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Publication Date:

ID Number: G00270096

Leveraging Enterprise Architecture to Enable Business Value With Smart Machine Innovations Today

Mike J. Walker, Tom Austin

Organizations that leverage EA can seize the value drivers of smart machines to drive competitive advantage, embrace solid returns and protect intellectual capital. EA leaders can use this report as critical enablers of the exploration and delivery of actionable plans for smart machine technologies.

Key Findings

- Organizations that have a unique plan of action that specifically addresses Smart Machines capabilities (adaptive, curious and insightful) dramatically increase their competitive advantage by identifying business transformation opportunities.
- Leading organizations that manage smart machine innovations as intellectual property (including processes and information) substantially increase their ability to protect existing business while putting their company in a future market leadership position and setting a new vision for their industry.
- Organizations that are able to contrast their analysis of their business and information architectures with smart machine technologies are in a powerful position to understand how they can maximize their workforce results through the digitization.
- Enterprise architects that valuate smart machine technologies taking a laser focus on risk and benefits measures increase their market leadership by identifying actionable and innovative opportunities.

Recommendations

EA practitioners:

- Take a clearly defined, time-boxed, structured ideation approach, exploring the business value that will be delivered and creating an actionable strategy through a highly iterative approach.
- Highlight the feasibility and applicability of smart machine technologies through structured ideation analysis to confront both fear and inflated expectations of business unit and IT leaders.
- Engage in intellectual property creation through the identification of patentable smart machine algorithms as part of tomorrow's business processes.

- Create an education and communication plan to stay abreast of how smart machine related regulatory and legal developments impact your company's operations across its different markets, geographies and customer segments.
- Create a human capital impact assessment that identifies how smart machine technologies will affect the organization's workforce and provide value to the business linked to a smart machine road map and associated technologies.

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Introduction

There is great interest and enthusiasm for smart machines, but also a clear warning from leading minds on their impacts — not only to business but also in terms of the effect they will have on humanity. Influential theoretical physicist Stephen Hawking stated that if artificial intelligence (AI) risks are not well understood, the consequences could be disastrous to humanity.[1]

This research primarily focuses on helping enterprise architecture (EA) practitioners lead their organizations response to the opportunities and threats of smart machines, and provides actionable advice on how to evaluate the impact of smart machines. This research is not limited to just one technology, but covers an entire class of smart machine technologies (see Note 1).

Enterprise architects should pay close attention to smart machines for the following reasons:

- **Smart machines will change IT forever.** Smart machines are beginning to reshape industries today in banking, hospitality, automotive, hospitality or even a grill out.[2,3,4,5,6] The real impacts are yet to come, with smart machine technology having a profound impact on individual companies, entire industries and markets ever so quickly emerging.
- **Businesses will be disrupted.** Smart machines usher in an entirely new class of product and services that can either enhance or disrupt core business models.
- **Smart machines are here today.** These technologies are here now, having impacts on the medical industry, legal industry and banking, to name a few.
- **Plans are not optional.** The majority of smart machine technologies are two to 10 years from being fully mature, in the true sense of the smart machines definition.

This research is designed to help enterprise architects:

- Determine the potential value and impact of smart machines in the context of how these technologies will affect the business outcomes of their organizations.
- Create actionable deliverables that can be used to determine which business opportunities and initiatives need to be created as a result of smart machine technologies.
- Identify example diagnostic deliverables that will aid in the understanding of how smart machine technologies could be leveraged.
- Determine the types of contextualized examples of how smart machines are used today to solve address business outcomes.

Analysis

Organizations that have a unique plan of action that specifically addresses Smart Machines capabilities (adaptive, curious and insightful) dramatically increase their competitive advantage by identifying business transformation opportunities.

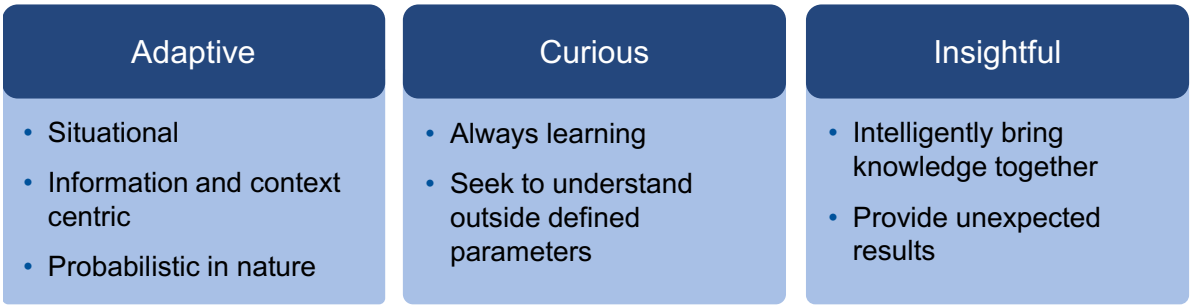
Smart machines are a grouping of emerging technologies that are able to deal with complexity at a rate in which other technologies and humans cannot. What makes smart machines unique is the way they can:

- Understand problems and their context
- Learn from experience
- Make decisions using probabilistic models
- Predict future states
- Act autonomously
- Mimic human reactions to questions in natural language

Creating a business-outcome-driven plan of action leveraging these unique abilities requires EA practitioners to first understand the characteristics of smart machine technologies. Smart machines aren't

just one technology, but a set of technologies that can be characterized through a common set of attributes as shown in Figure 1.

Figure 1. Smart Machine Characteristics

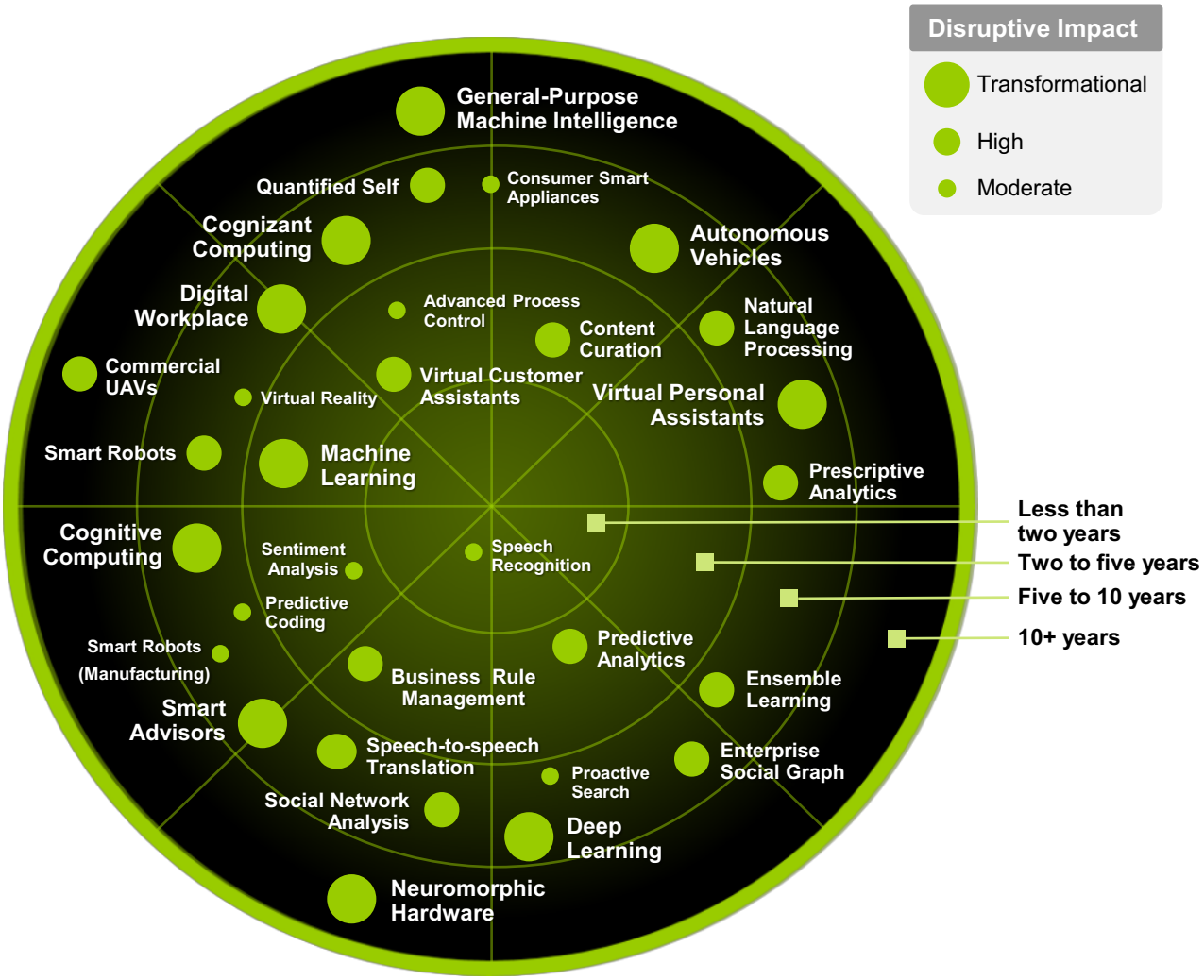


Source: Gartner (September 2014)

While very few technologies adhere to all of these characteristics today, many of the technologies are in basic form with planned evolution stages.

As shown in Figure 2, the majority of smart machine technologies are not expected to be fully "smart" for another decade (see "Hype Cycle for Smart Machines, 2014"). However, that shouldn't hinder innovation. Using a human or gamification approach (see "Redefine Gamification to Understand Its Opportunities and Limitations") in a similar way, Boeing Employees' Credit Union improved employee participation and engagement in their enterprisewide innovation program, allowing them to deliver greater business value.[7] EA practitioners who are able to utilize these techniques will be able to leverage the creativity and ideation-style methods to identify smart machine opportunities for use today.

Figure 2. Smart Machine Radar



Source: Gartner (September 2014)

By leveraging a combination of enabling deliverables — Gartner Hype Cycles, Maverick reports and Cool Vendor research — along with the diagnostics deliverables such as smart machine radar, EA practitioners are enabled to customize the identification, classification and opportunities for usage of smart machine technologies (see "Toolkit: Example EA Deliverables for Driving Smart Machine Strategies"). By taking this approach, EA practitioners will be able to create an actionable, tailored, signature-ready plan of action.

Recommendations:

EA practitioners:

- Conduct structured ideation workshops that confront both fear and inflated expectations of business unit and IT leaders, while creating meaningful analysis of the outcomes[(aa)].[8]

- Avoid analysis/paralysis syndrome by clearly defining starting and ending points of the smart machine ideation process.
- Use the smart machine radar, combined with your industry market analysis, to identify the business and technical impacts to the organization.
- Determine, based on the impact and benefit, the appropriate amount of time to dedicate a vanguard enterprise architect to provide monitoring of evolution, industry impacts and ongoing business viability analysis of smart machine technologies:
  - Vanguard enterprise architects should:
    - Create focus smart machine groups that are composed of technologists, business unit and IT leaders
    - Facilitate brainstorming workshops with clear goals and outcomes
    - Foster a culture of out-of-the-box thinking with clear incentives for innovative thinking.

Leading organizations that manage smart machine innovations as intellectual property (including processes and information) substantially increase their ability to protect existing business while putting their company in a future market leadership position and setting a new vision for their industry.

As organizations start and continue the creation of their digital business, the traditional way in which business was designed and operated will shift to a blurred physical and digital world (see "Agenda Overview for Digital Business, 2014"). This shift to a digital business will aid the rise of smart machines that will complement and/or fully automate business capabilities, creation of new business models and even introduction of nonhuman customers/consumers of information and events.[9,10]

Largely due to computer-enabled automation, the U.S. Patent Office changed its stance on the patenting "methods of doing business" to an acceptable patent called a "business method patent." With the Supreme Court of the U.S. continuing to clarify this ruling made in 1999, business method patents must produce a concrete, useful and tangible result in order to be patentable.[11] The advent of smart machines applied to business processes makes patent protection an important consideration to the use of these technologies within the business.

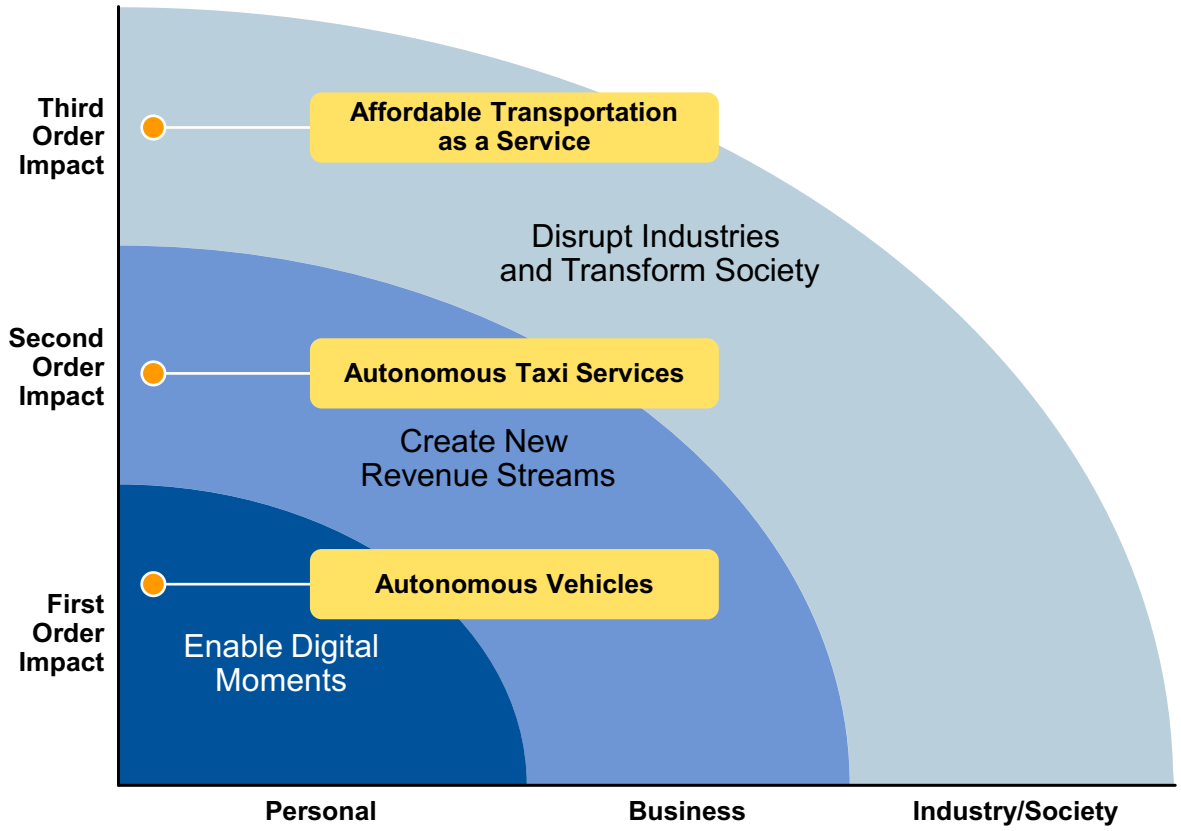
As organizations continue to streamline, optimize and innovate their business models in the shift to digital business, unique and smart methods will emerge. Smart machines pose both great risk and opportunity. With smart machines, yesterday's business process is today's smart machine algorithms. Those algorithms are now legally patentable, in that they are applied to produce "a useful, concrete and tangible result."

Globally, $104 billion has been received from royalties in 2012.[12] If organizations don't protect their intellectual property, they expose themselves to considerable business risk while missing or diminishing new opportunities for revenue and continued innovation. Microsoft is an example of how having a clear intellectual property (IP) approach has protected their innovations, thus providing $2 billion in direct revenue from IP.[13]

Smart machines define entirely new classes of products and services that can enhance and/or disrupt core business models. With Uber leading the ridesharing industry in patent portfolios, it is clear IP is a

part of the business strategy. Uber, which is the front runner in patent activity with 11 pending published U.S. patent applications, has several algorithmic technology-based patents that extend its business model.[14,15] As shown in Figure 3, Uber isn't looking only at optimization of its core business model but also into smart machine technologies to redefine its industry — as well as how humans look at transportation.[16]

Figure 3. Transformation of the Automotive Industry



Source: Gartner (September 2014)

Smart machines will impose an entirely different interaction model between humans and technology.

Recommendations:

EA practitioners:

- Facilitate a smart machine opportunity identification session with business and IT leadership to gain agreement and direction on how smart machines impact the long-term strategy (see "Smart Machines Lead to Competitive Advantage as Well as Ethical Challenges").
- Include intellectual property and risk management stakeholders in all stages of the exploration of business value of smart machine technologies.
- Educate yourself on the impacts of intellectual property, understand how to analyze intellectual property and identify the share of the market that can be attributed to smart machine technologies.

- Create a business capability model overlay that identifies the smart machine technology impact uses, and the importance of information that is enabled by smart machines.

Organizations that are able to contrast their analysis of their business and information architectures with smart machine technologies are in a powerful position to understand how they can maximize their workforce results through the digitization.

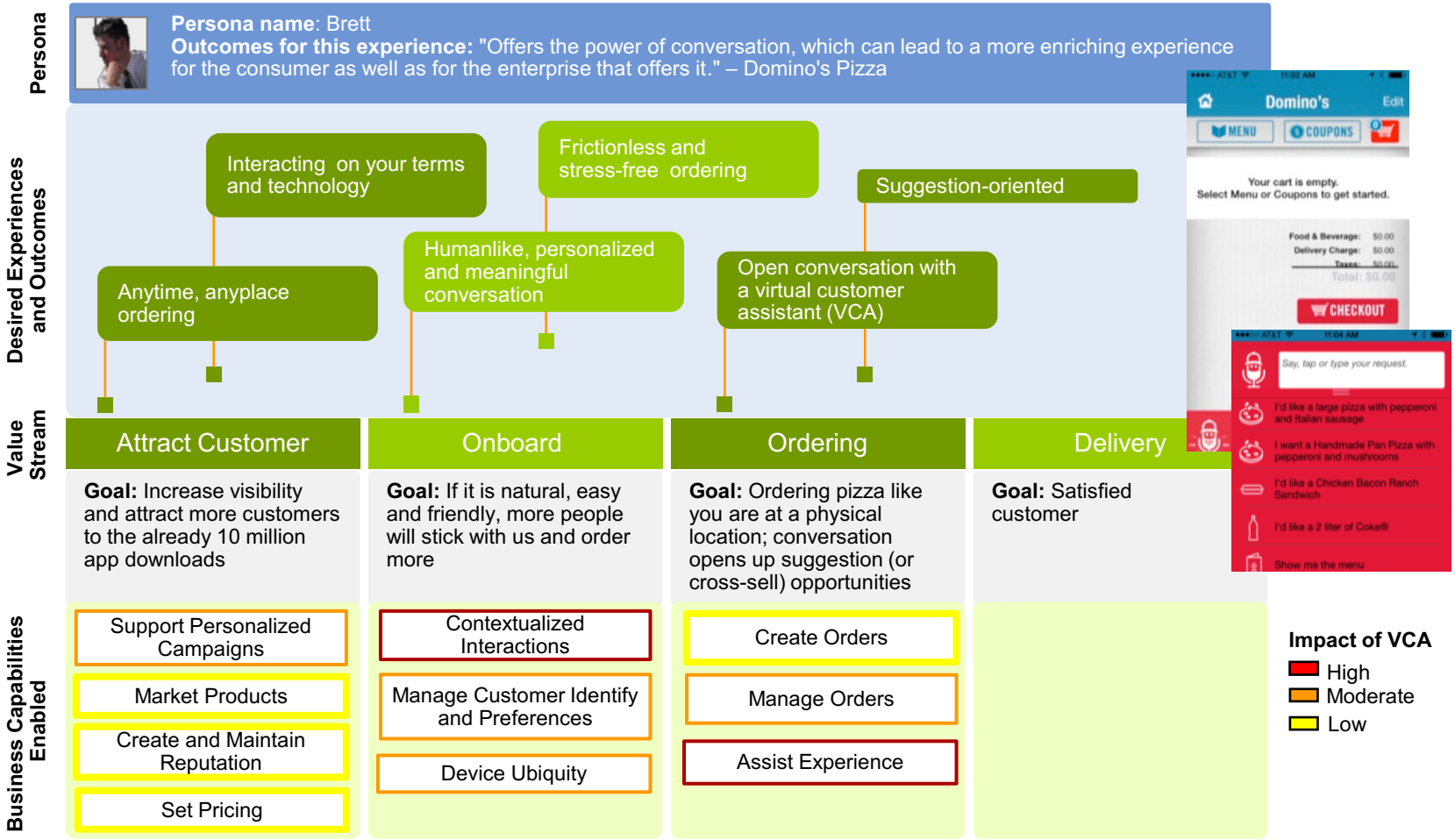
Smart machines are well poised to provide the next big innovation wave in the digital enterprise. With digitization happening in technology areas, other opportunities exist on the human capital side. While IT costs are typically about 4% of annual revenue, these costs pale in comparison to the staggering 40% of human capital costs across some industries.[17] This is where smart machines have an opportunity to augment, assist or replace humans in the workforce.

The highly innovative bank United Services Automobile Association (USAA) is no stranger to taking on disruptive trends. As an example, USAA's dedicated innovation lab aided USAA in being the first bank to embrace mobile remote deposit capability in the U.S.[18] USAA innovation lab has also embraced a class of smart machine technologies called "virtual customer assistants" (VCAs) with both speech enabled.[19] This solution provides USAA members that are in a transition from the service to civilian life with a virtual customer assistant that answers questions about the military transitions. Through the digitization of this highly interactive solution of a potential 155,000 military member base, it frees up knowledge workers for other high-touch and interaction points with its members.[20]

USAA and others show that activities primarily sourced from skilled humans workers can now be accomplished by smart machines. Organizations that want to seize this opportunity should turn to EA practitioners to bring forth the analysis required to combine business outcomes with disruptive trend analysis.

Figure 4 is an illustrative example inspired by a Domino's Pizza smartphone VCA innovation for mobile ordering.[21] Using a business outcomes journey map allows organizations to understand the experiences they want for their customers that are directly tied to the monetization of a value stream.

Figure 4. Business Outcomes Journey Map Inspired by Domino's Pizza VCA Case Study



Source: Gartner (September 2014)

The business outcomes journey map also extends into understanding which business capabilities will be needed or to the introduction of new ones (see "Toolkit: Example EA Deliverables for Driving Smart Machine Strategies"). This provides the bridge to understanding the people, process, information and resources required to enable smart machines. Leveraging EA-oriented techniques with a disruptive trend like smart machine allows organization to manage and calculate risk just like other any other technology initiative.

Recommendations:

EA practitioners:

- Create business scenarios that define opportunities in the context of tangible business outcomes along with a way to understand how to make knowledge workers more effective, reduce risk and increase efficiencies.
- Define personas based on key human capital areas that will be affected by smart machines as a way to identify high-impact business scenarios that are grounded in a real-world view of the organizations products and services.
- Use business outcome journey maps to discover new and enhance business outcomes through the experiences and interactions that drive monetization of the organizations products or services
- Create an education and communication plan to stay abreast of smart machine regulatory and legal developments that impact your company's operations across different markets, geographies and customer segments in which business is conducted.
- Create a human capital impact assessment that identifies how smart machine technologies will affect the organizations workforce through the identification of the ethical, social and political ramifications. As shown by Frey and Osborne, 47% of today's jobs are likely to disappear in the next "decade or two," human labor being replaced by smart machines.[22]

Enterprise architects that valuate smart machine technologies taking a laser focus on risk and benefits measures increase their market leadership by identifying actionable and innovative opportunities.

Smart machines are intrinsically difficult to rationalize into a set of actionable opportunities due to the very broad classification of smart machines. Groupings of smart machines (doers, sages and movers — see Note 2) have very specific paths that may not have conformity to each other, resulting in imperfect road mapping when bringing together multiple groupings (see "Smart Machines Mean Big Impacts: Benefits, Risks and Massive Disruption").

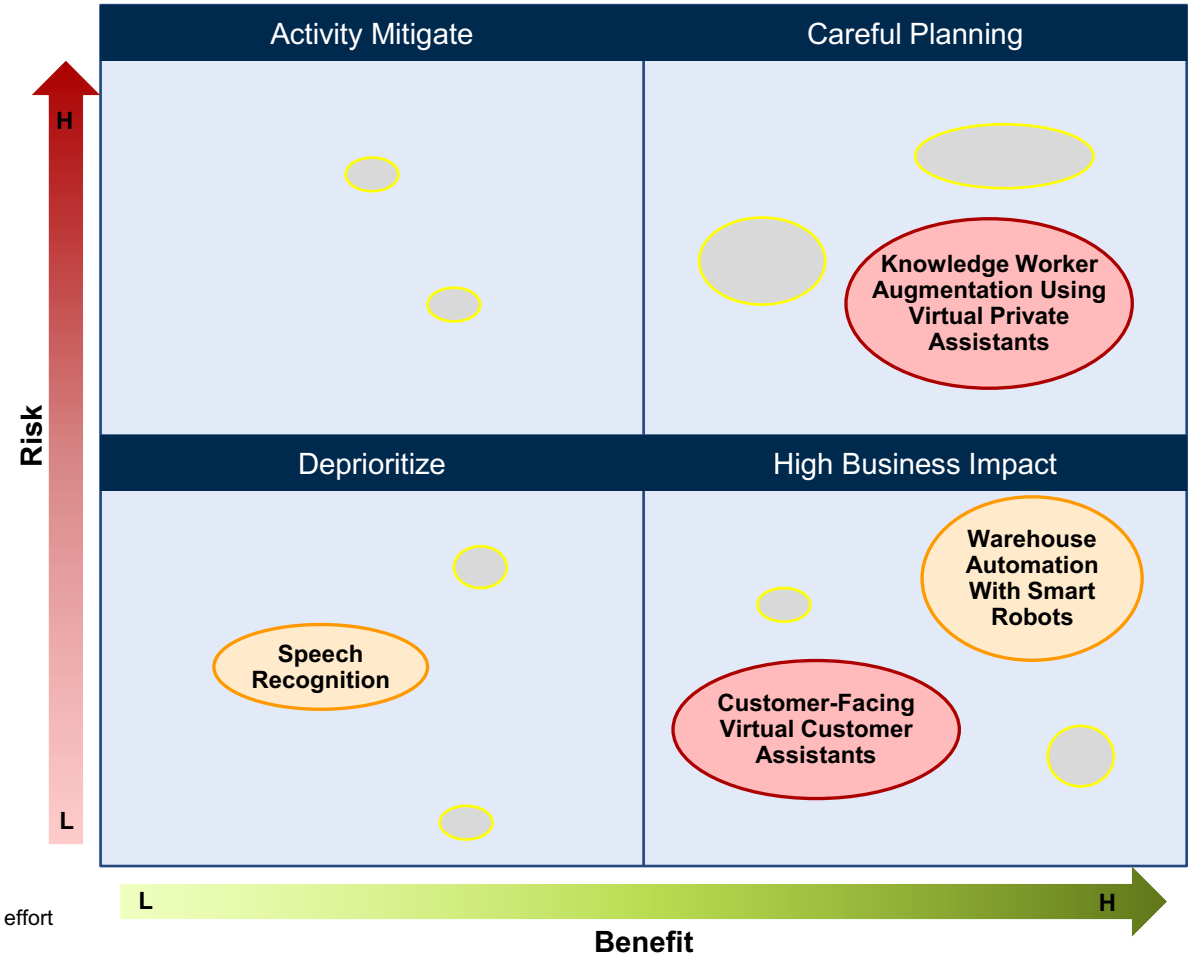
To better understand how smart machine technologies can be applied, valuation based techniques should be used to distill business benefits and risks associated with the very specific smart machine technologies in question. An example of a business driven approach to the application of smart machine technologies is the mobile operator O2. At a recent forum meeting hosted by O2, a BPO roundtable discussed how the speed and economics of robotic automation can have a radical impact on business processes with the ability to reduce costs by up to 60%.[23]

Wayne Butterfield, head of back office for O2 stated, "With revenue in the mobile market falling, and offshore costs rising, a viable alternative needed to be found to keep operational costs low. A virtual Back Office is not only financially appealing to set up, but with extended opening times, no sickness or holidays and no personality to contend with, it was a no brainer to use a business lead automation tool like Blue Prism to automate those existing FTE heavy processes that Technology weren't looking to automate in any large IT projects."[24] This was realized by O2 when directly facing the surge of customer demand following the release of the new Apple iPhone O2 needed a solution to address the capacity challenges. O2 employed robots to automate business processes thus reducing the cost of back office operations to handle the spike., simply building the SIM swap process into its back office.

Shown in Figure 5, the business value matrix is an example of a diagnostic deliverable that can be used by EA practitioners to better understand how opportunities translate into direct business value (see "Toolkit: What Enterprise Architects Need to Know About Smart Machines").

Figure 5. Applying the Business Value Matrix to Smart Machines

Applying Smart Machine Diagnostic Deliverables



Strategic Alignment

- High
- Moderate
- Low

Effort

Size denotes level of effort

Source: Gartner (September 2014)

Using enabling deliverables and other diagnostic deliverables as key inputs into this model, opportunities are fully qualified and viable paths of action for organizations.

Recommendations:

EA practitioners:

- Create a risk profile around smart machine opportunities that provides business unit and IT leaders with analysis that identifies business impacts before they can occur.[25]
- Identify the strategies and business outcome statements that are affected by smart machine technologies and recommend a clear course of action that uniquely provides business benefit.
- Leverage the business value matrix as a way to balance smart machine benefits and risks so that EA practitioners are able to recommend high impact initiatives through valuation based diagnostic deliverables that balance both the benefits along with its potential impacts of negative disruption.
- Create road maps in the context of both the evolution of the technology and how multiple desperate technologies link together to provide value back to the organization.
- Prioritize smart machine investments based on the value it brings back to the organization.

Gartner Recommended Reading

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

"The Top 10 Strategic Technology Trends for 2014"

"Hype Cycle for Smart Machines, 2014"

"The Disruptive Era of Smart Machines Is Upon Us"

"Smart Machines Mean Big Impacts: Benefits, Risks and Massive Disruption"

"Maverick* Research: How Technology Is Ending the Automotive Industry's Century-Old Business Model"

"Maverick* Research: Surviving the Rise of 'Smart Machines,' the Loss of 'Dream Jobs' and '90% Unemployment'"

"Use Journey Maps in User Experience Design and Digital Workplaces"

"Vanguard Business and Technology Innovation Is Client-Led and Value-Driven"

"Toolkit: What Enterprise Architects Need to Know About Smart Machines"

Evidence

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[2] "New IBM/Watson Technology Available For USAA Members Transitioning to Civilian Life," Military One Click.

[3] S. Cousins, "Your Robot Butler Has Arrived," Savioke, 12 August 2014.

[4] "Maverick* Research: How Technology Is Ending the Automotive Industry's Century-Old Business Model"

[5] A. Robinson, "Perfect Buns: Imaging System Controls Baking Process on Production Line to Improve Sandwich Bun Quality," Georgia Tech Research News, 8 March 2011.

[6] D. Kerr, "IBM's Watson and Bon Appetit Team Up to Create Cutting-Edge Cuisine," CNET, 30 June 2014.

[7] "BECU Adopts a Human Approach to Innovation to Drive Employee Engagement in Business Value Creation"

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[18] "USAA Bank and Mitek Systems Earn Top Honors in Inaugural BAI MobileLink Awards," 20 October 2010.

[19] "New IBM/Watson Technology Available For USAA Members Transitioning to Civilian Life," Military One Click.

[20] Bureau of Labor Statistics

[21] B. Beranek, "Domino's Makes a Game-Changing Move to the Way You Order Pizza," What's Next at Nuance, 16 June 2014

[22] ""Maverick* Research: Surviving the Rise of 'Smart Machines,' the Loss of 'Dream Jobs' and '90% Unemployment'"

[23] Operational Agility Forum

[24] "Robotic Automation — What Next for BPOs?" Operational Agility Forum

[25] "Toolkit: Risk-Adjusted Value Management Workshop"

(i) Smart Machines Lead to Competitive Advantage as Well as Ethical Challenges

(I) IBM Sets U.S. Patent Record

(v) Vanguard Business and Technology Innovation Is Client-Led and Value-Driven

Note 1
Definition of Smart Machines

Smart machines are a grouping of emerging technologies that are able to deal with complexity at a rate in which other technologies and humans cannot that address a combination of: (1) understanding problems and their context, (2) learning from experience, (3) making decisions using probabilistic models, (4) predicting future states, (5) acting autonomously and (6) mimicking human reactions to questions in natural language (see "The Disruptive Era of Smart Machines Is Upon Us").

Note 2
Groupings of Smart Machines: Doers, Sages and Movers

Smart machines take many forms (see "The Disruptive Era of Smart Machines Is Upon Us"):

- **Doers** are technologies that are machine-focused helpers, and emerge at various levels of scale, from individual robots to enormous networks of industrial machines.
- **Sages** are technologies that appear to understand the meaning of rich content (including context). We can identify at least three different categories of sages:
    - Virtual personal assistants
    - Smart advisors
    - Other linguistically smart systems
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- **Movers** are technologies that enable autonomous vehicles.