head start on understanding how to best structure its own internal data, to be able to mine it for the sorts of game-changing insights that can bring significant competitive advantage. The same is true for cognitive automation and engagement; helping customers tackle these use cases inevitably allows a company to do better at them itself.

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Technology, media, and telecom get smarter

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ACKNOWLEDGEMENTS

Many thanks to **Elina Ianchulev, Karthik Ramachandran, Shashank Srivastava, and Gaurav Khetan** for their contributions to this article.

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