

The Fundamentals of AI Success for Data and Analytics Leaders

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The wondrous stories of artificial intelligence may lure data and analytics leaders into projects that have unrealistic expectations, indefinite timelines and dubious business value. A better near-term route to value is capitalizing on human and machine symbiosis, while applying top use cases.

Key Findings

- Many believe that artificial intelligence (AI) will result in mass joblessness or that it is a replacement for human intelligence — neither are true. The dystopian idea that AI will replace human intelligence is nowhere in sight as a reality, and people play a critical role in AI's success.
- AI presents opportunities to enable human and machine symbiosis where it is possible to do more together than either can do on their own.
- Enterprises that are at the beginning of their AI journey can increase their likelihood of success by pursuing the most practical applications of AI and recapitulating use cases of others that are leading the way.

Recommendations

Data and analytics leaders (including chief data officers) in charge of data and analytics programs should take these first steps to apply AI:

- Use AI to observe and imitate human actions by using intelligent automation, virtual agents and chatbots to take over repetitive human tasks and free up humans for value-added activities.
- Infuse insights into decision making by applying classic statistical and analytical techniques, and when appropriate, use deep learning to uncover insights possible only with AI.
- Proceed with caution when using AI to monetize domain knowledge by using infonomics to identify opportunities with the most economic potential and then assessing the deep learning competencies required for success.

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Strategic Planning Assumptions

Through 2022, AI will be a major battleground for technology leadership.

By 2021, 40% of new enterprise applications implemented by service providers will include AI technologies.

By 2020, 25% of customer service and support operations will integrate smart technology virtual customer assistants across engagement channels.

Analysis

The Symbiosis of Humans With AI Will Profoundly Reshape Work

Not a day passes without an article referring to AI's potential virtues and dangers. The stories tap into long-held management beliefs — and worker fears — that automation will reach its apex with

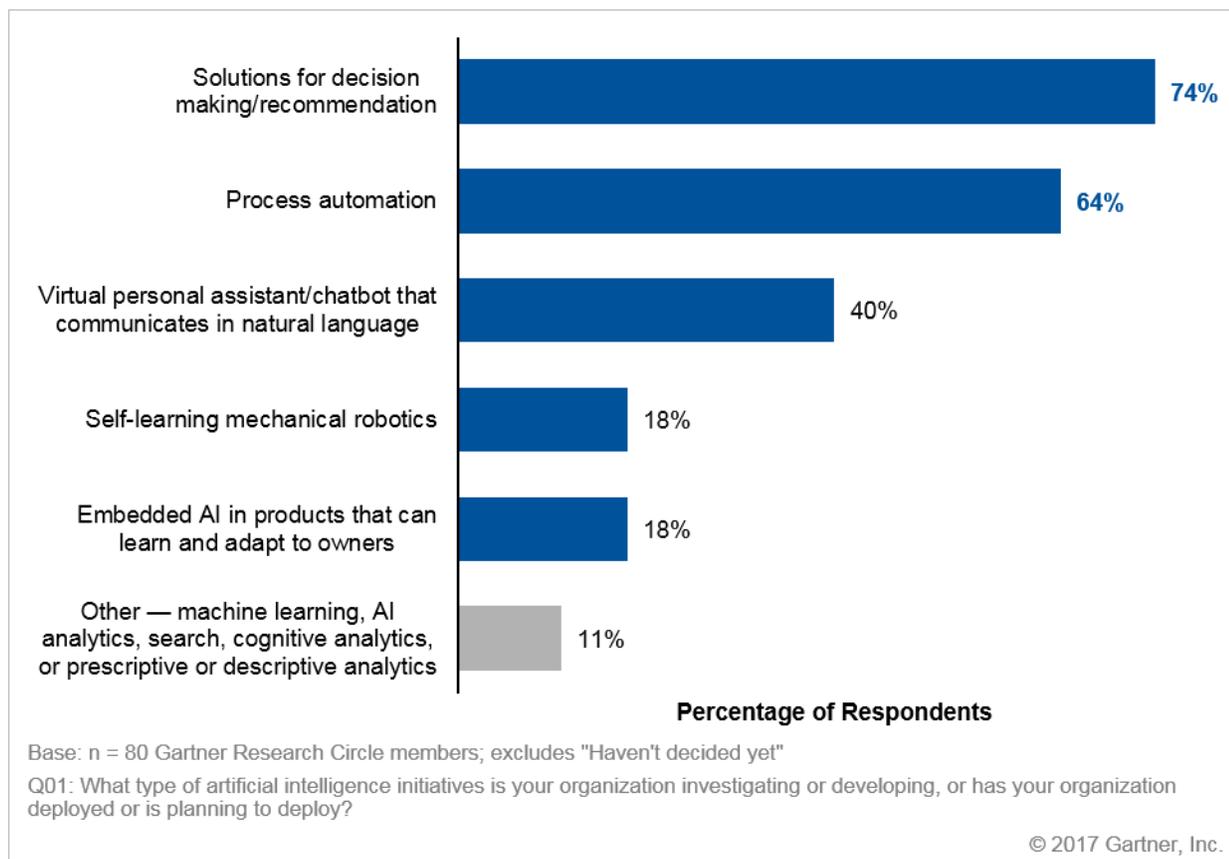
the complete removal of human effort. The stories also rely on the dystopian promise that AI will soon attain humanlike intelligence that can apply intelligence to any problem it confronts; exhibit consciousness; and have a sense of self, situational awareness and the ability to reason its way through novel situations. These extreme cases are false — some jobs will certainly disappear, but a world filled with AI overlords is nowhere in sight.

These and other forms of AI hype distract organizations from achieving the most benefit from AI investment (see "Hype Hurts: Steering Clear of Dangerous AI Myths"). AI is not general intelligence, and "an AI" will not be replacing people any time soon. On the contrary, people are a critical part of AI success, especially in defining goals and grooming AI to achieve business objectives. While AI may be able to take on repetitive and mundane tasks that free up humans for other activities, the symbiosis of humans with AI is more nuanced, allowing both to perform activities that are not easily performed by the other.

To increase the likelihood of success, organizations should look for opportunities to do more with humans and machines than either can do on their own. This isn't just an altruistic battle cry. Instead, it is a direction seated in the practicality of AI advancements to date and for the foreseeable future. Most organizations may not pursue the leading-edge uses of AI, such as building robots and self-driving cars. Increasingly, though, AI will inject insights into everyday decision-making activities and fundamentally change how people work.

A recent Gartner Research Circle survey shows the types of AI applications that organizations have deployed or are planning to deploy (see Figure 1).¹

Figure 1. Types of AI Applications That Organizations Have Deployed or Are Planning to Deploy



Source: Gartner (August 2017)

Improving decision making and process automation can be interpreted as classic examples of automation. But as organizations begin to consider more symbiotic uses of AI, they will be less likely to simply replicate the steps that a human performs to reach a particular judgment, and will instead use the relative strengths and weaknesses of both to maximize value generation. Doing this will radically reshape work. Keeping this in mind, we see many AI opportunities falling into the following three areas:

- Uncovering patterns to mimic human action, automate processes and free up people to create additional business value
- Exposing insights for decision making
- Capturing and sharing domain knowledge to monetize it internally and externally

AI Can Uncover Patterns to Mimic Human Action, Automate Processes and Free Up People to Create Additional Business Value

Automation is a classic cause for any technology. Yet, AI makes automation of repetitive tasks more feasible, but not magical. The ability to automate human interactions is enabled by digital platforms

that foster the creation of the domain data and the metadata about how the organization is currently executing business. This data becomes the fuel for machine-executed tasks and the insights to reinvent flows. Humans benefit from the insights, predictions and individual tasks performed by the digital counterparts, and the machine benefits from the domain data and metadata thrown off during the flow of work. This allows humans to focus more on the most important aspects of a job, and allows algorithms to increase their capacity to render specific insights with more learning.

Falling into this category are the top AI application areas of process automation, the use of virtual personal assistants or chatbots, and embedded AI in products that adapts to owners. When tools like robotic process automation (RPA) tools are combined with machine learning, it can be used to discover work patterns and rules, allowing machines to take over tasks. This type of implementation is more broadly characterized in the service sector as intelligent automation. AI can be used to discover patterns in enormous amounts of data, learn from past projects and libraries of artifacts, recommend best practices, and automate routine knowledge worker tasks (see "Market Trends: Five Emerging Artificial Intelligence Use Cases Fuel IT Services Opportunities for Intelligent Automation"). Similarly, products that have AI can learn workers' routines and adapt their usage to workers' patterns.

Beyond RPA, buyers are exploring many use cases that benefit from using AI technologies, such as the use of virtual agents and chatbots to take over parts of human interactions. In general, these approaches may allow the reduction of human effort, but many organizations don't see it purely as a cost reduction activity and, instead, hope to permit staff to do other value-added tasks. For example, one customer service organization used the combination of chatbots, natural-language processing and RPA to reduce the number of password resets performed by the agents, thus permitting them to focus on their primary role of delivering financial advice. Similarly, for all but the most repetitive task-oriented activities, AI will be a force multiplier for many organizations, rather than a way to simply reduce staff. Emerging use cases in this area are noted in Figure 2.

Figure 2. Emerging AI Use Cases for Mimicking Human Action and Automating Process

Use Case	What It Is		Example	Value Driver
Virtual Agents	Chatbots that use text or voice to communicate with users in natural language. They understand language, not just commands, and continuously get smarter as they learn from conversations they have with people.	Personal	Virtual personal assistants (VPAs) — calendar management; vacation planner; smartphone messaging apps and apps powered by Siri, Alexa or Cortana	<ul style="list-style-type: none"> ▪ Increasing productivity ▪ Novelty ▪ Ease of use
		Corporate	<ul style="list-style-type: none"> ▪ Call center virtual agents ▪ Technical support agents ▪ Recruitment agents ▪ Robot financial advisors 	<ul style="list-style-type: none"> ▪ Increasing productivity ▪ Scaling up expertise ▪ Improving customer experience ▪ Reducing costs
Process Optimization	AI technologies that automate tasks or optimize business processes that are internal to an organization.		<ul style="list-style-type: none"> ▪ Processing handwritten forms or images ▪ Translating voice to text and vice versa ▪ Automating a large volume of routine work ▪ Making decisions on approval, routing, next steps and other workflow 	<ul style="list-style-type: none"> ▪ Increasing productivity ▪ Scaling up expertise ▪ Reducing costs

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Source: Gartner (August 2017)

The following research relates to pursuing near-term opportunities to mimic human actions:

- "Market Guide for Robotic Process Automation Software"
- "Robotic Process Automation: Eight Guidelines for Effective Results"
- "Use Cases for Robotic Process Automation: Providing a Team of 'Virtual Workers'"
- "Four Use Cases for Chatbots in the Enterprise Now"
- "Market Guide for Virtual Customer Assistants"
- "Conversational AI to Shake Up Your Technical and Business Worlds"
- "Enterprises Must Prepare 'Now' for the Disruptive Power of Conversational AI Platforms"
- "Architecture of Conversational Platforms"

AI Can Expose Insights for Decision Making

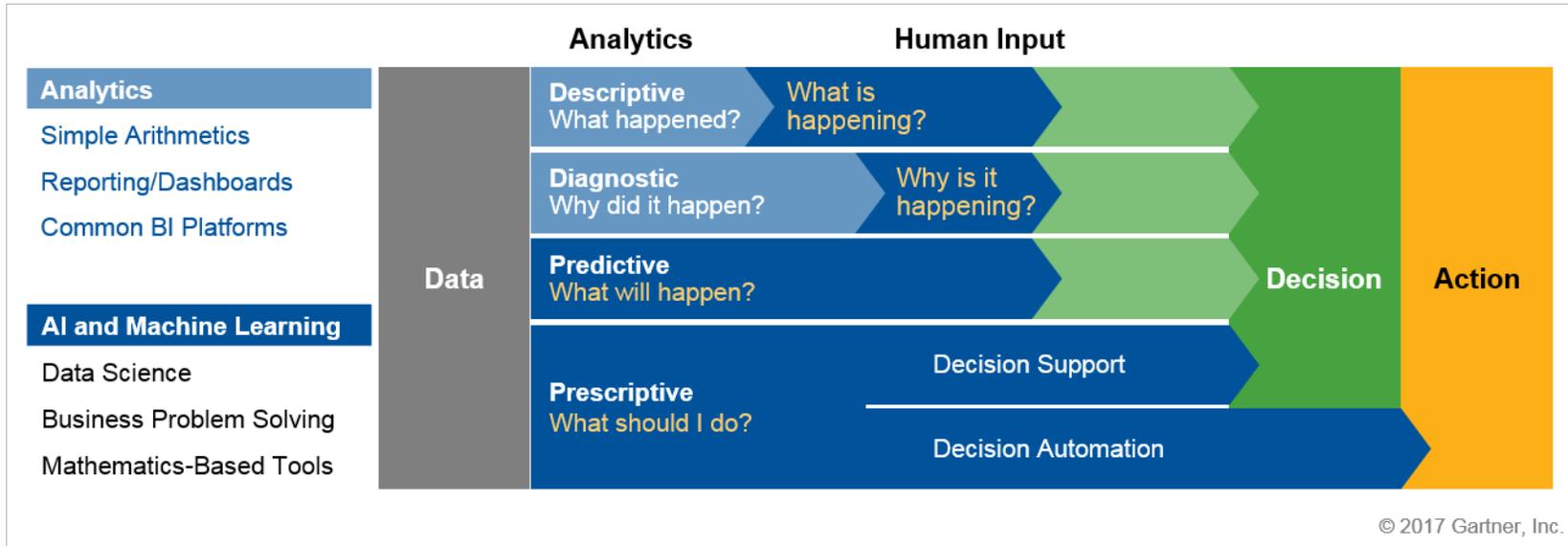
The most popular of the top AI application areas is seeking solutions that explore insights and recommendations for decision making. This is not surprising, since there is a vast realm of potential beyond automating tasks. Custom-developed and purchased solutions will routinely augment human decisions with AI-created insights — specifically, insights that machines are much more

capable of making, relative to their human counterparts. This is especially enabled by machine learning capabilities and the ability to uncover advanced analytical insights.

This is one of the largest landscapes of potential uses for AI and, obviously, a massive focus for data and analytics leaders. As recommended in "Combine Predictive and Prescriptive Analytics to Drive High-Impact Decisions," analytics leaders should bring together two distinct, but synergistic, data science techniques to drive high-impact decisions:

- **Predictive analytics**, which addresses the descriptive observation — "What is happening?" — and the questions "Why is it happening?" and "What is likely to happen?" It relies on techniques such as predictive modeling, regression analysis, forecasting, multivariate statistics, pattern matching, and increasingly, machine learning.
- **Prescriptive analytics**, which addresses the questions "What should be done?" or "What can we do to make 'X' happen?" It relies on techniques such as graph analysis, simulation, complex-event processing, recommendation engines, heuristics, and increasingly, neural networks and machine learning. See Figure 3.

Figure 3. Insights From Predictive and Prescriptive Analytics



BI = business intelligence

Source: Gartner (August 2017)

The pursuit of these types of opportunities need not involve AI. Organizations should consider classic statistical and analytical techniques before thinking about pursuing more-complex techniques like deep learning, but deep learning in particular is expanding possibilities because of its ability to deal with massively complex and diverse data. Some examples of how organizations are using this capability are noted in Figure 4.

Figure 4. Emerging AI Use Cases for Exposing Insights for Decision Making

Use Case	What It Is	Example	Value Driver
Decision Making	Learning systems that use data mining and pattern recognition across a huge amount of data to produce insights, provide personalization, predict events and make probabilistic recommendations. Algorithms learn and adapt from new data to become better and more accurate over time.	<ul style="list-style-type: none"> ▪ Automating high-volume expert decisions ▪ Fraud detection ▪ Customer churn ▪ Credit risk ▪ Sentiment analysis ▪ Recommendation or personalization engines ▪ Dynamic pricing ▪ Forecasting costs, revenues 	<ul style="list-style-type: none"> ▪ Better decisions ▪ Reducing costs ▪ Increasing revenues ▪ Reducing risks

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Source: Gartner (August 2017)

Some research related to starting a pursuit of this broad area of potential includes the following:

- "Domain Analytics: Harnessing the Pervasive Nature of Analytics"
- "Augmented Analytics Is the Future of Data and Analytics"
- "How to Be Agile With Business Analytics"
- "Organizing Your Teams for Modern Data and Analytics Deployment"
- "Doing Machine Learning Without Hiring Data Scientists"
- "Critical Capabilities for Business Intelligence and Analytics Platforms"
- "Develop Good Decision Models to Succeed at Decision Management"
- "How to Leverage Events to Empower Decisions in Business Real Time"
- "Hype Cycle for Analytics and Business Intelligence, 2017"
- "Rebalance Your Integration Effort With a Mix of Human and Artificial Intelligence"

AI Can Capture and Share Domain Knowledge to Monetize It Internally and Externally

The third opportunity area is where domain expertise becomes embedded in a platform that can be used to empower others with knowledge they do not possess, and this is represented in the top AI

application areas by cognitive analytics. It differs from exposing insights for decision making in that the goal is to capture a complete (but very narrow) slice of domain knowledge to render a likely answer. For example, a deep learning algorithm created by Stanford Artificial Intelligence Laboratory can identify skin cancer as well as trained dermatologists can, based on the input of a picture taken by anyone with a smartphone.²

These types of opportunities are not trivial to address, and beyond requiring data science skills, they require a massive amount of domain knowledge and countless iterations to get a desired outcome. In the Stanford example, the researchers had nearly 130,000 skin disease images — and the knowledge to classify the images — that they used to train and gradually improve their algorithm to visually diagnose potential cancer. This is a very advanced capability, but organizations can take action now to identify and prepare for opportunities.

Deep learning is a critical part of these endeavors. Deep learning expands standard machine learning by allowing intermediate representations to be discovered. These intermediate representations allow more-complex problems to be tackled and other problems to be potentially solved with higher accuracy, fewer observations and less cumbersome manual fine-tuning. With deep learning, a computer model can be fed lots of complex data, such as images, speech and text, to "figure out" on its own which patterns are important in the data. Several problems that lend themselves to deep learning are shown in Table 1.

Table 1. A Broad Range of Problems Lend Themselves to Deep Learning

Type of Problem	Inputs	Outputs
Medical diagnosis	<ul style="list-style-type: none"> ■ Two-dimensional image pixel data from a retinal scan 	Likelihood that the retina exhibits signs of a specific disease
Demand prediction	<ul style="list-style-type: none"> ■ Market situation 	Amount of products in a given category projected to be sold in the next time frame
Propensity to buy	<ul style="list-style-type: none"> ■ Customer profile ■ Recent transactions 	Likelihood that customers with a given customer profile will accept a specific product offer
Customer churn	<ul style="list-style-type: none"> ■ Customer profile ■ Vector describing recent transactions and customer engagements ■ Customer engagements 	Likelihood that a customer may decide to discontinue an ongoing contract

Source: Gartner (August 2017)

This is not an area where organizations dive right in as their first foray into AI. These implementations require a lot of work, both at the start and over time. For example, creating and managing the corpus (body of information, training and test dataset) is one of several activities that must be done well. It requires data collection, curation, tagging, the separation of training and testing sets, and corpus life cycle management. And that is only the beginning.

The construction of a virtual agent requires analysis, model building, training, testing, deployment, monitoring, modification and life cycle management. It requires a commitment to ongoing, extensive, costly, multiphase activities, which are done without a precise set of engineering specifications or comprehensive automation tools. Organizations should use "Innovation Insight for Deep Learning" to understand the competencies necessary to train a system such as an AI-based expert advisor.

Instead, a practical step toward this end goal is to begin by applying infonomics and assessing data assets to determine how monetization of domain knowledge would render an economic value. Finding these opportunities, quantifying the potential value and making a determination of what it would take to pursue the opportunity are necessary parts of any business case.

Gartner has long argued that information should be considered an acknowledged corporate asset — at least for internal purposes (see "Maverick* Research: The Birth of Infonomics, the New Economics of Information"). Infonomics provides a way to begin the conversation about increasing the value of domain knowledge to improve internal outcomes, as well as to examine the potential external economic value associated with a product or service that would embody such knowledge. A variety of information valuation models developed in collaboration with clients, accountants and valuation experts are provided in "Why and How to Measure the Value of Your Information Assets."

Rather than diving head first into murky water associated with the area of AI opportunity, organizations should use these valuation approaches first to determine the potential value associated with monetizing the enterprise domain knowledge.

Additional research to consider for this opportunity includes:

- "How to Start a Machine-Learning Initiative With Less Anxiety"
- "Machine Learning: FAQ From Clients"
- "How CIOs and CDOs Can Use Infonomics to Identify, Justify and Fund Initiatives"
- "Seven Steps to Monetizing Your Information Assets"

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

"A Chief Data Officer's Guide to an AI Strategy"

"Chief Data Officer Desk Reference for Artificial Intelligence"

"Four Data Management Best Practices for AI"

"Develop Your Artificial Intelligence Strategy Expecting These Three Trends to Shape Its Future"

"Cool Vendors in AI Core Technologies, 2017"

"Top 10 Strategic Technology Trends for 2017: Artificial Intelligence and Advanced Machine Learning"

"Predicts 2017: Artificial Intelligence"

"Are Your Algorithms Ethical? Look to Examples of Dynamic Pricing for Guidance"

"Seek Diversity of People, Data and Algorithms to Keep AI Honest"

"Must-Have Roles for Data and Analytics, 2017"

Evidence

¹ Research conducted via an online survey from 5 April 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, and in total, 83 members completed the survey.

² T. Kubota. ["Deep Learning Algorithm Does as Well as Dermatologists in Identifying Skin Cancer."](#) Stanford News Service. 25 January 2017.

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