

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

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Artificial intelligence will become easier for humans to use, then expand its impact throughout the organization, and then serve as a new means for deeper automated interaction and integration. Application leaders responsible for AI must be included in project planning and execution.

Impacts

- Dramatic improvements in natural-language processing and generation will allow application managers to engage workers, customers and constituents.
- Because CDOs need to gather a significant volume of data for artificial intelligence (AI) to function, application architects must enable existing applications to provide it.
- The spreading presence of AI allows enterprise architects to foresee the necessity for integration and interoperation.

Recommendations

Application leaders responsible for AI projects should:

- Choose natural-language applications — for interpretation of input and generation of cogent output — that have artificial intelligence elements in order to get the benefit of continuous improvements in accuracy and sophistication.
- Incorporate transparency into data generated by the Internet of Things (IoT) as an aspect of your organization's enterprise architecture, IoT target architecture and platform suite selection.
- Involve your IoT and enterprise architects, as well as application managers, in decision making on AI projects.
- Give your chief data officer responsibility for the integration and interoperation of applications and data repositories that include AI aspects.

Strategic Planning Assumptions

By 2020, artificial intelligence will be a priority for more than 30% of CIOs.

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

By 2021, smart machine services will enter mainstream adoption, with 30% adoption by large companies.

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

Analysis

Artificial intelligence applications in commercial and governmental enterprise are growing, particularly where interactive chatbots and advanced analytics are exposed to very large datasets. Arcs of technology categories follow well-defined paths. However, the exceptional value of AI, and the concomitant hype that fogs its directions, make it imperative for CIOs, CDOs, application managers and enterprise architects to plan for change.

In AI-powered applications and systems, advanced analytic strategies are employed to analyze data and content to improve performance and outcomes in an automated fashion. Such automated improvements allow the systems to recommend or take action. These systems are capable of rich actions that we previously did not think computers could accomplish, or that we thought only humans could.

Adoption will rise as applications more effectively employ natural-language processing in various ways, from the iconic speech-to-text models made famous by Google Speech-to-Text and Amazon Echo, to improved autosuggest capabilities in applications and search engines of all kinds. Such adoption will spread even more broadly as the IoT makes available unprecedented volumes of data at great velocity from an abundance of data resources. AI will not only be valuable in analyzing this data, but also in selecting what data to retrieve from the edge where it is collected.

The idea of "artificial intelligence" brings with it the flaw of its appearing to be, like human intelligence, composed of individual and nonintegrated entities. In other words, because people are separate, we expect AIs to be separate. We want to think they have distinct idiosyncrasies and "personal" elements — as they are often portrayed in popular stories and films. Whether humans are really separate entities is a question for philosophers more than IT analysts. Yet, we can see that life — especially nonhuman life — operates in a collective fashion, even with heterogeneous organisms, more than in an individualistic fashion — hence the adage "no man is an island."

When looking at a business process, the likelihood that increasing numbers of the "human/manual" steps will be replaced by AI steps is conventional wisdom (even if opinions vary about when or if particular types of steps will be replaced). Just as robots gradually replaced humans in many production lines only gradually (initially delivering components for a human to assemble, then taking the next step of doing the assembly), so AI systems will initially replace one set of human tasks,

then another, until the process includes a series of AIs interacting with each other. When these processes span organizational boundaries, or exist between different companies, the effective result is an ecosystem of AIs that must interact with each other — even when that was not the initial design expectation — in order to fulfill their primary purpose.

We expect three major trends to affect AI during the next several years. All shift it away from projects that stand by themselves as showcase efforts, and toward more-practical employment as part of organizational strategies:

1. **Better communication (both ways) with people:** Natural-language processing, generation and contextual interpretation will make AI easier to use and improve the use of all computing resources.
2. **Deeper and broader integration with existing applications and IoT projects:** AI has its greatest value when it is built into architectures that drive business and service value.
3. **Richer ecosystem interaction:** As AI becomes more common, applications that employ it must work effectively with others employing similar technologies, which will result in chains and meshes of AI systems that work simultaneously toward their individual goals in a cooperative but decoupled fashion.

Figure 1. Impacts and Top Recommendations for Application Leaders

Impacts	Top Recommendations
Dramatic improvements in natural-language processing and generation will allow application managers to engage workers, customers and constituents.	Choose natural-language applications for interpretation of input and generation of cogent output that have artificial intelligence elements in order to get the benefit of continuous improvements in accuracy and sophistication.
Because CDOs need to gather a significant volume of data for AI to function, application architects must enable existing applications to provide it.	Incorporate transparency into data generated by the IoT as an aspect of your organization's enterprise architecture, IoT target architecture and platform suite selection.
The spreading presence of artificial intelligence allows enterprise architects to foresee the necessity for integration and interoperation.	Make your chief data officer responsible for the integration and interoperation of applications and data repositories that include artificial intelligence aspects.

Source: Gartner (April 2017)

Impacts and Recommendations

Dramatic improvements in natural-language processing and generation will allow application managers to engage workers, customers and constituents

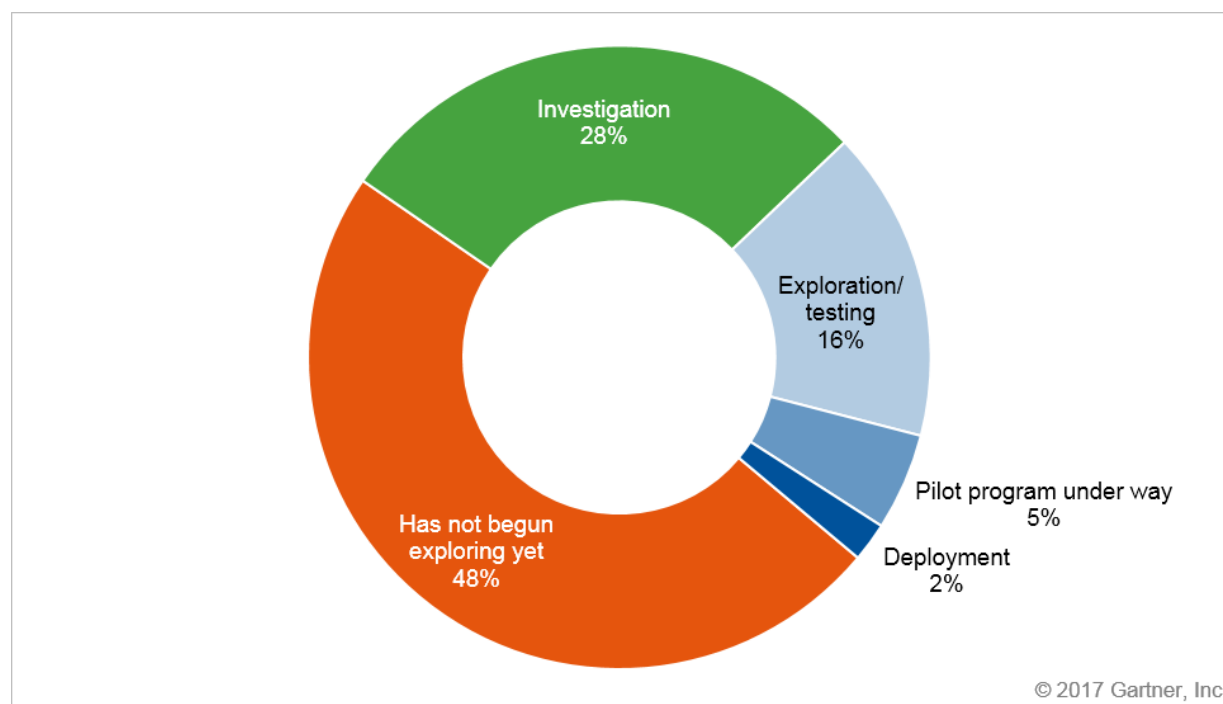
Interest in the use of plain spoken language as a means of communication between humans and computing resources is increasing dramatically among organizations as a way to cut through organizational, process and interface complexity. The improvements for adoption offered by such an interface model are exceptional. Although significant, the current focus on hands-free interaction — which extends the user's ability to interact with a system into a series of use cases with considerable (mostly consumer) appeal — disguises the real impact of this capability. What a natural-language interface allows is a system that trains itself according to the communication style of its operator. This frees the operator from the need to learn how to interact with the system, and lowers the barriers to adoption for everyone (including consumers, casual enterprise users and time-pressured employees). It also improves the potential for ubiquitous access to capabilities that were historically limited to a select few willing and able to make the commitment to learning how to use the standard interface.

Growth in enterprise interest in natural-language processing is substantial. By the end of March 2017, Gartner clients had asked as many questions about natural-language processing this year as they did in the entirety of 2015.

Further, their reasons include external and internal ones. Natural language's value for organizations is largely contained in its most-common use today, which is in powering virtual assistants that face consumers, customers and workers. About three in four people who use personal assistants on their smartphones do so at least several times a week, and about half of those frequent users actually do so daily.

Consequently, about two in 10 Research Circle organizations we surveyed — and that have undertaken mobile app development — indicated that they were testing or piloting virtual assistants in 2016, while another three in 10 said they were investigating such applications (see Figure 2). Such assistants must be able to process natural input, but must also be able to respond in familiar vernacular.

Figure 2. Use of Bots, Chatbots or Virtual Assistants as an Alternative to Mobile Apps



Question: Has your organization begun to explore bots, chatbots and virtual assistants as an alternative or adjunct to mobile apps and if so, what stage are you at in your efforts? (n = 99). Rounding of scores may result in a result other than 100%.

Source: Gartner (April 2017)

Spoken communication is only part of natural communication, however — similarly important is the context of communication, which has until now largely been driven by business rules that must be established and maintained by humans. The potential for machine learning and AI to mediate analyses of what contextual elements are valuable, and the best action for organizations to take, is similarly significant.

In general, what AI and machine learning offer is a more-reliable and scalable interpretation of such communication. They more-effectively capture the meaning in ambiguous human communication, and offer easier-to-interpret common communication styles back to users. Through their ability to handle very large amounts of data, including a very wide variety of data, they also grant greater latitude in interpreting contextual information.

Recommendation:

- Choose natural-language applications for interpretation of input and generation of cogent output that have machine learning or AI elements in order to get the benefit of continuous improvements in accuracy and sophistication.

Because CDOs need to gather a significant volume of data for AI to function, application architects must enable existing applications to provide it

The earliest AI projects happened independently of other applications and environments, and required only a "greenfield" sensibility of what an enterprise required or needed to make a system work. For example, an internal question-answering application that a major organization embarked on to ease integration only needed limited interoperability with other existing systems; employees signed into the system and saw how to ask a question or answer one independently of existing applications.

But projects with lasting value and broad applicability must be connected to existing applications relevant to digital workplaces, or operations, or to any number of other aspects of business. AI is of unique value to IoT projects, because they generate so much data that it is difficult or impossible for human operators to sift through with an eye toward choosing granular actions.

Such connections are currently mostly one way, allowing AI-powered applications to gather data from outside their scope of operation, and include it with other data to generate novel perspectives and proposed solutions for business necessity. But such unexploited insights will only be attractive for a while — ultimately, organizations will rely on AI-powered applications to execute decisions as well as propose them. A smart advisor that recommends courses to students based on their course requirements and the professor's teaching style is less valuable than one that recommends them, inserts them in a schedule, and orders the necessary study materials.

The creation of feedback loops between AI and robots (or things that are very similar in most ways to robots, such as self-driving vehicles) will be transformational. AI will serve as the engine that turns data floods back on themselves. Where systems generate large volumes of diverse, streaming data, AI seeks to respond in kind, granting applications and IoT elements the ability to react to a variety of rapidly changing circumstances the way a human might, but without the sensory, cognitive and mechanical delays that a human would impose on the process.

Integration between AI and its input and output partners will not necessarily be simple. While AI improves its outcomes as it goes, such improvement must be vetted and tested before they are implemented as core parts of the system's own rules and reactions. The process of data gathering and rules implementation will include effort for validation.

Recommendations:

- Incorporate transparency into data generated by the IoT as an aspect of your organization's enterprise architecture, IoT target architecture and platform suite selection.
- Involve your IoT architect in decision making on AI projects.
- Use AI to throttle data floods through selecting what is most important.

The spreading presence of AI allows enterprise architects to foresee the necessity for integration and interoperation

"The network is the computer."

In 1984, the above slogan was too radical to process. By the mid-1990s, the idea appealed to the digital elite, as it carried with it enough ambiguity and mysticism to make it intriguing (and not incidentally, to boost the appeal of the internet to a world still a little baffled by the idea that it would add up to more than a useful email system). Since then, the idea that a network has a virtuous cycle of increasing value attached to it has grown in currency. In the past 20 years, very few applications have achieved success without interconnecting participants technically or socially. The most successful sustain their advantage through magnetic forces that make it difficult for prospects to ignore or drop them.

AI today seems like a contradiction. Products tend to stand on their own, with integration stories that weave roots out among other applications, but without interconnection. Such models will change, as AI-powered applications and systems expand their reach, and organizations encounter each other through them. This will evolve in the same way as the need to twine systems together to share the details of business through system integration.

It is never sensible to see AI as capable of replacing human intelligence through humanlike thinking. Such scenarios are decades in the future, if they ever become real at all. But it is always salutary to use analogies and metaphors for unfamiliar changes in digital technologies. Consider, in this case, natural ecosystems. Such systems combine various animal brains — nearly all of which are not intelligent — into involuntary societies that demonstrate reactive mastery of unstable circumstances (which include participants from vegetable and microbial life kingdoms). Such ecosystems add layers when animals that are smart enter them, sometimes for extended periods, interacting with each other cooperatively and competitively.

AI-enabled applications and systems will need to communicate on behalf of their end users (which we could call "masters," if it weren't for the inappropriate echoes of magic that such verbiage would conjure). The systems will interoperate through IoT objects (such as a logistics operator broadcasting a vehicle's path to warning devices) and applications (such as a calendaring system discovering end users' shared needs and scheduling them to meet next to a key resource).

To achieve such interoperation, these systems are likely to begin by using streamlined means of communication designed for situations where they were actually interacting with a human, such as natural language. Over time, we will probably see the emergence of standardized means of data transfer as "AI to AI" becomes the new default rather than "AI to human." The result is always likely to be the result of a natural evolution of different AI systems and deployments rather than an "intelligent design" based on theoretical systems. The result will lead to more effective and creative collaboration and multiplied impacts, as the AIs interact effectively using rules that humans generate (such as "consult traffic indicators") in creative ways ("call traffic indicators from local and federal government and piece together the available data") to develop a more-comprehensive perspective on circumstances and achieve more.

Recommendation:

- Give your chief data officer responsibility for the integration and interoperation of applications and data repositories that include AI aspects.

Gartner Recommended Reading

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

"Artificial Intelligence Primer for 2017"

"Maverick* Research: Machines Will Talk to Each Other in English"

"How CSPs Can Exploit Artificial Intelligence"

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

"Enterprises Must Prepare 'Now' for the Disruptive Power of Conversational AI Platforms"

Evidence

Gartner client interest in artificial intelligence and related topics (such as cognitive computing and machine learning) continues to grow at a rapid pace. Inquiries about topics related to AI grew 210% from 2015 to 2016.

In Gartner's annual enterprise survey, we asked a key group of executive stakeholders how important AI and machine learning projects were to their organization. More than 40% of executives indicated such projects are critical to the organization's future (rating it at 6 or 7 on a 7-point scale). About two in five of the executives indicated that their organizations had begun such projects (AI or machine learning) before 2017.

Gartner's enterprise mobile apps research was conducted via an online survey from 27 October to 11 November 2016 among Gartner Research Circle Members — a Gartner-managed panel composed of IT and business leaders. In total, 163 members participated.

Gartner conducted its annual enterprise survey in six countries between 23 September and 2 December 2016 to explore organizations' use of IT products and services across geographies and help Gartner build its forecasts.

The research was conducted online among 2,557 respondents in six countries:

- U.S. (n = 420)
- Brazil (n = 422)
- France (n = 420)
- U.K. (n = 417)

- China (n = 424)
- India (n = 454)

Qualifying organizations have at least 20 employees. Participants were screened to have a general understanding of their organization's IT department and/or its policies and procedures. Further, each of the six technology-focused section of the questionnaire required the respondents to be involved in decisions related to at least one phase of the IT buying cycle ("determine and set the strategy," "evaluate or select vendor or service provider," "plan investment or set the budget," or "implement or manage the technology or services").

Interviews were conducted online and in a native language, and averaged 24 minutes. The sample universe was drawn from external panels of IT and business professionals. The survey was developed collaboratively by a team of Gartner analysts who follow these IT markets and was reviewed, tested and administered by Gartner's Research Data and Analytics team.

Disclaimer: "Total" results do not represent "global" findings and are a simple average of results for the targeted countries, industries and company size segments in this survey.

More on This Topic

This is part of two in-depth collections of research. See the collections:

- IoT Technology Disruptions: A Gartner Trend Insight Report
- Applying Artificial Intelligence to Drive Business Transformation: A Gartner Trend Insight Report

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