

Forecast: The Business Value of Artificial Intelligence, Worldwide, 2017-2025

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Artificial intelligence technologies are causing technology strategic planners to redraw near-term and long-term product plans. AI will be pervasive by 2020. Gartner's forecast of AI business value, broken down by type of AI, serves as an invaluable guide to R&D investment.

Key Findings

- Artificial intelligence (AI) business value growth will slow from 2018 through 2025 — dropping from a peak of 70% to 7% by 2025; enterprises between 2017 and 2022 will use niche solutions that address one need very well.
- AI agents have a first-mover advantage that will last only until 2019, when decision support/augmentation will overtake and remain the largest type of AI by business value-add.
- Customer experience represents the majority of business value through 2020, when new revenue takes over to gain prominence for the next five years. Cost reduction, while important, will not be a point of differentiation from most products and with most users.
- By leveraging the increasing amount of data available through Internet of Things (IoT), the heavy industry sector leads in derived business value from AI.

Recommendations

Technology strategic planners seeking to identify growth opportunities in AI across the IT market should:

- Ensure that development of AI products and services are small, focused and targeted.
- Focus new AI development on decision support/augmentation, which derives the largest business value for users and faces the fewest early barriers to adoption.
- Base product differentiation on customer experience now before shifting to revenue growth by 2020.

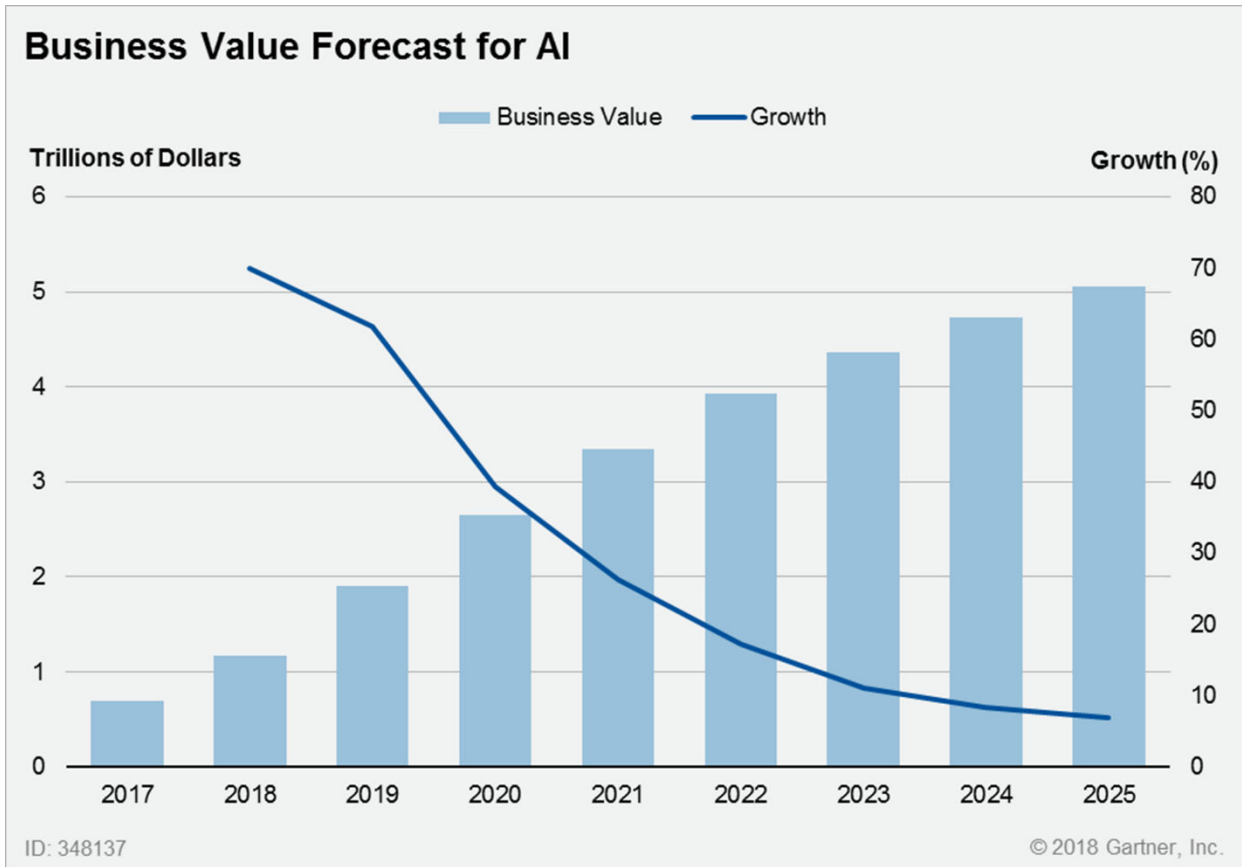
- Target industries with existing large amounts of data — so much that humans can't possibly analyze or understand it on their own — as the early adopters of AI.

Forecast Data

This document was revised on 14 March 2018. For more information, see the [Corrections](#) page on gartner.com.

Figure 1 shows the business value forecast for AI from 2017 through 2025. Table 1 shows the forecast of global AI-derived business value.

Figure 1. AI Business Value Forecast, 2017-2025



Source: Gartner (March 2018)

Table 1. Forecast of Global AI-Derived Business Value, 2017-2025

	2017	2018	2019	2020	2021	2022	2023	2024	2025
Business Value (Billions of Dollars)	692	1,175	1,901	2,649	3,346	3,923	4,358	4,725	5,052
Growth		70%	62%	39%	26%	17%	11%	8%	7%

Source: Gartner (March 2018)

Analysis

AI promises to be the most disruptive class of technologies during the next 10 years due to advances in computational power, volume, velocity and variety of data, as well as advances in deep neural networks (DNNs). AI comes in two forms — quantitative techniques that can predict behavior from data; and neural network techniques that can classify complex objects, such as images, video, speech and sound. Organizations using AI technologies can harness data to both extract new insights from data and automate processes that are uneconomical applications for the human labor that is otherwise needed to perform the process. Any industry with very large amounts of data — so much that humans can't possibly analyze or understand it on their own — can utilize AI. Some industries, such as healthcare, are ripe for disruption. AI applications will bring new levels of customer service, decision quality, scale and operational efficiency to processes formerly operated by human labor.

AI business value growth (see the Business Value-Add Forecast Approach section) shows the typical S-shaped curve pattern associated with an emerging technology (as shown in Figure 1). In 2017, the growth rate was estimated to be at 70%, but it will quickly drop to 39% in 2020. After 2020, the curve will flatten, resulting in a low growth rate of 7% in 2025. The business value attributable to using AI will come from the following:

- Efficiency gains
- Creation of insights that personalize the customer experience
- New automated processes that reduce friction and improve business efficiency

AI systems will enhance customer engagement and commerce, expand revenue-generating opportunities, and enable new business models driven by data insights.

Key points in the evolution of AI are:

- By 2020, AI technologies will be virtually pervasive in almost every new software product and service.
- In 2020, AI will become a positive net job motivator, creating 2.3 million jobs, while only eliminating 1.8 million jobs.

- In 2021, AI augmentation will generate \$2.9 trillion in business value and recover 6.2 billion hours of worker productivity.
- Through 2022, more than 90% of AI technologies in use in enterprises will be embedded in broader products, not assembled or created from scratch by the enterprise itself or its agents.

One of the biggest aggregate sources for AI-enhanced products and services acquired by enterprises between 2017 and 2022 will be niche solutions that address one need very well. Business executives will drive investment in these products, sourced from thousands of narrowly focused, specialist suppliers with specific AI-enhanced applications.

This AI report is based on the value an enterprise will receive for using AI in a production system. Within this document, we will parse that overall global value four ways — the type of AI, the source of business value, business value by geography and business value by vertical industry. Each segmentation reveals its own insights: AI is a complex market, and there are many ways to view how this market will evolve. First up is AI type, which includes decision support/augmentation, agents, decision automation and smart products.

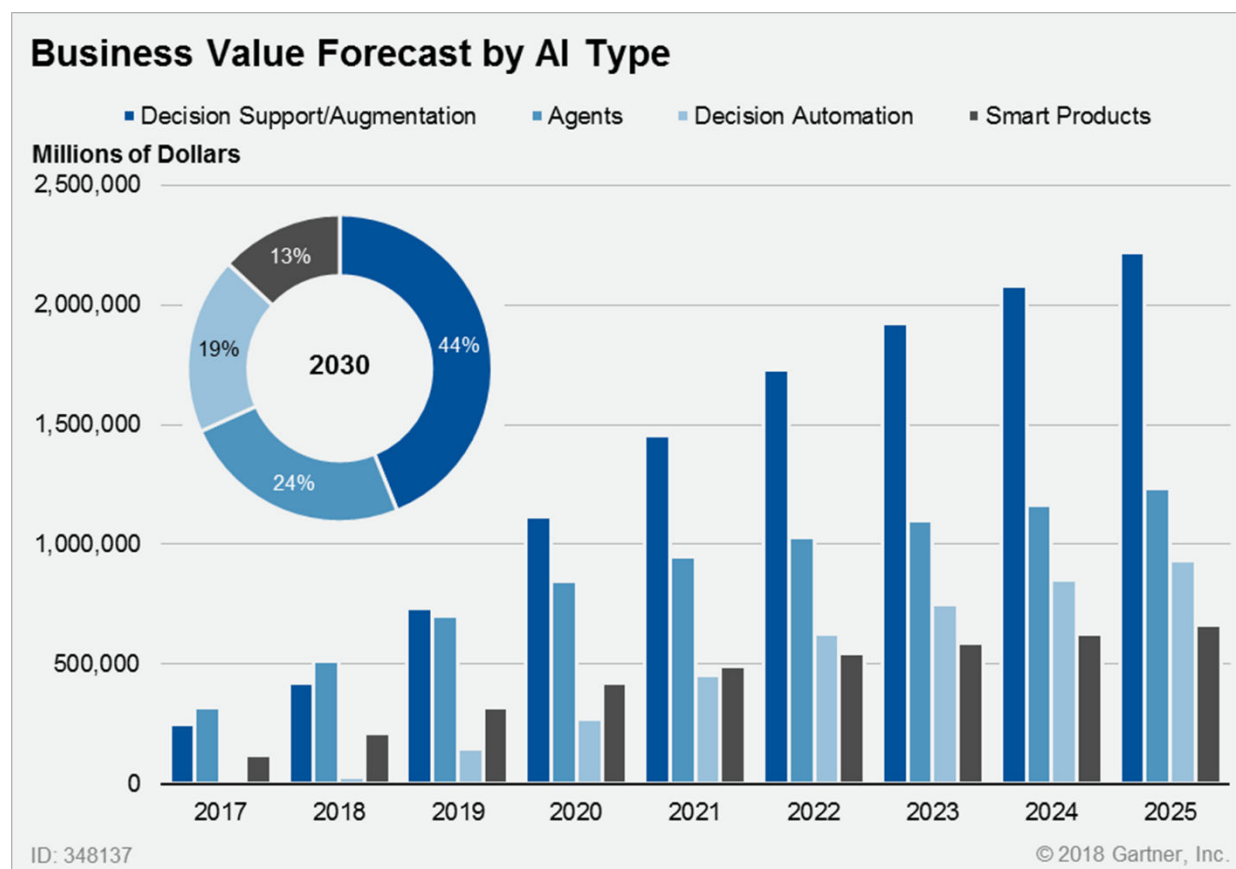
The Four Types of AI

Decision Support/Augmentation

Breaking out the global business value derived by AI type, decision support/augmentation will represent 36% of the global AI-derived business value in 2017. By 2030, decision support/augmentation will surpass all other types of AI initiatives to account for 44% of the global AI-derived business value (see Figure 2).

The use of DNNs in decision support/augmentation enhances AI systems built on traditional analytics and statistical techniques, which are well-established for improving the quality of business decisions. DNNs allow organizations to perform data mining and pattern recognition across huge datasets not otherwise readily quantified or classified, creating tools that classify complex inputs that then feed traditional programming systems. These systems can produce insights, provide personalization, predict events and make probabilistic recommendations at a greater scale than traditional technologies. The improved classification of complex inputs enables algorithms for decision support/augmentation to work directly with information that formerly required a human classifier. Such capabilities have a huge impact on the ability of organizations to automate decision and interaction processes. This new level of automation reduces costs and risks, and enables, for example, increased revenue through better microtargeting, segmentation, marketing and selling.

Figure 2. Business Value Forecast by AI Type, 2017-2025



Source: Gartner (March 2018)

Agents

Agents use text or voice to communicate with users in natural language. Made popular by AI agents like Amazon's Alexa and Microsoft's Cortana, they are seemingly ubiquitous in messaging apps. They can reliably convert the spoken word into text, capturing other attributes from the user's speech — such as frustration. However, capturing words and even intent are only part of the problem. Today, customer service applications still require manual coding to correctly deal with the far better extraction of intent that is possible with previous systems. Once implemented correctly, however, automated systems will deal with several steps of a customer interaction. These systems will rapidly capture identifying information and the nature of the problem, as well as and examine possible resolutions without engaging a human agent. Customers will find this experience efficient compared with the use of a human operator, and they will rapidly connect to a human who can resolve harder problems in one step.

These systems drive consistent results in one domain or a few domains. They can also handle multiple languages, although different cultures and languages will materially affect decision trees. Virtual agents allow corporate organizations to reduce labor costs as they take over simple requests

and tasks from call center, help desk and other service human agents, while handing over the more complex questions to their human counterparts. They can also provide uplift to revenue, as in the case of roboadvisors in financial services or upselling in call centers. As virtual employee assistants, virtual agents can help with calendaring, scheduling and other administrative tasks, freeing up employees' time for higher value-add work and/or reducing the need for human assistants. Agents account for 43% of the global AI-derived business value in 2017 and 24% by 2030, as other AI types mature and contribute to business value.

Decision Automation

Decision automation systems use AI to automate tasks or optimize business processes. They are particularly helpful in tasks like translating voice to text and vice versa, processing handwritten forms or images, and classifying other rich data content not readily accessible to conventional systems. Statistical techniques can automate routing, recommend next steps or instantiate other workflows, based on heuristics that improve over time with experience. Decision automation is an appropriate solution when there is some ambiguity, as well as when big datasets and nonquantitative data objects are involved. Strictly rule-based repetitive processes with structured data can be solved by simpler robotic process automation (RPA). As unstructured data and ambiguity are the staple of the corporate world, decision automation — as it matures — will bring tremendous business value to organizations. For now, decision automation accounts for just 2% of the global AI-derived business value in 2017 but will grow to 19% by 2030.

Smart Products

Smart products accounts for 18% of the global AI-derived business value in 2017 but will shrink to 13% by 2030 as other DNN-based system types mature and overtake smart products in their contribution to business value. Smart products have AI embedded in them, usually in the form of cloud systems that can integrate data about the user's preferences from multiple systems and interactions. They learn about their users and their preferences to hyperpersonalize the experience and drive engagement. A subset of smart products is mechanical robots with embedded AI that use sophisticated models to move in, and interact with, the robots' environment. Examples include autonomous vehicles and factory robots, which eliminate the need to put humans at risk in dangerous environments, as well as help with cost cutting. Humanoid robots like SoftBank's Pepper can communicate through emotion, speech or body language, as well as can classify tone of voice. They have been piloted in roles like hotel receptionist, hospital concierge and caregiver for the elderly.

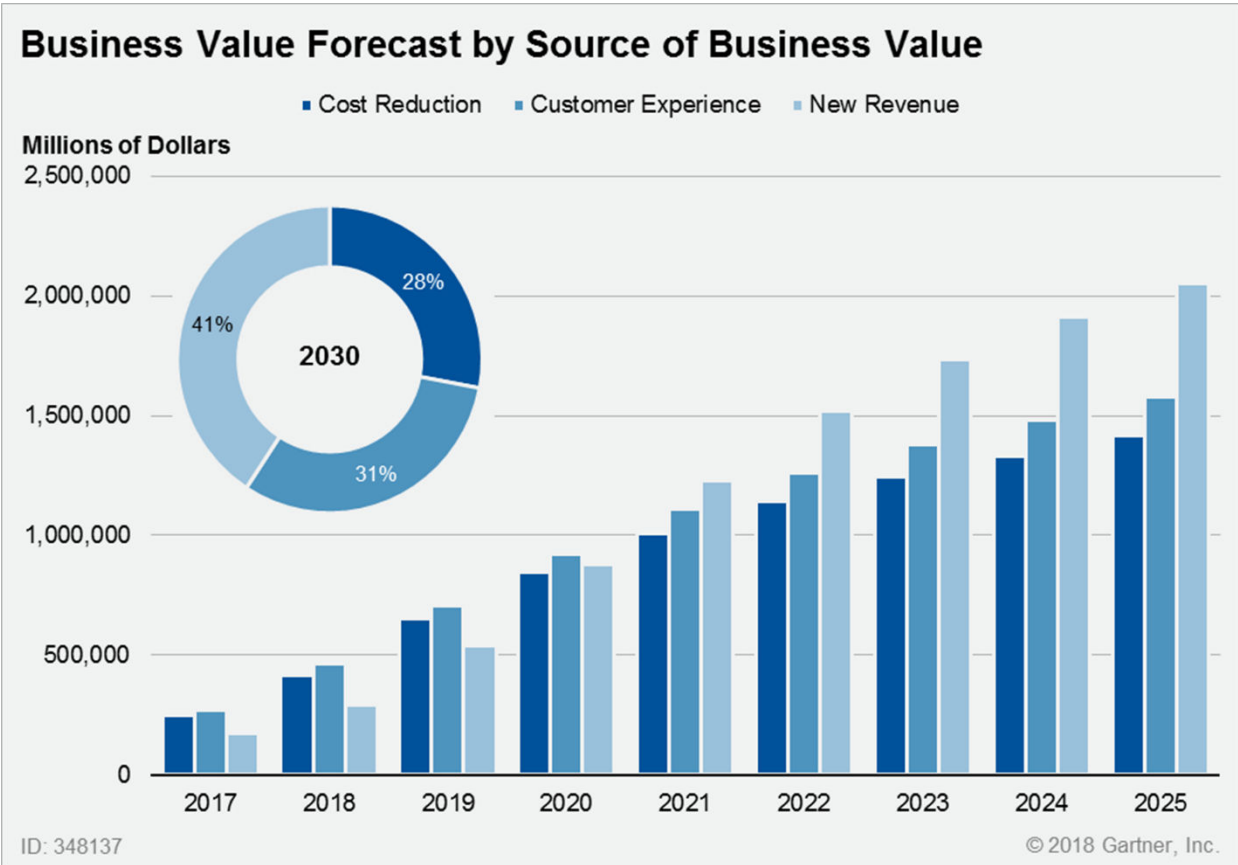
The Source of Business Value

Three different sources of AI business value (see Figure 3) include customer experience, new revenue and cost reduction:

- Customer experience: The positive or negative effects on indirect cost. Customer experience is a necessary precondition for widespread adoption of AI technology to both unlock its full potential and enable value.

- New revenue: Increasing sales of existing products and services, and/or creating new product or service opportunity beyond the existing situation.
- Cost reduction: Reduced costs incurred in producing and delivering those new or existing products and services.

Figure 3. Business Value Forecast by Source of Business Value, 2017-2025



Source: Gartner (March 2018)

Customer Experience

In the early years of AI, customer experience (CX) is the primary source of derived business value, as organizations see value in using AI techniques to improve every customer interaction, with the goal of increasing customer growth and retention. CX is followed closely by cost reduction, as organizations look for ways to use AI to increase process efficiency to improve decision making and automate more tasks. However, in 2021, new revenue will become the dominant source, as companies uncover business value in using AI to increase sales of existing products and services, as well as to discover opportunities for new products and services. Thus, in the long run, the business value of AI will be about new revenue possibilities.

New Revenue

New revenue derived from AI is much lower than the other business value sources, primarily because it is often difficult for organizations to determine how their AI investments initially can be used to directly impact sales of products and services. Instead, organizations see business value in using AI to improve CX. In fact, Gartner survey results highlight that CX is currently a top priority for CEOs, who are increasing investment in projects that improve the experience of customers interacting with their organization. (For more information, see "Survey Analysis: Customer Experience Innovation 2017 — AI Now on the CX Map.") As AI becomes widely used for CX, it becomes easier to sell products and services. Organizations are able to better contextualize the buying experience by understanding when a customer is in a buying mode and recommending the right product or service and at the right place and time, increasing the probability of a sale. Furthermore, human resources freed from frontline customer service can be retrained to deliver better customer interactions. And, as AI is used over time to understand customer preferences and behaviors, the technology can identify new product and service offerings to generate new revenue streams.

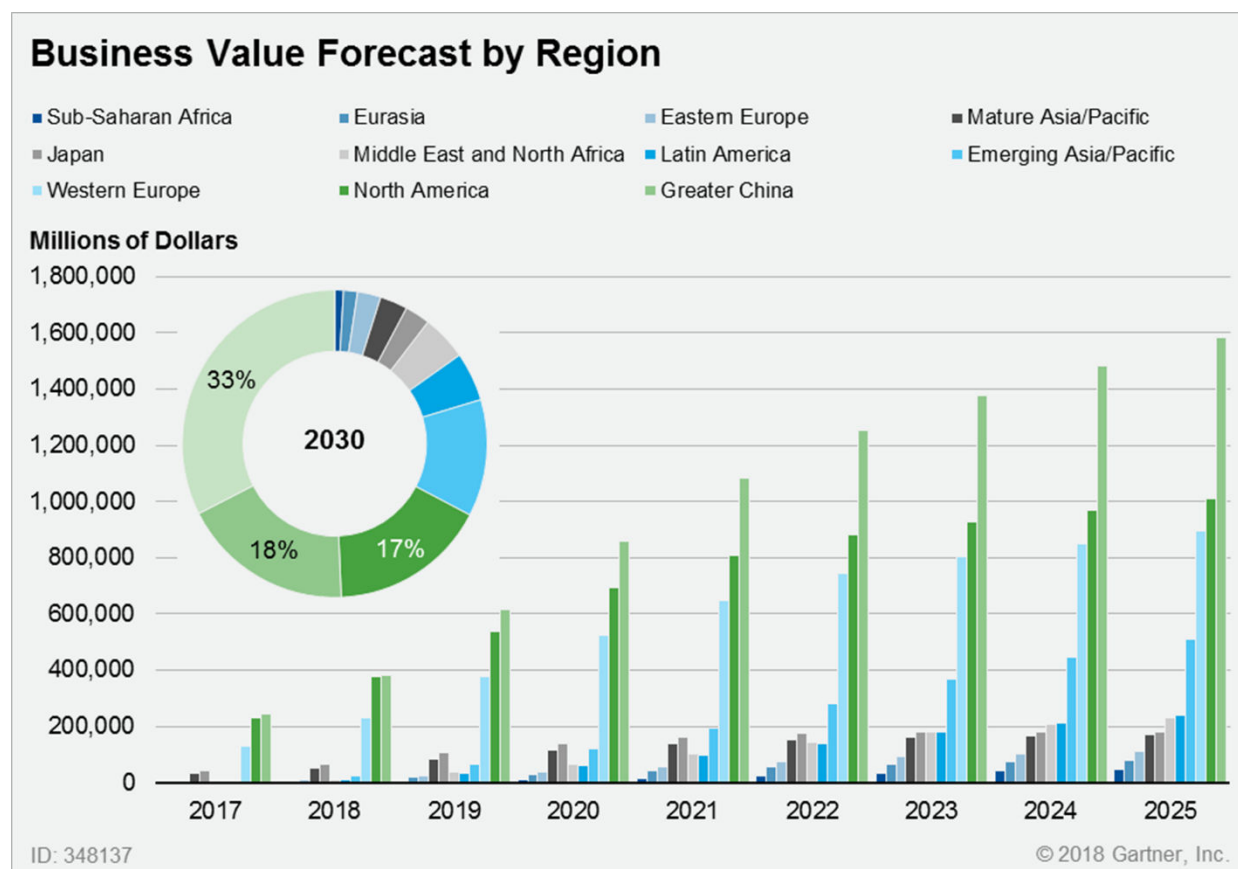
Cost Reduction

Cost reduction is a close second to CX until 2020, when new revenue rises significantly. Reducing costs is a safe way to start experimenting with any technology, as it's far easier to predict and track cost reductions than it is to predict and track new revenue opportunities. However, the potential for AI is far broader than cost reduction, particularly once speech interpretation and generation technologies mature further, and drive ever-advancing customer service applications.

Business Value by Geography

The Greater China region leads throughout the forecast period, although only by a whisker until 2019. North America is a third of business value in 2018, dropping to a fifth by 2025 and finishing the forecast period as 18.2% of the total (see Figure 4). Emerging Asia/Pacific is the fastest-growing region, going from 0.2% in 2017 to fourth position at 12.3% by 2030. Both Latin America, and the Middle East and North Africa grow from less than 0.5% to 5% in the same time frame. Decision support/augmentation and decision automation accelerate more quickly in mature regions, where there is a significant level of automation already present — these take longer to impact the emerging regions.

Figure 4. Business Value Forecast by Region, 2017-2025



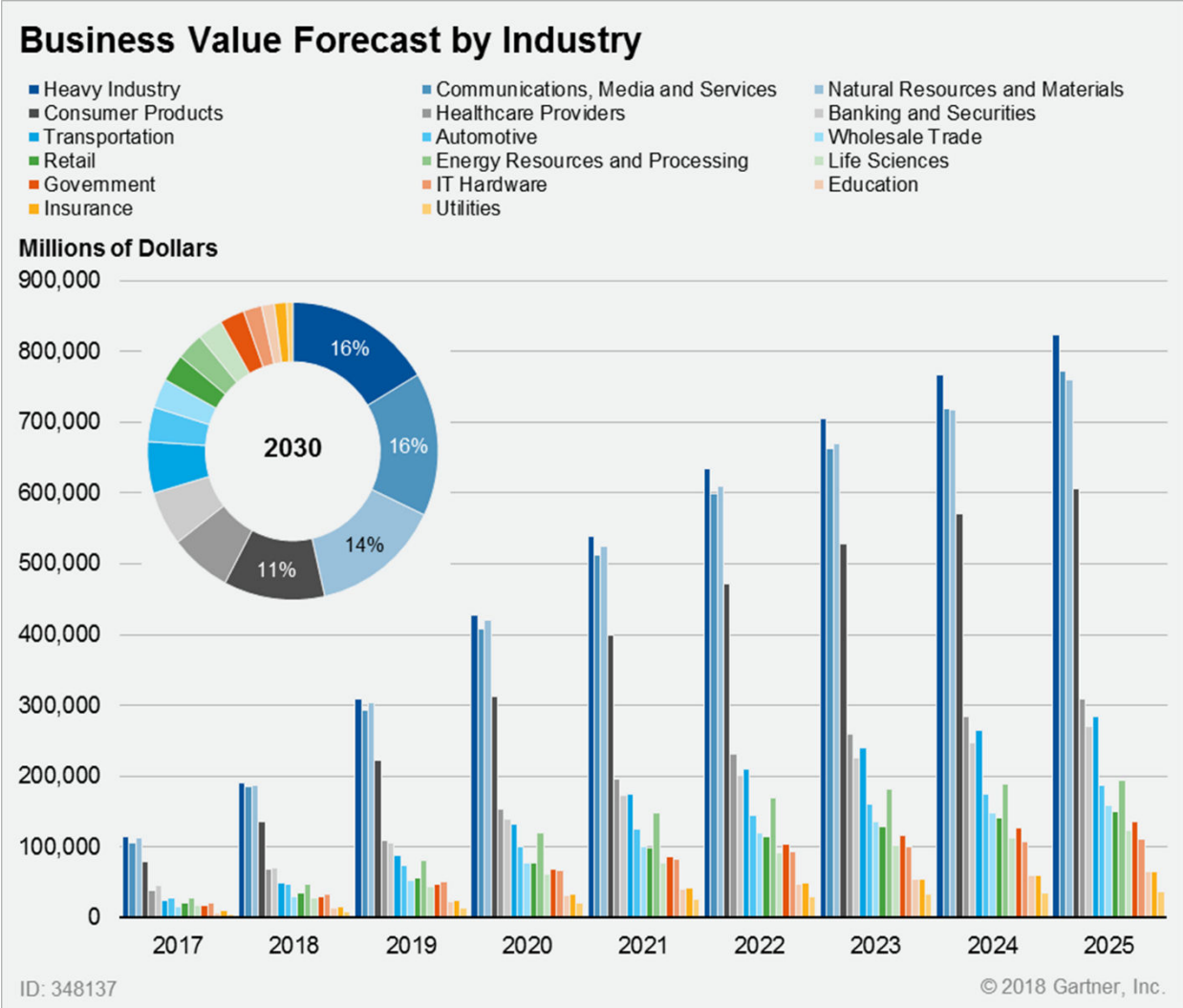
Source: Gartner (March 2018)

Business Value by Industry

Adoption and value from AI will be based on bringing differentiated business value to operations within a vertical — not generically across all verticals. For this reason, there are only modest fluctuations in the proportion of business value from AI generated by each individual industry.

The heavy industry sector leads from 2017 throughout the forecast period (see Figure 5). The transportation and construction organizations are focused on becoming more data-driven in order to support their goals of growth, digital transformation and profitability improvements. The advance of the IoT will increase the amount of data available, demanding new AI systems that identify otherwise undetected patterns that presage unexpected costs. These systems will also enable predictive maintenance techniques, which Gartner believes will save asset operators about \$1 trillion a year. Agents are the main type of AI in the early years, but by 2019, decision support/augmentation is the leading AI type for heavy industry. Minimal uplift comes from decision automation in 2017, but by 2022, decision automation (particularly in the form of predictive maintenance) will have overtaken products in terms of business value generated.

Figure 5. Business Value Forecast by Industry, 2017-2025



Source: Gartner (March 2018)

The communications, media and services' business value from AI dips by 2023 but is peaking by the end of the forecast period. Agents are the dominant type of AI in the early years, but by 2025, the proportion of AI types has stabilized, with decision support/augmentation at 45% and a significant proportion from decision automation (18%). AI systems will enhance content by performing indexing and classification that are otherwise unavailable, and encourage consumers to find and consume more content.

Natural resources and materials have long used machine learning for exploring data about extraction of resources and finding new areas and new potential resources to extract. DNNs can detect new opportunities indicated by datasets that are not detectable using conventional processing techniques. Mining and oil extraction are examples of resources that will benefit from the superior technology of DNNs to detect undiscovered opportunities hidden in the large, diverse datasets in this industry. Decision support/augmentation is the top AI type from 2021 onward.

For the consumer products industry, the proportion of the entire AI business value peaks in 2023 and 2024. Adoption of products like smart home devices (for example, Amazon Echo and Google Home), smart personal care devices (like toothbrushes) and smart toys becomes mainstream, while new categories emerge (for example, smart toiletries). In this space, digital business models are emerging that blur the lines between the digital and physical worlds. Companies are leveraging IoT to connect people, businesses and things to drive revenue and efficiency. AI applications create the leverage necessary to service interactions with these customers.

Assumptions

By 2020, at least 40% of people will interact primarily with people-literate technologies, removing much of the perceived need to invest further in improving computer literacy.

Virtual private assistants (VPAs) and voice response systems, such as Alexa, Cortana, Google Assistant and Siri, are becoming the norm for consumer interaction with search engines, along with many other services that would previously have required interaction via web browsers. AI functionality is also being used to enhance image recognition capabilities of many devices, enabling facial recognition to replace text-based security systems and automatic tagging of captured images and video data. For many users, this AI functionality will become the norm, and there will no longer be the need to understand, or use, traditional computer operating systems or applications for many tasks. It will enable many more people to easily interact with complex computer systems, reducing the need for computer literacy as we know it today.

By 2020, 95% of video/image content will never be viewed by humans, but instead will be vetted by machines that can provide some degree of automated analysis.

A driving factor for many hyperscale cloud operators to develop AI systems, and services, is the need to analyze the vast volume of "natural" data collected within their services and to ensure that the content is correctly tagged and classified. This analysis is especially important when using automated advertising placement systems to ensure that customer advertisements are not placed alongside inappropriate content. These content evaluation AI systems will become a minimum requirement for all operators of advertising placement systems. Many cloud operators will use visual analysis systems internally and also offer API-based content analysis services for enterprise uses, as discussed in Gartner's "Smart Vision Systems Promise a Lot, but Are Difficult to Adopt Successfully."

By 2020, virtual agents will participate in a majority of commercial interactions between people and businesses.

Many early uses of AI will be for managing initial customer interactions, both via chatbots — textual web-based systems — and automated audio response systems. The growth in consumer VPAs is a precursor to chatbots' use by many organizations to provide initial customer assistance. Today, many web-based support services utilize AI-based chatbots to provide initial customer response and support, only falling back to a human-based response when the query complexity is beyond the chatbot capabilities. With the growth in the capabilities of speech-to-text systems and translation

services, the use of AI-based services for customer engagement will increase, thus impacting the use of call-center-based services. Gartner's "Market Guide for Virtual Customer Assistants" provides additional insight and recommendations for this growth segment.

Through 2020, organizations using cognitive ergonomics and system design in new AI projects will achieve long-term success four times more often than others.

Many organizations use data analytics techniques to analyze the data within their main business databases, and increasingly, the results of applying analytics to unstructured data are being combined with traditional business analytics. As the use of AI advances within businesses, many more datasets, data types and sources will be capable of being integrated into the overall analysis. This integration will enable organizations implementing AI-based projects to gain a more holistic market view and better drive their business objectives, especially when compared with organizations relying on purely traditional business datasets.

By 2019, startups will overtake Amazon, Google, IBM and Microsoft in driving the AI economy with disruptive business solutions.

Today, much of the initial work in developing AI models is being undertaken by the "Super 7" cloud operators (Alibaba Group, Amazon, Baidu, Facebook, Google, Microsoft and Tencent). This is driven by two major factors:

- The need to improve the Super 7's content analysis to facilitate their ad placement business
- Enable new services to drive customer engagement — VPAs, recommendation engines for online sales and so forth

To accelerate adoption of AI, many development frameworks and tools are being made available via the open-source software community. This approach eliminates any opportunity to monetize software in this space, but it accelerates development at a wide range of startup companies that focus on developing AI-driven tools and solutions for use by a wide range of business organizations. Many startups also will leverage the cloud providers' on-demand compute capacity to build and train new AI models. The startups will then integrate these new models into a wide range of new business applications and services. However, once developed, the new business applications and services may not utilize the cloud vendors' AI API services.

In 2020, AI becomes a positive net job motivator, creating 2.3 million jobs, while eliminating only 1.8 million jobs.

AI-enabled decision support/augmentation will be the largest contributor to business value creation, overshadowing AI process automation throughout the entire forecast period. The number of jobs affected by AI will vary by industry, with healthcare, public sector and education benefiting from growing job demand, while the manufacturing sector will experience the biggest impact from AI-enabled processes. The effects of AI on jobs will vary throughout the forecast period. AI will lead to incremental growth and new jobs: In most cases, savings and efficiencies — through the use of AI — will result in increased productivity. In the longer term, job loss will predominantly be in the middle-skilled jobs — typified by jobs in which the training is received "on the job." The net impact

throughout the forecast period will be a growth in jobs, albeit with a shift in the skills demanded. For further analysis, see "Predicts 2018: AI and the Future of Work."

In 2021, AI augmentation will generate \$2.9 trillion in business value and recover 6.2 billion hours of worker productivity.

The business value attributable to using AI will come from efficiency gains and the creation of insights that personalize the customer experience. This will enhance customer engagement and commerce, expanding revenue-generating opportunities and, thus, resulting in new business models driven by data insights.

While many industries will see incremental business value, increased automation in the manufacturing segment will create significant cost savings. With the ability to remove friction in value chains and the optimization of supply chains and go-to-market activities, the manufacturing segment will see a significant increase in revenue.

AI will enable insights into everyday decision-making activities, serve as agents in delegated tasks and fundamentally change how people work. While many organizations may not pursue the leading-edge uses of AI, such as building robots and self-driving cars, AI will augment employees, customers and ecosystem participants. Consequently, AI will enable increased productivity and business value generation, over and above what could be achieved by humans or machines on their own.

AI will start to impact business value with a shift to revenue generation in 2020, making it essential for organizations to view this as an opportunity for reinvention, rather than simply as cost reductions due to efficiency gains.

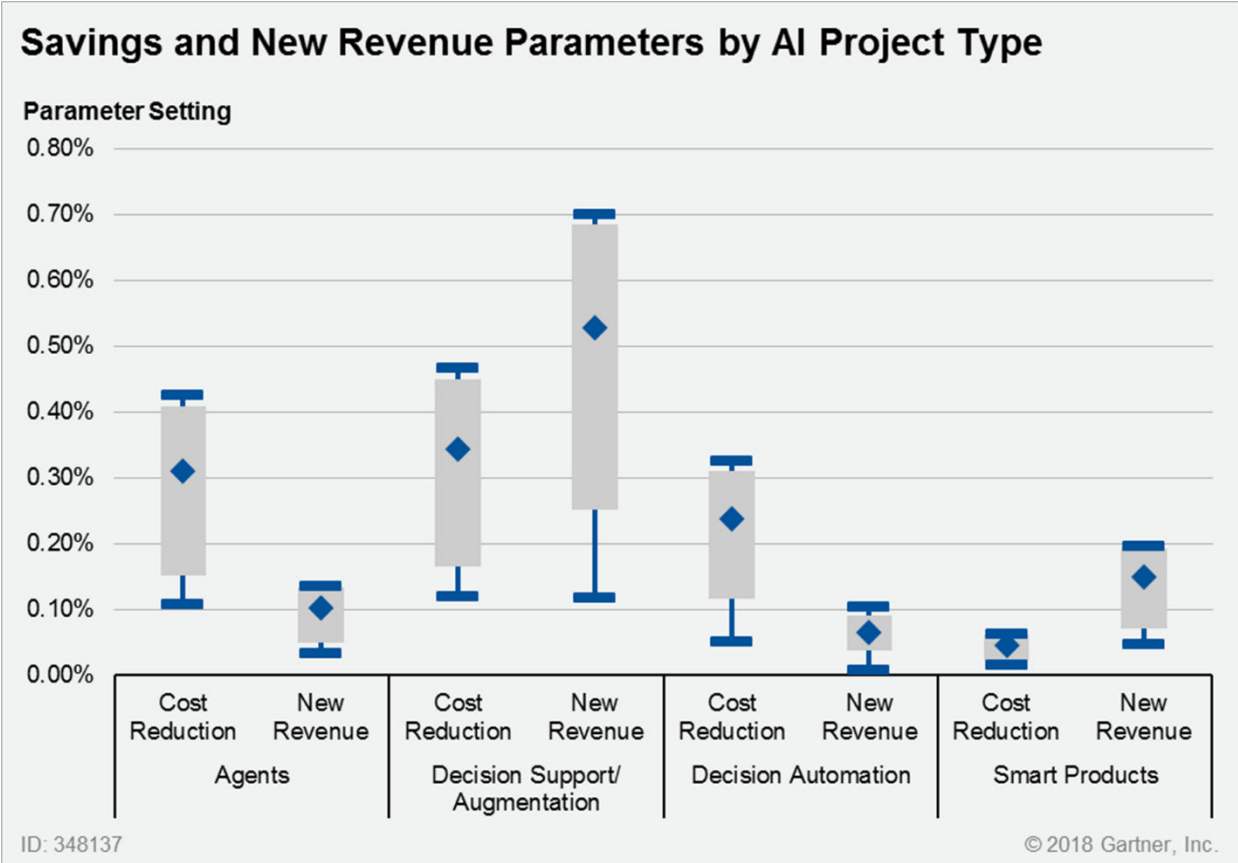
By 2022, more than 80% of enterprise IoT projects will have an AI component, up from less than 10% today.

Today, most IoT endpoints capture data and transmit it to a central data center; often, this data is stored and analyzed at a later time. As the number and complexity of IoT endpoints grow, there will be an increasing need for immediate decision making based on the captured data. In many instances, network latency and data center capacity will dictate that decision making must take place within the endpoint (for example, autonomous vehicles may not always have network connectivity, yet they need it to make fast local decisions). This need for decision making will require AI functionality to be deployed across many new devices, with more than 80% of all enterprise IoT projects utilizing AI to derive increased business value from the IoT data.

Cost Reduction and New Revenue Vary by Industry and Country

For each industry in each of the 43 countries, values are set for new revenue as a percentage of industry gross output, cost reduction as a percentage of industry costs and customer experience as a percentage of industry gross output. Figure 6 shows the range of values used: The maximum and minimum parameters, the interquartile range, and the average are depicted for each AI initiative, with the new revenue and cost reduction broken out.

Figure 6. Cost Reduction and New Revenue Parameters by AI Project Type Across All Industries and Countries



Source: Gartner (March 2018)

AI will not be adopted across all countries and regions at the same rate. The derived business value requires a certain level of technology penetration to be present before any given value is attainable. By combining the enterprise IT spending forecast with the World Bank's World Development Indicators, we derived a series of country-level lags to the start date of industry AI initiatives (see "Forecast: Enterprise IT Spending by Vertical Industry Market, Worldwide, 2015-2021, 4Q17 Update"). The United States is considered the base zero-lag country. All other countries are lagging between zero and 11 years; for example, Canada is lagging by 0.8 years, which makes North America lag 0.4 years. The average start lag by region is listed in Table 2.

Table 2. Regional AI Initiative Average Start Lag in Years

Region	Average Start Lag
North America	0.4
Greater China	1.3
Japan	1.3
Mature Asia/Pacific	1.3
Western Europe	1.7
Eastern Europe	3.5
Middle East and North Africa	4.5
Eurasia	5.1
Emerging Asia/Pacific	5.4
Sub-Saharan Africa	6.8
Latin America	6.9

Source: Adapted from World Bank

There Will Not Be Another "AI Winter"

AI is not a new concept: The modern field of AI research arguably started in 1956. In the intervening 60-plus years, there have been cycles of investments and expectations, followed by disillusionment and a withdrawing of funding. The term "AI winter" was coined in 1984 at an "American Association of Artificial Intelligence" meeting to describe this cycle. The world has suffered two AI winters — in the 1970s and again in the late 1980s, when the expectations for AI had outrun AI abilities. While there is currently many headlines warning of another "AI winter," in which business and government would walk away from AI because it has not achieved the expectations of its promoters, this forecast assumes that this will not happen.

Methodology

AI refers to systems that automate decisions at scale, driven by quantitative modeling or classification of complex image, video and audio information.

AI (see Note 1) is defined by systems that are capable of one or more of:

- Statistical machine learning — deducing future results as represented by quantitative indicators
- Predicting outcomes via complex and iterative calculations of probabilities
- Neural network machine learning — identifying and classifying patterns in rich datasets, such as voice, video, images and sounds
- Making autonomous decisions, with or without coordination or collaboration with people

AI systems use these attributes, integrated as part of an application, to automate decision processes. This automation frees up labor, enables deeper automation of otherwise manual processes and enables new processes to be instantiated that would otherwise be uneconomical.

Industry Gross Output and Business Value-Add

The most common measure for economic output is gross domestic product (GDP). GDP reports the final value of all goods and services consumed. As such, it represents the value-add associated with a product or service when it is finally consumed. Intermediate transactions — for example, in the manufacturing supply chain — are excluded from GDP.

The AI forecast is based on estimates of industry gross output (IGO), which is a measure of the total economic activity within a sector. IGO captures all transactions in a product or service supply chain. From an overall economic perspective, this approach leads to multiple counting, but for our purposes, we want to capture the total value of transactions in the supply chain. By way of example, the U.S. gross output in 2015 was approximately \$3.1 trillion. The equivalent GDP was approximately \$1.74 trillion. The \$3.1 trillion is a better representation of the total transacted value in the economy. In the case of AI analysis, it is this total value of transactions that drives the AI market opportunity.

IGO raises another important point. In the U.S. GDP, services is the largest sector. However, in IGO, manufacturing is the largest sector, and it is approximately 10 times the value of the banking sector. This scale causes our model to show manufacturing as the largest opportunity for AI implementations, with banking in second place. Manufacturing holds this position because of the nature of its supply chains, in which products may pass through multiple businesses before reaching the end customer. Service businesses mostly deliver value via employees, eliminating the supply chain multiplier.

Economic value-add for a sector is essentially the sales in that sector, minus inputs and supplies from other industries (for example, manufacturing sales minus the cost of raw materials and energy). Conceptually, the total business value-add across all sectors is a measure of GDP (actual GDP includes the impact of taxes, subsidies and other factors).

There is no intrinsic business value from experimenting with AI technologies. AI must be used as part of a production system before there can be any business value. Business value-add can be derived within a sector by increasing sales, creating a new sales opportunity, decreasing input costs or reducing what Lean Six Sigma calls "indirect costs," such as customer experience, brand strength or risk. The business value-add represents the aggregate of all these benefits that businesses derive through the usage of AI technology. For example, an AI technology supplier derives value-add through its profit from sales of products or services. A business that invests in AI technology (bought from a supplier) derives value-add from the use of the technology, which can be leveraged to increase the business's sales or reduce its costs. The business value for a sector represents the total incremental gains (or losses) for all businesses in a sector.

Business Value-Add Forecast Approach

The forecast presented here assesses the total business value of AI across all the enterprise vertical sectors covered by Gartner. There are three different sources of AI business value: customer experience, new revenue and, cost reduction and customer experience.

- Customer experience: The positive or negative effects on indirect cost. Customer experience is a necessary precondition for widespread adoption of AI technology to both unlock its full potential and enable value.
- New revenue: Increasing sales of existing products and services, and/or creating new product or service opportunity beyond the existing situation.
- Cost reduction: Reduced costs incurred in producing and delivering those new or existing products and services.

Traditionally, when forecasting a given market, Gartner's starting point is a sizing of the current market, which forms the basis for the forecast of how the market will develop in the future. However, the AI market is still at a very early stage, in which many aspects of the market are embryonic or even nonexistent.

Given the characteristics of the AI market, this forecast will cover 2017 through 2025 — which is when we believe the market will be sufficiently mature for AI projects to be built around an increasingly normalized set of tools and software. To gauge a market size that far out, we decided on an approach that utilizes economic data to determine the magnitude of the impact and a bass diffusion approach to determine industry and country-level adoption rates. Other details of the approach include:

- The purpose of this analysis was to ensure that the market size that we forecast fits within the economic constraints of the global economy.

- Global business value-add from AI was constrained by IGO and economic value-add data from IHS Economics & Country Risk (formerly IHS Global Insight).
- Business value-add was determined for revenue gain, cost reduction and indirect value by sector. Each business value-add component was calculated for the years of the forecast period for each sector in all 43 countries covered, based on an individualized Weibull adoption pattern.
- IGO is a measure of the total economic activity or value-generating activity within a sector. It measures the value of new goods and services produced in that industry.
- Economic value-add for a sector is the net value created by that sector. It is essentially sales in that sector, minus the value of inputs and supplies from other industries (so, for example, manufacturing sales, minus the cost of raw materials and energy).
- By definition, the sum of economic value-add across all sectors is GDP; however, in practice, it may be slightly different because of, for example, accounting differences. In our case, the sum of value-add across all the sectors that Gartner covers will be less than GDP because we exclude some economic activity from our analysis.
- Business value-add can be derived from increasing sales, creating a new sales opportunity, decreasing input costs or reducing indirect costs, such as customer experience.

When we looked at the AI impact in a sector, we considered ways that AI technology could increase sales of existing products and services, as well as could create new product or service opportunity beyond the existing situation. These are all included under "new revenue." AI systems that could reduce costs incurred in producing and delivering new or existing products and services are included in "cost reduction." Finally, AI systems that could have both positive and negative effects on indirect cost, is included in "customer experience." Business value-add is simply the sum of customer experience, new revenue and cost reduction. There are, however, several intentional limitations to this AI forecast — accounting for every possible effect would dilute value rather than improve it. To that end, value-add has been assessed as a first-order analysis:

- In some cases, savings in one area will lead to cutbacks in others.
- The introduction of new AI-based products or services may, in some cases, cause a decline or demise of the existing/legacy products or services.
- Organizations that do not adopt AI may have reductions in revenue, reductions in employment or increases in costs.
- These higher-order effects were not considered in the current analysis.

AI Initiatives

Enterprises will pursue AI for myriad reasons and use cases. It would be herculean to attempt to define all of the projects, particularly when they span multiple technologies, use cases, industries and regions. Instead, we created four types of projects based on the central use of AI within those projects (see Table 3).

Table 3. Types of AI Projects

Type of Project	Description	Example
Decision Support/ Augmentation	Systems use data mining and pattern recognition across huge amounts of data to produce insights, provide personalization, predict events and make probabilistic recommendations. Algorithms for decision support and augmentation get better with more data to become more accurate.	<ul style="list-style-type: none"> ■ Automate high-volume expert decisions ■ Fraud detection ■ Customer churn ■ Predictive maintenance ■ Credit risk ■ Sentiment analysis ■ Recommendation/personalization engines ■ Dynamic pricing ■ Forecasting costs and revenue ■ Anomaly/tumor detection ■ Compliance with regulations
Agents	Agents are chatbots that use text or voice to communicate with users in natural language. They reliably convert the spoken word into text, not just commands. They provide accurate input for decision systems.	<ul style="list-style-type: none"> ■ Call center virtual agents ■ Technical support agents ■ Robo financial advisors ■ VPAs
Decision Automation	Also known as process optimization, decision automation systems use AI to automate tasks or optimize business processes.	<ul style="list-style-type: none"> ■ Process handwritten forms or images ■ Translating voice to text and vice versa ■ Automate routing, next steps and other workflows
Smart Products	Smart products have AI embedded in them. They observe their users and their preferences to create hyperpersonalized interactions and improve their usefulness. A subset of smart products is mechanical robots with embedded AI that can interact with the robots' environment.	<ul style="list-style-type: none"> ■ Enterprise applications ■ Buildings ■ Elevators ■ Cameras ■ Home appliances ■ Toys ■ Thermostats ■ Drones ■ Autonomous vehicles ■ Factory robots

Type of Project	Description	Example
		<ul style="list-style-type: none"> ▪ Robotic caregiver

Source: Gartner (March 2018)

Gartner Recommended Reading

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

"Predicts 2018: Artificial Intelligence"

"Market Trends: Five Emerging Artificial Intelligence Use Cases Fuel IT Services Opportunities for Intelligent Automation"

Evidence

The global economic data is provided by IHS Economics & Country Risk for the IGO and the economic value-add. IGO is a measure of the total economic activity or value-generating activity within a sector. It measures the value of new goods and services produced in that industry. Economic value-add for a sector is the net value created by that sector. It is essentially sales in that sector, minus the value of inputs and supplies from other industries (so, for example, manufacturing sales, minus the cost of raw materials and energy).

Note 1 Artificial Intelligence

AI refers to systems that automate decisions at scale, driven by quantitative modeling or classification of complex image, video and audio information.

AI is defined by systems that are capable of one or more of:

- Statistical machine learning — deducing future results as represented by quantitative indicators
- Predicting outcomes via complex and iterative calculations of probabilities
- Neural network machine learning — identifying and classifying patterns in rich datasets, such as voice, video, images and sounds
- Making autonomous decisions, with or without coordination or collaboration with people

AI systems use these attributes, integrated as part of an application, to automate decision processes. This automation frees up labor, enables deeper automation of otherwise manual processes and enables new processes to be instantiated that would otherwise be uneconomical.

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