Top 10 Strategic Technology Trends for 2017: A Gartner Trend Insight Report

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The intelligent digital mesh is a foundation for future digital business and its ecosystems. To create competitive advantage, IT leaders must factor into their technology innovation strategies the disruptive trends related to the mesh, or risk losing ground to those that do.

Opportunities and Challenges

- Identifying the business opportunities, challenges and disruptions presented by strategic technology trends is an important input into strategic business planning.
- Artificial intelligence (AI) and advanced machine-learning techniques are opening up a new frontier for digital business, as virtually every application, service and digitalized thing incorporates an intelligent aspect.
- The merging of, and interaction between, the physical and digital worlds provides a digital business revenue opportunity and sets the stage for digital business ecosystem development.
- An expanding mesh of rich connections between devices, things, services, people and businesses demands systems that are more adaptable and responsive to changing needs.

What You Need to Know

- Organizations gain competitive advantage when they identify trends that are poised to break out of the emerging state and exploit them before they become mainstream.
- AI and advanced machine learning give rise to new classes of physical and virtual systems, as well as delivering intelligent enhancement to existing software and things.
- The digital world will become an increasingly detailed reflection of the physical world, and the digital world will appear as part of the physical world, creating fertile ground for new business models and digitally enabled ecosystems.
- The user-centric intelligent digital mesh requires significant changes in the underlying digital technology platforms, application and service architectures, and security architecture to deliver greater value.
Insight From the Analyst

Strategic Technology Trends — Threat or Opportunity?

David W. Cearley, Vice President, Distinguished Analyst and Gartner Fellow

Disruption — It’s great when you’re the disruptor, but it’s scary when you’re the one being disrupted.

The world is becoming an intelligent, digitally enabled mesh of people, things and services. Ordinary people will experience a digitally enabled world where the lines between what’s real and what’s digital truly blur. AI and machine learning will be used to enhance analytics, actions and interfaces of nearly every technology-enabled system. New digital business models are emerging, and new ecosystems are forming to realign business and customer relationships.

The status quo won’t hold.

Rich digital services will be delivered to everything, and intelligence will be embedded in everything, creating an intelligent digital experience for people and organizations. Underneath these changes, big shifts in the enabling technologies and IT best practices create a mesh of technology building blocks to support the intelligent digital experience and resulting digital business ecosystems.

We call this disruptive set of strategic technology trends the intelligent digital mesh, and this forms the basis for our top 10 strategic technology trends for 2017. Strategic trends are those with broad and potentially disruptive impacts that are reaching key tipping points and demand a fresh look as part of strategic business and technology planning. You can’t afford to ignore our annual list of the top 10 strategic technology trends.

In this research, we explore:

- The role AI and advanced machine learning will play in the digital future
- The opportunities the blending of the digital and physical worlds brings
- How the increasing complexity of connections between people, organizations and technology-based systems changes the user experience and supporting IT models
- How we identified, categorized and ranked the strategic technology trends
Executive Overview

Definition

Our top 10 strategic technology trends are rapidly evolving breakout trends affecting digital business and its ecosystems. They have the most disruptive potential through 2021.

Our top 10 trends pose the biggest threat and offer the most potential for competitive advantage. They fall into three main themes (see Figure 1):

- **The intelligent** theme (see Note 1) explores how AI and machine learning are seeping into virtually every technology and represent a major battleground for technology providers over the next five years. The use of AI and machine learning for well-scoped and targeted purposes delivers more adaptable, flexible and potentially autonomous systems.

- **The digital** theme focuses on blending the digital and physical worlds to create an immersive, digitally enhanced environment. Digital services, connections and interfaces link the two. Digital trends, along with opportunities enabled by AI and machine learning, are driving the next generation of digital business and the creation of digital business ecosystems.

- **The mesh** theme refers to exploiting connections between an expanding set of people and businesses, as well as devices, content and services, to deliver digital business outcomes. The mesh demands new interface modalities (for example, conversational interfaces), security models, technology platforms and approaches to solution design.
Figure 1. The Top 10 Strategic Technology Trends for 2017

Research Highlights

Intelligent: AI and Advanced Machine Learning Enhance Systems

AI and machine learning have reached a critical tipping point in capability, and will augment and extend virtually every technology-enabled service, thing and application.

Excitement about AI is growing rapidly, as evidenced by a 200% increase in the number of inquiry calls from Gartner clients about topics related to AI and advanced machine learning between 2015 and 2016. Creating systems that learn, adapt and potentially act autonomously will be a major battleground for technology vendors through at least 2020. The ability to use AI and machine learning to enhance decision making, reinvent business models and ecosystems, and remake the customer experience will drive the payoff for digital initiatives through 2025. Three tightly linked trends form the intelligent theme for our 2017 strategic technology trends:

- AI and advanced machine learning
- Intelligent apps
Intelligent things

AI and advanced machine learning include technologies such as deep learning, neural networks and natural-language processing. They also enable more advanced systems that appear to understand, learn, predict, adapt and even operate autonomously, rather than being programmed only for a finite set of prescribed actions. For example, machine learning can create probabilistic models from wind turbines, solar panels and soil actuators to predict when failures will occur.

Intelligent apps deliver advanced analytics, autonomous business processes, and immersive, conversational and continuous interfaces (see Table 1). AI-powered natural-language recognition makes possible new categories of apps, such as virtual personal assistants (VPAs), driven by voice interfaces. These have the potential to transform the workplace by making everyday tasks easier and users more effective. Every software category, from security tools\(^1\) to enterprise applications\(^2\) such as ERP, will be infused with AI-enabled capabilities. By 2018, Gartner expects that most of the world’s largest 200 companies will exploit intelligent apps and use the full toolkit of big data and analytics tools.

Figure 2. Three Broad Areas for the Use of Artificial Intelligence and Advanced Machine Learning

<table>
<thead>
<tr>
<th>Intelligent Analytics</th>
<th>Intelligent Process or Action</th>
<th>Intelligent User Experience</th>
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</thead>
<tbody>
<tr>
<td>Conduct in-depth predictive and prescriptive analytics on a wide variety of data sources. Deliver the results to the user of the app or thing, or analyze the behavior of the app or thing.</td>
<td>Improve the function of the app or thing with increasing reliance on automatic execution of an action based on the predictive results of the AI model.</td>
<td>Enhance the interface between human beings and machines so that the AI-enhanced system can interact with, and adapt to, user needs based on natural and contextual interfaces.</td>
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</tbody>
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Examples:
- Display the top five candidates to an HR professional based on an analysis of submitted resumes.
- Predict the likelihood of an aircraft engine failure based on an analysis of the behavior of its components.
- Automatically slow an autonomous vehicle based on a real-time analysis of road conditions and other environmental inputs.
- Automatically order additional inventory based on the simulation by an AI model of likely future sales.

Examples:
- Use natural-language processing, dialogue management and other techniques to interpret and generate language (auditory or textual) and carry on a conversation with the user (through, for example, VPAs, chatbots and smart speakers).
- Use AI-enhanced capabilities to provide more robust access, orchestration and control of back-end content and services.

Source: Gartner (March 2017)

Intelligent things are computing devices and Internet of Things (IoT) sensors and things that make use of AI and advanced machine-learning capabilities embedded in the thing or in a connected cloud service. These enhanced capabilities make possible new intelligent things, such as advanced robots. They create opportunities in industries such as retail, where robots are acting as store
greeters, and farming, where self-driving tractors, robots and drones could increase farm yields and efficiencies. Existing things, including IoT devices, will become intelligent, potentially delivering the power of AI-enabled systems everywhere, including the home and medical facilities.

As intelligent things evolve, they will shift from a stand-alone to a collaborative model in which they communicate with one another and act together. However, nontechnical issues such as liability and privacy, along with the complexity of creating highly specialized assistants, will slow embedded intelligence in some scenarios.

Organizations should evaluate scenarios in which AI and machine learning could deliver clear business value through apps and things, and consider experimenting with one or two high-impact scenarios. Examine how AI and advanced machine learning can deliver new systems that everyone views as intelligent (such as autonomous vehicles). Also analyze how AI and advanced machine learning can be used in less obvious ways (see Figure 2), subtly embedded into existing systems (such as intelligent sensors) to enhance them.

Figure 3. Inconspicuous and Obvious Uses of AI and Advanced Machine Learning

Related Research

- "Top 10 Strategic Technology Trends for 2017: Artificial Intelligence and Advanced Machine Learning": AI and advanced machine learning are much-talked-about emerging technologies that could revolutionize businesses and even entire industries. They have the ability to drastically reduce labor costs, generate new and unexpected insights, discover new patterns,
and create predictive models from raw data. However, they can't yet match the breadth of human intelligence.

- "Top 10 Strategic Technology Trends for 2017: Intelligent Apps": Intelligent apps have the potential to transform everything, from the nature of work and how we conduct commerce, to how we use our leisure time. Routine and information-driven workloads will shift from human beings to intelligent apps that update themselves and corresponding systems. However, intelligent apps have challenges to overcome as they move from early-stage emerging technologies to more robust functional products.

- "Top 10 Strategic Technology Trends for 2017: Intelligent Things": Intelligent things exploit applied AI and machine learning, enabling them to deliver advanced behaviors and interact more naturally with their surroundings and with people. The rapid explosion in the number of connected, intelligent things has propelled this trend forward. Although intelligent things are still inferior to human beings in many ways, the underlying technology is improving at an unprecedented rate.

- "Hype Cycle for Smart Machines, 2016": Smart machines are truly disruptive technologies but aren't ready for most adopters at scale. However, organizations should explore them now, because the competitive gaps and missed opportunity costs for laggards could be insurmountable.

Digital: Bringing Together the Real and Virtual Worlds

The lines between the digital and physical worlds continue to blur, creating new opportunities for digital businesses.

The digital world will be an increasingly detailed reflection of the physical world, and the digital world will appear as part of the physical world, creating fertile ground for new business models and digitally enabled ecosystems (see Figure 3). Three loosely related areas form the digital theme in our 2017 top strategic technology trends:

- Virtual reality (VR) and augmented reality (AR)
- Digital twins
- Blockchains and distributed ledgers
VR and AR transform the way individuals interact with each other and with software systems, creating an immersive environment. For example, VR can be used for training scenarios and remote experiences. AR, which blends the real and virtual worlds, enables businesses to overlay graphics onto real-world objects. Immersive experiences with AR and VR are reaching tipping points in terms of price and capability, but they won’t replace other interface models. Over time, AR and VR will expand beyond visual immersion to include all human senses. Enterprises should look for targeted applications of VR and AR through 2020.

The IoT has climbed to the top of the "Hype Cycle for the Internet of Things, 2016." Many subtrends are emerging that build on the broad notion of the IoT. One such trend is digital twins. Within three to five years, billions of things will be represented by digital twins, which are dynamic software models of physical things or systems. Using physics data on how the components of a thing operate, as well as data provided by sensors in the physical world, organizations can use a digital twin to analyze and simulate real-world conditions, respond to changes, improve operations and add value. Virtually every IoT thing could have a digital twin. This opens a new set of opportunities for AI-based analysis or control of the physical asset, although organizations must consider the...
potential cost and complexity, particularly in the near term. Identifying clear business objectives and targeted value propositions will be crucial.

The digital world is spawning new techniques such as blockchains to digitize value transfer models. Blockchains are a type of distributed ledger in which value-exchange transactions (in bitcoin or other token) are sequentially grouped into blocks. Blockchain and distributed-ledger concepts are becoming more popular because they have the potential to transform industry operating models in areas such as music distribution, identify verification, the pharmaceutical supply chain and title registry. They offer the promise of adding trust to untrusted environments and reducing business friction by providing transparent access to information in the chain. Most blockchain initiatives are in alpha or beta phases, and significant technology challenges exist. Enterprises should explore the long-term potential for disruption, but be cautious about implementations through 2019.

Related Research

- "Top 10 Strategic Technology Trends for 2017: Virtual Reality and Augmented Reality": Businesses will use VR and AR technologies to enhance customer and employee digital experiences. Although the market is adolescent and fragmented, 40% of organizations that are already using or piloting AR report that it has exceeded expectations.

- "Top 10 Strategic Technology Trends for 2017: Digital Twins": Well-designed digital twins based on business priorities have the potential to significantly improve enterprise decision making. Organizations will implement them simply at first, then evolve them, improving their ability to collect and visualize the right data, apply the right analytics and rules, and respond effectively to business objectives.

- "Top 10 Strategic Technology Trends for 2017: Blockchains and Distributed Ledgers": Blockchain and distributed-ledger technologies can digitally define, store and transfer value, theoretically in real time, potentially at near-zero cost, and without centralized control. Although most of the hype surrounding blockchains concerns their use in financial services, they have many potential uses in, for example, medical records, music distribution, identity verification, title registry, IoT data and supply chain automation.

- "Hype Cycle for Blockchain Technologies and the Programmable Economy, 2016": The programmable economy is a massive technology-enabled transformation of global economic systems, industries and businesses. It enables the production and consumption of goods and services, allowing diverse value-exchange scenarios, both monetary and nonmonetary.

- "Hype Cycle for Human-Machine Interface, 2016": The disruption of the human-machine interface is progressing in leaps and bounds. The point of interaction is moving to mobile and wearable devices as the interface between device and user evolves toward a more user-centric, intuitive interaction.
Mesh: Making the Connection

Digital businesses are evolving into digital ecosystems that drive value through increased interactions between business, people and things.

The mesh theme in our top strategic technology trends for 2017 refers to exploiting connections between the expanding set of people and businesses — as well as devices, content and services — to deliver digital business outcomes. Dealing with the increasing complexity of connections and capitalizing on digital business ecosystems require fundamental changes to the user experience, as well as the underlying platforms, architectures and technologies. Four of our top strategic technology trends deal with different aspects of the mesh:

- Conversational systems
- Mesh app and service architecture (MASA)
- Digital technology platforms
- Adaptive security architecture

**Conversational systems** can range from simple, informal, bidirectional text or voice conversations (such as that beginning with the question "What time is it?") to more complex interactions (such as collecting oral testimony from crime witnesses to generate a sketch of a suspect). Conversational systems shift from a model in which people adapt to computers to one in which the computer "hears" and adapts to a person's desired outcome. Conversational systems enable people and machines to use multiple modalities (such as sight, sound and touch) to communicate across the digital device mesh (through devices — including sensors, appliances and IoT systems).

**The MASA** is a multichannel solution architecture. It uses cloud and serverless computing, containers and microservices, as well as APIs and events, to deliver modular, flexible and dynamic solutions. Solutions ultimately support multiple users in multiple roles, using multiple devices and communicating over multiple networks. MASA is a long-term architectural shift that requires significant changes to development tooling and best practices.

**Digital technology platforms** are the building blocks for a digital business and are necessary to create digital ecosystems. Every organization will have a mixture of five digital technology platform elements (see Figure 4 and "Building a Digital Business Technology Platform"): 

- Information systems
- Customer experience
- Analytics and intelligence
- The IoT
- Business ecosystems
New platforms and services for the IoT, AI and conversational systems will be a key focus through 2020. Everything is opened up through APIs, integrated and made programmable. By 2020, 75% of integration platforms will use machine learning to automate integration between application APIs, reducing the need for integration specialists. Organizations should identify how industry platforms will evolve and devise ways to adapt their platforms to meet the challenges of digital business.

**Adaptive security architecture** deals with the security ramifications of the digital business, with particular emphasis on the security needed to support flexible digital ecosystems, the IoT and AI-based systems. Security has to become fluid and adaptive. Security in the IoT environment is particularly challenging. Security teams need to work with application, solution and enterprise architects to consider security early in the design of applications and IoT solutions. Almost every enterprise will have to use multilayered security and user and entity behavior analytics.

**Related Research**

- "Top 10 Strategic Technology Trends for 2017: Conversational Systems": Conversational systems will drive the next paradigm shift in IT, fundamentally changing the relationship between people and technology. The focus will move from technology-literate people to people-literate technology.
"Top 10 Strategic Technology Trends for 2017: Mesh App and Service Architecture": Digital business ecosystems demand a new approach to application architecture. The MASA can deliver adaptable systems that maximize current and future business value.

"Top 10 Strategic Technology Trends for 2017: Digital Technology Platforms": Digital technology platforms provide critical services that support the growing mesh of connections between people, devices, things, apps, services and content. They also support the intelligent digital business solutions delivered through the mesh.

"Top 10 Strategic Technology Trends for 2017: Adaptive Security Architecture": The intelligent digital mesh creates an ever-more complex world for security, demanding a continuous, contextual and coordinated approach. Establishing a broad adaptive security architecture is vital.

"Hype Cycle for Application Architecture, 2016": Application architecture is undergoing a wave of innovation as organizations invent new architectural paradigms, patterns and structures to support digital business initiatives and modern delivery processes.

"Hype Cycle for the Internet of Things, 2016": The challenges for enterprises implementing IoT projects remain formidable. Enterprises must prepare for custom IoT projects that exploit immature ecosystems, technology stacks and standards — and that require consulting and professional services.

Identifying and Applying Strategic Technology Trends

Organizations that fail to respond appropriately to our top 10 strategic technology trends risk losing competitive advantage to those that do.

We use insights from analysts across Gartner and key research projects — including Hype Cycles, Predicts and Magic Quadrants — to identify and evaluate candidate trends. The top 10 is not a ranked list, with one trend being more important than the others. Rather, it is a list of interconnected trends, with their relative importance shifting by industry, business need and maturity of the enterprise. Organizations must examine the potential impact of these trends, factor them into their strategic planning for 2017, and adjust business models and operations appropriately. The ability to identify trends that are poised to break out of the emerging state and navigate the rapid pace of change with growth trends leads directly to competitive advantage (see Figure 5).
IT leaders and digital business leaders must identify technology trends and determine which of them will significantly affect their organization. As the rate of technological innovation increases, organizations are challenged to evaluate the impacts of these technology trends. This evaluation is not limited to one role in IT, or even to IT itself — it cuts across the entire organization, with various groups bringing a unique perspective. For example:

- **CIOs** lead the charge, working with business executives to set the vision for the organization’s technology-enabled business initiatives, and establishing the culture and process within IT to deliver on this vision. They must ensure that the IT organization works closely with the business to explore strategic technology trends and factor their impact into enterprise and business strategy and architecture.

- **Enterprise architecture (EA) and technology innovation leaders** must work across IT and the business to support strategic business and technology strategies that meet current business needs, while simultaneously enabling business innovation. They must factor these trends, and their business and technology implications, into future EA models and initiatives. By using a structured approach to evaluate disruptive technologies, EA leaders can increase the opportunities of technology innovation and reduce the risks. By 2018, 40% of EA teams will be distinguished as leaders by their primary focus on applying disruptive technologies to drive business innovation.

- **Technology leaders across IT**, including infrastructure and operations, applications and security, have an important role to play in tracking and addressing strategic trends. These professionals examine the individual technologies in detail. They need to understand the trends'
implications for current and future technology architectures, supporting technologies and best practices.

- **Business leaders** evaluate these trends’ potential impact, rather than focusing on their technical details. Working with technology innovation professionals, they should consider the specific implications of these trends on current and future business activities.

**Related Research**

- "Identify the Technology Trends You Need to Watch": Organizations must separate the reality from the hype about disruptive technology trends. This research presents a model for identifying the technology trends that organizations need to track.

- "Using EA to Master Emerging and Strategic Trends Primer for 2017": As organizations continue to invest in digital business transformation initiatives, they will use EA to implement their strategies.

- "How Vanguard Enterprise Architects Lead Technology Innovation": By using a structured approach to evaluate disruptive technologies, EA leaders can increase the opportunities and reduce the risks of technology innovation.

- "Hype Cycle for Emerging Technologies, 2016": Emerging technologies are enabling highly disruptive business models that compel organizations to pursue digital business innovation.

- "The 2017 CIO Agenda: Seize the Digital Ecosystem Opportunity": As digitalization matures, more organizations join digital ecosystems. This raises technological, organizational and leadership challenges. Many organizations will need to change from being linear-value-chain businesses to being part of a faster and more dynamic networked digital ecosystem.
Related Priorities

Table 1. Related Priorities

<table>
<thead>
<tr>
<th>Priority</th>
<th>Focus</th>
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<tbody>
<tr>
<td>Building a Sustainable Innovation Process and Culture</td>
<td>The building of a sustainable innovation process and culture initiative helps drive innovation within teams and across the broader enterprise.</td>
</tr>
<tr>
<td>Developing Strategy and Creating a Strategic Plan</td>
<td>Forty percent of technology spending now occurs outside IT. This initiative helps organizations to create an inclusive, executable digital business strategy enterprisewide.</td>
</tr>
<tr>
<td>Building and Expanding a Digital Business</td>
<td>Digital business is the creation of new business designs by blurring the digital and physical worlds. Digital business involves the interaction of people, businesses and intelligent &quot;things.&quot;</td>
</tr>
<tr>
<td>Build a World-Class EA Capability</td>
<td>This initiative on building a world-class enterprise architecture (EA) capability provides Gartner clients with definitions, along with the portfolio of research to expect in 2017.</td>
</tr>
</tbody>
</table>

Source: Gartner

Gartner Analysts Supporting This Trend

![David W. Cearley](image)
David W. Cearley

![Mike J. Walker](image)
Mike J. Walker

![Brian Burke](image)
Brian Burke

Related Resources

Webinars

"The Gartner Top 10 Strategic Technology Trends for 2017"

"Top Predictions 2017 and Beyond: Surviving the Storm Winds of Digital Disruption"
Podcasts

"Top 10 Strategic Technology Trends for 2017 and Beyond"

"These Digital Trends Could Reshape Your 2017 Strategy"

Articles


Gartner Recommended Reading

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


"Top 10 IoT Technologies for 2017 and 2018"

"Top 10 Strategic Technology Trends for 2016"

"Practical Blockchain: A Gartner Trend Insight Report"

"Artificial Intelligence Primer for 2017"

Evidence


14 Gartner conducted a survey of 228 respondents on the use of digital technologies to drive digital business transformation. Of the 29% of organizations currently using or piloting AR, 40% found that AR exceeded expectations, while 60% found that AR performed as expected.

Note 1 Artificial Intelligence Isn’t the Same as Human Intelligence

Human intelligence refers to the natural cognitive ability of human beings. Human intelligence is a broad, generalized activity, while AI mimics narrow aspects of human intelligence in a tightly bounded domain for a well-scoped purpose.

AI is designed to add human-like qualities, but is extremely limited in comparison. AI-based systems aren’t autonomous and don’t understand or learn in the same sense that a human being understands, learns and acts autonomously. Rather, they apply machine-learning techniques and appear to understand and act autonomously, but only within a specific area and with a well-defined purpose.

An AI-enhanced system can make probabilistic projections, come to conclusions that were not explicitly programmed and adapt its rule set based on observations. However, it can’t expand beyond its defined domain and purpose. For example, an autonomous vehicle can’t "learn" how to play chess by receiving data on chess.

The term "intelligent" in this research refers to the use of AI and related advanced machine-learning techniques in a system.