Artificial Intelligence Primer for 2018

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Supporting Key Initiative is Artificial Intelligence

Artificial intelligence is a transformative technology that will drive sustainable competitive advantage and business value. IT leaders must take action now to employ AI and deliver critical business outcomes, while constrained by scarce skills.

Scope

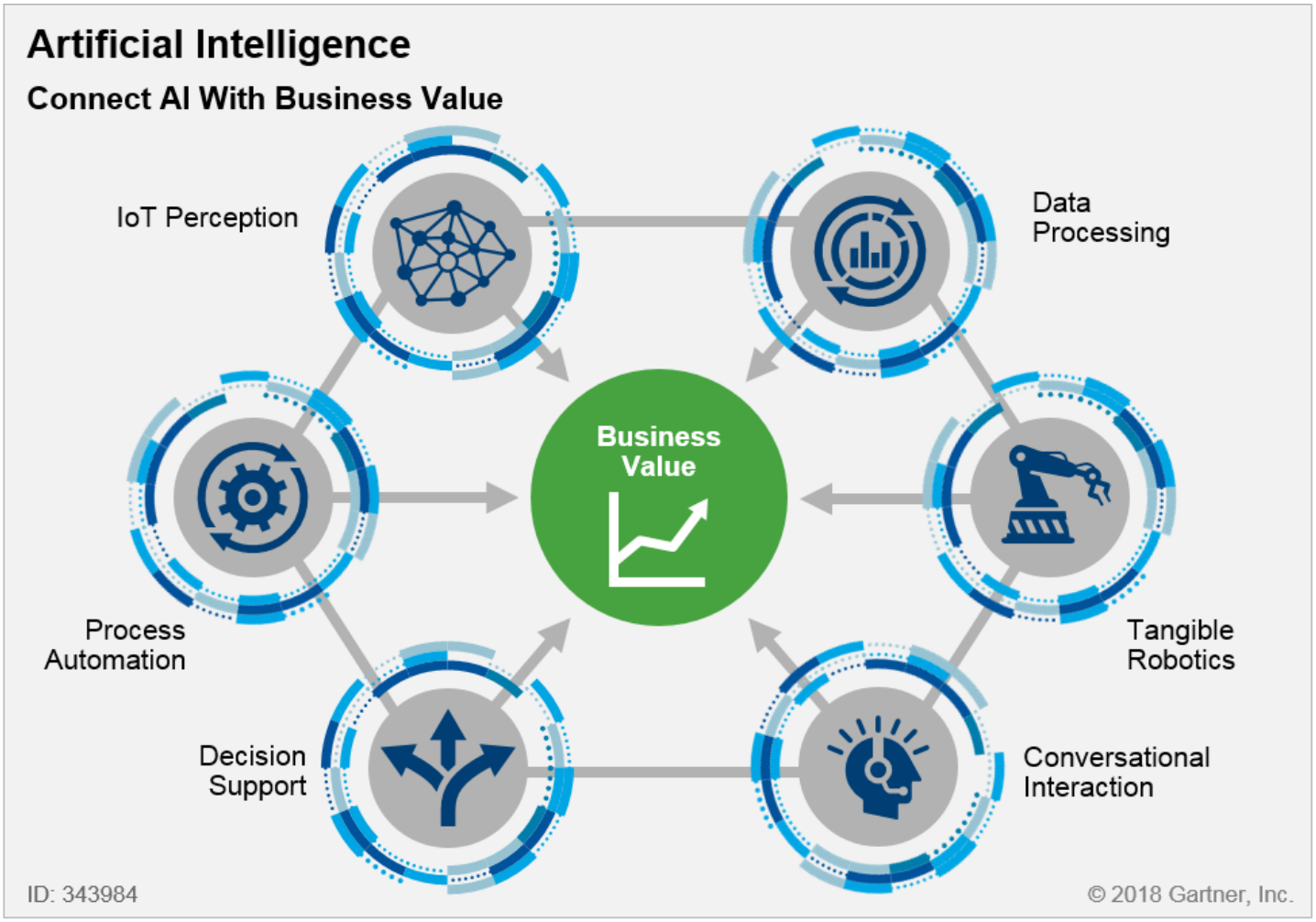
This initiative equips organizations to understand, plan and adopt emerging artificial intelligence (AI) technologies for significant digital business outcomes.

It covers:

- Understanding AI technologies
- Identifying promising business use cases
- Strategizing and planning for AI deployment
- Linking AI projects to specific business outcomes
- Coping with AI skills shortage
- Initiating AI projects

Analysis

Figure 1. Artificial Intelligence Overview



Source: Gartner (January 2018)

Many IT leaders are struggling to deploy AI for business value and competitive advantage. The transformative potential of AI is shackled by extravagant hype, which drives misunderstanding, inflated expectations and skewed assessments of AI's business value. There is deep uncertainty about how to start with AI because of speculative business use cases, the profound skills shortages and the belief that AI requires massive investments.

Organizations that fail to apply AI, however, will inevitably fall behind rivals that do. Industry leaders such as Alibaba Group, Amazon, Baidu, Facebook and Google view AI as essential to future business success. They use AI as the cornerstone of every new business strategy. Furthermore, Gartner client inquiries about AI have increased by 500% from 2015 to 2017. AI is coming to your markets. IT leaders must take the initiative to develop and implement AI for their business.

Gartner's AI Key Initiative Primer will help IT leaders focus on treating AI strategically to make progress on real business challenges. IT leaders can leverage AI by using established best practices and expertise in two key areas: assessing the business value of AI and evaluating AI as simply the newest, most promising advanced technology. It's about normalizing AI planning and development for the organization as a whole. The goal is to help you be smart about artificial intelligence.

Top Challenges and How Gartner Can Help

AI is especially daunting because of its complex technical and scientific underpinnings, and the lack of in-house expertise and skills in these highly specialized disciplines. But forward-looking CIOs are already taking action. This trend will speed up in 2018, in part because AI capabilities will become more readily available and affordable. Vendors are racing to add AI to popular enterprise applications and platforms, such as office suites. Cloud accessibility and APIs will enable organizations to leverage AI capabilities in pilot and production deployments. The ongoing consumerization of AI — through the growing use and effectiveness of AI-enabled assistants such as Alexa and Google Assistant — boosts end users' awareness of, and expectations for, intelligent conversational interfaces to enterprise products and services.

The following dynamics shape the major AI challenges that IT leaders face: Understanding the complex collection of emerging AI technologies, finding AI skills, identifying the AI business case, and developing AI strategies for business value.

What exactly is "artificial intelligence?"

AI is a combination of advanced technologies in varying degrees of maturity. Some have been around for decades, while others are relatively new. Many are rapidly evolving, in part due to recent hardware and software breakthroughs. In current popular cases, AI refers to systems that change behaviors without being explicitly programmed based on data collected, usage analysis and other observations. These systems learn to identify and classify input patterns, probabilistically predict, and operate unsupervised. In most current implementations, AI relies on deep neural networks (DNNs) as a critical part of the solution. The DNN converts complex inputs such as images, video or sounds into data that can readily be processed and acted upon by conventional programming solutions. Other configurations are possible, but this is the most common layout. This conversion of rich input into data that can be readily processed by conventional software is the heart of today's AI resurgence.

Most organizations will not be able to match the AI investments of giant technology and service providers. But they don't have to. The AI component that converts complex inputs to easily processed tags is readily available now from several large providers. The operational components specific to the business become more complex because of the richness of the AI's input into them, but are within the scope of traditional application development. For example, customer service systems that start with an accurate transcription of voice input provide a strong foundation for improving a customer service application. IT leaders can guide their organizations in "understanding by doing." They can create the organizational and role incentives that foster interest in learning about AI and its potential by starting to experiment with AI capabilities.

AI capabilities that are applied to the right use cases potentially create transformative business value and competitive advantage. Organizations are already using AI to:

- Enable software to improve performance and outcomes at human speed or faster — especially in tasks that depend on classification or prediction related to complex inputs (such as process flows, customer or constituent interactions, and other data).
- Start and advance automated interactions with customers, business partners and workers.

- Improve the analysis of video, audio and other complex elements captured in media at a scale and speed that allows actions to be taken in an automated or expedited fashion.
- Improve organizational insight into machinery, vehicles and structures to achieve better tuning, optimization and maintenance while better conserving resources and delivering value.

By creating a culture of AI learning and experimentation, IT leaders start to normalize the organization's shared understanding and evaluation of AI. As practical experience deepens and spreads, the organization can set realistic expectations for AI and evaluate it to identify ways to generate business value.

Planned Research

In 2018, we will deliver research notes (including this one) that address the core necessities for AI. Our key research will include perspectives on how organizations perceive AI, including how it can be used in connection with other products and systems within organizations. (Our survey of Research Circle members in 2017 revealed that most organizations expect to develop and deploy AI capabilities within, on average, two or more applications.)

Documents we expect to produce include:

- Artificial Intelligence Demands That CIOs Foster a Data-Literate Society
- Gartner Hype Cycle for AI — An overview of the relative maturity of AI technologies, services and business disciplines.
- Predicts report — To identify the critical AI trends and events that will affect your enterprise during a one- to three-year planning cycle.

How do we develop the necessary staff skills for AI deployment?

Skills are one of the top challenge in AI deployment, according to a recent Gartner Research Circle survey. More than half of the sample named "lack of necessary staff skills" as their most significant challenge. Technical skills, especially for DNNs, remain limited and are still evolving. Even experts cannot consistently and reliably configure a DNN to deliver useful results. The long turnaround time in DNN training demands makes for a long evaluation cycle.

Management and governance skills also need to evolve. It's only recently that more managers have come to understand and rely upon advanced statistical techniques that extract "signals from noise" to improve decision making using traditional machine-learning techniques. DNNs add new complexity and scale, where results and expectations can diverge in unexpected ways. Data literacy is still in short supply, as are the business-directed governance conversations about the ethical uses of data and about other situational choices, all of which become more pressing in deploying AI systems.

Relatively few organizations will have the financial resources to enter the bidding war for AI talent. Universities are now producing many graduates with valuable deep-learning skills. But few of these newly minted graduates have the technical experience that is the basis of successful DNN models, or the business or government experience that makes it possible to intuit how to employ them. Fortunately,

access to AI APIs from digital giants will be sufficient for many organizations. But managing and configuring these APIs and DNNs will still require training. Managing this AI skills deficit will remain a critical priority for IT leaders.

Forward-looking leaders can act decisively. An internal culture of AI learning and experimentation, mentioned above, is a foundation for identifying, encouraging and supporting in-house AI skills development. IT leaders can leverage existing expertise and practices in data acquisition and data quality to support the demanding data requirements for training the AI models. In many more cases, AI skills and capabilities will be "embedded" in vendor applications and platforms, and accessible via APIs to cloud services. IT leaders also can establish knowledge exchange programs with vendors to accelerate development of in-house capabilities.

Planned Research

We know that organizations find AI to be daunting. Its promise of greater simplicity and usefulness for organizations is matched by the necessity of major investments in human resources, skills and effort. In 2018, we will deliver research for:

- Describing and outlining the duties of AI architects.
- What to expect at the start of a career as an AI leader.
- Managing IP rights in AI projects that involve vendors and service providers.

What kinds of projects is AI good for?

The answer to this question lies in linking AI capabilities with the organization's most pressing business priorities, use cases and business problems. IT leaders can forge that link by expanding AI knowledge, developing the organization's practical AI experience with creative experimentation and building AI skills. Involving business users and leaders in all of these activities creates a synthesis that rescues AI from being an expensive solution in search of a problem.

AI can be described as enabling systems and software that, in turn, let users classify and predict much more swiftly and accurately than they can do on their own. AI systems can automatically improve their outcomes without human intervention. Projects that, to be successful, would have needed more people than could possibly have been hired are now candidates for AI.

IT leaders should be directly involved in starting, prioritizing and guiding the organizational discussion about how to leverage AI for business value. Simply having AI experts on staff and AI projects in development is no guarantee of success. Based on early adopters, AI today lends itself to effective automation of a wide range of human and machine interactions, and to boosting the performance and accuracy of software systems. But these kinds of advances must be linked with business outcomes and with metrics to measure AI's impact on those outcomes.

Virtual assistants (VAs) for customers are a good example of AI's potential and pitfalls. VAs use natural-language processing and some other AI capabilities to interact with customers. But additional AI capabilities can be leveraged to make those interactions even more useful. Via AI, the assistant leverages

what it can know about a customer's history and preferences to anticipate more accurately and more quickly what the customer desires in a given interaction, for example. However, customers expect these VAs to be effective in delivering the value that the customer prizes, otherwise AI-powered VA quickly becomes just another annoyance that undermines the customer experience and creates dissatisfaction.

Planned Research

How to apply AI in organizations will be a 2018 research priority:

- In 2Q18, we will deliver a special report on the business value of AI and in 4Q18 a special report on AI use cases, each providing specific inspirations for many different organizational strategies.
- We also will publish notes on how to establish business cases for AI, and how to characterize and measure its usefulness for executive management to understand it.
- In particular, we will address the use of AI in customer experience, which is the area of greatest interest for organizations applying AI.

How do we strategize AI?

Most organizations working with AI typically do so on a project basis, which is an inherently narrow focus. IT leaders' goal should be to normalize AI strategy development. AI is an advanced technology or, better, an advanced capability that should be evaluated, planned for, piloted and deployed just as organizations have done with other advanced technologies in the past. In the CIO survey cited above, more than a third of respondents named "defining our AI strategy" as the No. 2 challenge.

AI is ideally suited to a bimodal IT strategy. Bimodal is the practice of managing two separate but coherent styles of work: one focused on predictability; the other on exploration. Both modes are essential for creating substantial value and driving significant organizational change. Mode 1 is optimized for areas that are more predictable and well-understood. It focuses on exploiting what is known, while renovating the legacy environment into a state that is fit for a digital world. Mode 2 is exploratory, experimenting to solve new problems and optimized for areas of uncertainty. These initiatives often begin with a hypothesis that is tested and adapted during a process involving short iterations, potentially adopting a minimum viable product (MVP) approach.

Seen in terms of Mode 2, AI then becomes part of a standard approach to managing change and innovation. Organizations can incorporate their growing body of AI knowledge, experience and skills into existing IT, and business planning and budgeting processes. These processes can be linked with priority business outcomes and problems.

For example, AI creates a new challenge to conventional resource management. By creating computationally useful tokens from complex data such as speech, vision or sound, AI makes a significant demand on the rest of the software infrastructure. Deriving, via AI, a perfect transcription of a customer question is not enough. IT leaders need to tightly define the decision matrix that guides the optimal response to that question. To do so, requires not so much special new skills, but a material investment in customer service systems.

Planned Research

We have already published CDO- and CIO-targeted notes on applications of AI. In 2018, we will update and extend this coverage:

- One note will describe how to present AI opportunities to executive management.
- Other research will recommend how to avoid the AI pitfalls and how to leverage the lessons learned by early AI adopters.

Related Priorities

Table 1: Related Priorities

Priority ↓	Focus ↓
Customer Relationship Management and Customer Experience	CRM and customer experience are business strategies that optimize profitability, operational efficiency, customer satisfaction and loyalty through the implementation of customer-centric processes.
Analytics and BI Strategies	The analytics and BI strategies initiative focuses on the strategies, practices, technologies and products needed to support a variety of users across different types of business problems.
Internet of Things	Internet of Things (IoT) enables business value creation by reducing operational costs, better managing risk or developing new revenue streams via digital business models and advancing technologies.

Source: Gartner

Suggested First Steps

"Where You Should Use Artificial Intelligence — and Why" (https://www.gartner.com/document/code/328113?ref=grbody&refval=3845465)

"Hype Cycle for Artificial Intelligence, 2017" (https://www.gartner.com/document/code/314732?ref=grbody&refval=3845465)

"A Framework for Applying AI in the Enterprise" (https://www.gartner.com/document/code/336031?ref=grbody&refval=3845465)

"Survey Analysis: Enterprises Dipping Toes Into AI but Are Hindered by Skills Gap" (https://www.gartner.com/document/code/326682?ref=grbody&refval=3845465)

"The CIO's Journey to Artificial Intelligence: Learn Then Leap" (https://www.gartner.com/document/code/338461?ref=grbody&refval=3845465)

Essential Reading

"Hype Hurts: Steering Clear of Dangerous AI Myths" (https://www.gartner.com/document/code/324274?ref=grbody&refval=3845465)

"Questions to Ask Vendors That Say They Have 'Artificial Intelligence'" (https://www.gartner.com/document/code/334005?ref=grbody&refval=3845465)

"Where You Should Use Artificial Intelligence — and Why" (https://www.gartner.com/document/code/328113?ref=grbody&refval=3845465)

"Ten Ways AI Will Appear in Your Enterprise — No One Source Can Meet All Your Business Needs" (https://www.gartner.com/document/code/335052?ref=grbody&refval=3845465)

"Market Guide for Virtual Customer Assistants" (https://www.gartner.com/document/code/321124?ref=grbody&refval=3845465)

"Predicts 2018: Artificial Intelligence" (https://www.gartner.com/document/code/343423?ref=grbody&refval=3845465)

"Applying Artificial Intelligence to Drive Business Transformation: A Gartner Trend Insight Report" (https://www.gartner.com/document/code/328114?ref=grbody&refval=3845465)

Tools and Toolkits

"Toolkit: Tales From the Bleeding Edge — Trends Every Data and Analytics Leader Should Know About" (https://www.gartner.com/document/code/337214?ref=grbody&refval=3845465)

Evidence

Evidence for this research note was derived from:

Gartner's discussions with clients inquiring specifically about artificial intelligence, as well as one-to-one meetings at events and other conversations.

CIO survey: The 2018 Gartner CIO Survey was conducted online from 20 April to 26 June 2017 among Gartner Executive Programs members and other CIOs. Qualifying respondents were the most senior IT leader (CIO) for their overall organization or a part of their organization (for example, a business unit or region). The total sample is 3,160, with representation from all geographies and industry sectors (public and private). The survey was developed collaboratively by a team of Gartner analysts, and was reviewed, tested and administered by Gartner's Research Data and Analytics team (see "The 2018 CIO Agenda: Mastering the New Job of the CIO" (https://www.gartner.com/document/code/341914?ref=grbody&refval=3845465)).

Research Circle Survey: This research was conducted via an online survey from 5 to 21 April 2017 among Gartner Research Circle Members — a Gartner-managed panel composed of IT and business leaders. Gartner Research Circle IT and IT-business members were invited to participate. In total, 83 members completed the survey. Gartner Research Circle IT and IT-business members were invited to participate. The

survey was developed collaboratively by a team of Gartner analysts, and was reviewed, tested and administered by Gartner's Primary Research team.

Document Revision History

Artificial Intelligence Primer for 2017 - 3 February 2017 (https://www.gartner.com/document/code/318582?ref=ddrec)

Smart Machines Primer for 2016 - 8 March 2016 (https://www.gartner.com/document/code/301312?ref=ddrec)

Recommended For You

Predicts 2018: Artificial Intelligence (https://www.gartner.com/document/3827163?ref=ddrec&refval=3845465)

Questions to Ask Vendors That Say They Have 'Artificial Intelligence' (https://www.gartner.com/document/3779264?ref=ddrec&refval=3845465)

Predicts 2018: AI and the Future of Work (https://www.gartner.com/document/3833572?ref=ddrec&refval=3845465)

The CIO's Journey to Artificial Intelligence: Learn Then Leap (https://www.gartner.com/document/3787067?ref=ddrec&refval=3845465)

Seven Factors That Make Business Cases for Artificial Intelligence Projects Different (https://www.gartner.com/document/3854974?ref=ddrec&refval=3845465)