Five Ways Artificial Intelligence and Machine Learning Deliver Business Impacts

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Not all artificial intelligence and machine learning strategies are created equal, but they are becoming critical for differentiation and sometimes survival. This research aims at guiding data and analytics leaders in identifying which category will deliver maximum impact for their organization.

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Overview

Impacts

- Data and analytics leaders should pursue the powerful and tangible business benefits that artificial intelligence projects can deliver before engaging with their analytics teams.

Recommendations

To ensure that artificial intelligence (AI) innovations are deployed effectively, data and analytics leaders should:

- Increase the power of AI techniques by engaging data scientists and AI specialists in every innovation project throughout the organization.
- Ensure sustainable outcomes from AI techniques by using your AI team to support production teams for continuously improving enterprisewide model management and performance monitoring.

- Draft a portfolio of analytical scenarios and use cases, including those that your organization is already executing or planning. Present it to C-level executives. Document their preferences to better rationalize funding decisions for AI projects.
- Maximize the business impact of AI implementations by maintaining an intense dialogue between the AI team, the business functions (including lines of businesses) and the executives charting the corporate strategy.

Strategic Planning Assumption

Through 2021, 75% of AI projects will remain at the prototype level as AI experts and organizational functions cannot engage in a productive dialogue.

Analysis

Data is already everywhere and consistently growing in volume and complexity; consequently, AI problems are becoming increasingly prevalent. Some organizations face a large number of use cases to which AI (see Note 1) could be applied. To better cope with the sheer mass of projects, some leading organizations are starting AI teams whose general mission is to become a shared resource across the organization (see "How to Organize AI Talent").

Analytics themes still outrank other popular technology topics in executives' priorities. Organizations are actually funding this curiosity by increasing their investment in analytics from $31 billion in 2013 to an estimated $114 billion in 2018. [1] The same study also found that 60% of executives in 2016 believed that analytics would disrupt their industry within the next three years — which it has.

Organizations with AI expertise can expect significant returns when capitalizing on such radical societal changes and disruptions. Figure 1 illustrates the types of business value brought about by AI teams.

Figure 1. Mission Statement of Artificial Intelligence Teams

Mission Statement of Artificial Intelligence Teams

	Innovation	Exploration	Prototyping	Refinement	Firefighting
Challenging Status Quo	**100%**	**80%**	**60%**	**20%**	**0%**
Data Scientists Work as	Innovators or inventors	Investigators or detectives	Engineers	Engineers	Investigators
Main Objective	• Disruptive ideas • Discover new business moments • Deductive thinking	• Transformative ideas • Explore unknown issues • Look for discontinuities • Inductive thinking	• Evolutive ideas • New problem solving • Improve existing solutions by 20% to 300%	• Effective ideas • Improve existing solutions by 1% to 10%	• Remediating ideas • Diagnosis • Hypothesis validation
Plan	• Look for cross-industry insights • Research disruptive indicators • AI experts must participate in innovation • Brainstorm with senior executives	• Fund nondirected exploration • Leverage AI skills • Exploit existing market inefficiencies • Promote iconoclastic business ideas	• Require ROI justification • Ideal for AI lab involvement • Promote data augmentation • Close the business monitoring loop	• Go deep in LOB activity • Look for efficiency levers • Focus on critical variables • Use performance management tools as guides	• Tackle cross-function tactical projects • Acquire domain knowledge • Build versatile skills • Promote SWAT analytics
Use of Data	Audacious	Massive	Selective	Selective	Selective

LOB = line of business; SWAT = special weapons and tactics
Source: Gartner
ID: 431403

Data and analytics leaders can use AI projects to deliver the following high-level business impacts, which we discuss throughout the note in more detail:

- **Innovation:** Foster new thinking and business disruptions based on AI.
- **Exploration:** Explore unknown transformative patterns in data.
- **Prototyping:** Challenge the status quo with radical new solutions.
- **Refinement:** Continuously improve existing in-production solutions.
- **Firefighting:** Identify the drivers of certain upcoming situations.

Figure 2 summarizes the top recommendations for this area of impact.

Figure 2. Impacts and Top Recommendations for Data and Analytics Leaders

Impact Appraisal

Impact	Top Recommendations
Data and analytics leaders should pursue the powerful and tangible business benefits that artificial intelligence projects can deliver before engaging with their analytics teams.	• Increase the power of AI techniques by engaging data scientists and AI specialists in the organization's innovation projects. • Use your AI team to support production teams for continuously improving enterprisewide model management and performance monitoring. • Present C-level executives with a portfolio of analytical scenarios and use cases. Document their preferences to better rationalize funding decisions for AI projects. • Maintain an intense dialogue between the AI team, the business functions and the executives charting the corporate strategy.

Source: Gartner
ID: 431403

Impacts and Recommendations

Data and Analytics Leaders Should Understand the Powerful Business Benefits That Artificial Intelligence Projects Can Deliver

Innovation — Foster New Thinking Based on Artificial intelligence

Without data scientists and their knowledge, many issues surrounding the digital business age will remain unresolved — possibly even untouched. AI experts and data scientists frame complex business problems as machine learning or operations research problems. These experts know which new information sources should be collected or acquired from external sources, helping organizations to solve old and pivotal business issues in radically new ways.

There are many more examples of disruptive projects and new business moments (see Note 2) that are made possible through AI.

Case Examples: Innovation

- *In the mid-1990s, Amazon started one of the earliest recommendation services ("here are four other items that customers buying this product also bought"). This became one of the most prominent and lucrative AI projects in history. It is estimated that 15% to 20% of Amazon's retail business is due to this simple product recommendation. In fact, it became a desirable feature, with customers wanting to explore related items for any given product.* [2]

- *UPS On-Road Integrated Optimization and Navigation (ORION) revamped route optimization using many new data sources. It has enabled UPS to significantly improve its routing schedules, saving hundreds of millions of dollars per year while improving customer service.* [3]

- *IBM Watson's Jeopardy-winning natural language system was based on crowdsourced data and cutting-edge assembly of different machine learning and natural language approaches.* [4]

- *While using machine learning to predict and reduce engine repair costs (saving $63 million in two years), a U.S.-based aircraft engine manufacturer realized that it could better estimate fuel consumption and engine usage time by uploading in real-time thousands of sensor data points to the cloud. It therefore switched its entire business model from selling engines to plane manufacturers to "leasing hours of flight" while guaranteeing fuel consumption levels — a major expense for airlines. This was a revolutionary business move.* [5]

Companies also use data and the corresponding analytics in novel ways. For example, Progressive was one of the first insurers to create an insurance product that used GPS-based location intelligence to keep Progressive better informed about the actual risks against which it is insuring (see "Technology Overview for Personal P&C Auto Insurance Telematics").

Many online companies have been masters of data-driven innovation. The likes of Amazon, Google, Airbnb, Uber and Facebook constantly introduce new systems to collect better information. This enables them to create better or new services.

Recommendations for data and analytics leaders:

- Use your AI team to frame complex business problems not yet sufficiently understood as AI problems.
- Find inspiration for data-driven innovation from three sources:
    1. Internal curiosity: You are your most important source of inspiration. Constantly think about your own business model, industry (or other industries) and your understanding of new types of customer or equipment interaction points. Keep inventing new business moments through what-if scenarios.
    2. Technology screening: Learn what you can from successful case studies from your own industry or other industries. But be cautious: Many publicly available case studies may not fully reflect exactly what happened, so consider reaching out to the actual implementer.
    3. Induction from data: Examine how data expeditions can support your thinking process, and how they can uncover novel and insightful patterns that teach you more about unsuspected underlying business mechanics.

Exploration — Explore Unknown Patterns in Data

AI experts must engage with machine learning expeditions, especially when there is no clear objective other than to explore the data for insights and tidbits. Such expeditions are a form of inductive reasoning (see Note 3) — an example of "letting the data speak." The process can be tactical and ad hoc. Alternatively, it can be part of a more systematic practice in which you give the AI team or lab (see Note 4) a data dump for diving into and exploring. The lab looks for anomalies, seeking something new. It then drills deeper into the shape of the data using more-advanced techniques, which might include cluster and factor analysis, anomaly detection, regression, decision trees, Monte Carlo simulation and link analysis.

Case Example: Exploration

- *While providing ship classification services, a Japanese maritime service provider realized that it was gathering very valuable asset management data. By using advanced analytics methods and exploring its asset management data mother lode, the company discovered that it could help ship operators reduce equipment failures and lifetime maintenance costs by 10% and reduce anomaly detection costs by 90%. The provider increased its market share by 20% by offering an unexpected and valuable service.* [6]

The objective of data exploration is always to discover which events are drivers — and which are inhibitors — of other events, or of good or bad outcomes. Good outcomes include reducing equipment failure and increasing customer satisfaction. Data exploration could also lead to gaining an understanding of events that could be new customer touchpoints or engagement points. Such information could be used to foster databased innovation.

However, these kinds of projects can be like fishing expeditions. The available data may give hints about what you may gain from the process or give you a better understanding of underlying business mechanics. They can also help you uncover very valuable data assets seen to that point as merely data side effects (like in the Japanese maritime service provider case). Finally, those projects could validate that the data is clean or point to additional data sources to enhance internal sources.

Recommendations for data and analytics leaders:

- Use your AI team to spot anomalies in data in order to anticipate any problems, rather than reacting after a crisis happens.
- Ask your AI team to take another look at the data when new information sources become available or when you gain new understanding.
- Organize internal or external “analytics competitions” such as hackathons to promote innovative thinking and uncover analytics talents.

Prototyping — Challenge the Status Quo With Radical New Solutions

AI and (in particular) machine learning excel in solving complex, data-rich and logic-based business problems. This is particularly true where traditional approaches, such as human judgment and exact solutions, are increasingly showing their limits — due to the escalation of problem complexity and ever-expanding volume of available data (see "Top 10 Strategic Technology Trends for 2019: AI-Driven Development"). AI methods have often proven to deliver superior results when the space of critical variables is highly dimensional and very noisy.

AI teams could tackle hundreds of new business problems.

For instance, companies are already using AI teams to improve product categorization. Many large online retailers have realized that their product categorization may have errors or not align to the way customers think. AI teams are seeking to improve this by using all available features, including look, shape and purpose codes (such as European Article Numbering and North American Industry Classification System codes), product text descriptions and user-generated tags.

Airlines are using AI teams to predict passenger no-shows more accurately. More accurate predictions enable airlines to more safely overbook their planes. This minimizes potential lost revenue from empty seats as well as the risk of passengers arriving to find no seat available for them.

Case Examples: Prototyping

- *In April 2015, a competition on Kaggle concerned the early detection of diabetic retinopathy. [7] The competition challenged data scientists to design a model that would result in an enhanced automated detection system for this disease.*

- *Facing a rising crime rate, a U.S.-based police department needed an efficient and cost-effective way to analyze crime data, assess public safety risks and make intelligent decisions about personnel deployment. It used predictive analytics to discover hidden relationships in the data and automatically generate crime forecasts. By optimizing the deployment of police forces, homicides in the city fell by 35% and robberies by 20% year over year. The solution ROI was estimated at 863%. [8]*

Recommendations for data and analytics leaders:

- Assess whether it would be best to design a radical new solution or to buy or outsource one. It is often better for the business to have a good solution now than a great solution in a year.
- Be cautious when your AI team uses particular data for the first time. Some data was never intended for serious advanced analytics, so scrutinizing data lineage (including its legal validity) and making the data make sense are paramount.
- Use automated machine learning capabilities, which involve metasearches that tweak a set of acceptable solutions to increase lift, classification or estimation accuracy.
- Involve line-of-business units and internal business partners as early as possible to determine the appropriate key performance indicators of newly developed solutions. Close the decision management loop by constantly monitoring the solutions and adjusting it to their business results.

Refinement — Continuously Improve Existing In-Production Solutions

Most data scientists work in the production part of their business. In such areas, established models are already "in-production." For example:

- Banks, retailers, telcos and insurance companies are constantly refining their existing customer segmentation, in order to gain a better understanding of customer profitability, behavior and engagement optimization.
- Retailers keep recalibrating propensity-to-buy models. Online retailers specifically are constantly improving and updating price elasticity prediction, in order to optimize their dynamic pricing.
- Financial services providers are continuously working to improve their risk models — the more accurate their assessment of risk, the better their chances of profitability.

Case Examples: Refinement

- *As a race is taking place, an F1 racing team streams data to the cloud and shares it with the pit crew teams, who are equipped with mobile technology. The data is analyzed in real time by researchers at the engine manufacturer's R&D facility in Japan and the U.K.-based F1 team. Transmitting this analysis using streaming technology as the race is taking place allows for adjustments to basic metrics — such as temperature, pressure and power levels — which help improve the vehicle's performance.* [9]

In all these use cases, organizations must constantly improve their AI practices as new data becomes constantly available, as new products are created, and as consumers or ecosystem partners share data on the usage of these products. Other improvements are induced by changes in customer behavior — not only daily or quarterly, but also yearly, through competition, and as a consequence of an ever-changing marketplace and zeitgeist.

AI teams must also adjust to fast and constant changes around customer touchpoints, with new devices and wearables regularly released by equipment manufacturers and quickly adopted by consumers. Finally, new customer contextualization strategies can lead to better results, and require many existing models and data source inputs to be adjusted.

Recommendations for data and analytics leaders:

- Make sure that the AI team stays close to the business units, and keep sharing their experience and ideas. In turn, ensure that business units keep the AI team aware of changing market and business conditions.
- Use your AI team to support production teams in creating and improving enterprisewide model management and performance monitoring.
- Use your AI team to help production teams create a more homogeneous and cutting-edge compute architecture in terms of hardware, cloud and software stack.
- Ensure that your AI and production teams jointly explore the external data landscape and deploy cutting-edge algorithms (for example, ensemble techniques).

Firefighting — Identify the Drivers of Certain Upcoming Situations

Sometimes, it is not possible to avoid a crisis. The causes of a crisis may be unpredictable or led by previously uncorrelated events. This situation is a variation of the exploration category. Many analytics projects are triggered by crises whose symptoms are usually well identified, such as:

- Customer complaints rising suddenly.
- Customer retention falling dramatically.
- Quality defects increasing dramatically.
- Profitability dropping precipitously.

This means that the AI team only has to identify the cause, which narrows the datasets it must scrutinize.

Everything else in this use scenario is very similar to the work the AI lab does in exploration mode — that is, the lab does not know at the outset whether it can identify the cause of the problem. If the events are totally uncorrelated or rarely occurring issues, the lab may never be able to identify the cause.

Basic data discovery/self-service BI can often help. However, a deeper dive by an AI team can extract more from the data about what is really happening. For example:

- Manufacturers worldwide are looking into the causes of quality fluctuations by combining what-if analysis with sensitivity analysis or inversion of predictive models. Given the increasing complexity and change cadence of devices manufactured, prior data might not be readily available.
- Technical support operations are trying to understand the drivers of maintenance costs. It is known that certain customer segments are more difficult to deal with than others. Factoring these risks into pricing can be crucial and is a well-established practice in the insurance industry — especially considering the dramatic changes and uncertainties brought by increasingly unpredictable weather patterns.
- Online retailers are investigating the reasons why customers return purchased goods when prices are lower than the competition, delivery times are very competitive and the goods are of irreproachable quality.

Recommendations for data and analytics leaders:

- Apply Occam's razor: Data scientists establish trust by applying the simplest methods that deliver key insights. [10]
- Use firefighting projects to expand the AI team's corporate network whenever possible.
- Build versatile skills and domain knowledge within the AI team, allowing members to be ultrareactive when their services are required.

AI and machine learning projects can exert a profound influence on an organization — from tactical and immediate impacts to strategic transformations and even disruptive ideas.

Impressive business impacts have been documented across industries showing that these technologies are becoming critical factors of differentiation and sometimes survival. Being able to quickly identify and categorize that impact can further improve on those already outstanding results and contributions.

Acronym Key and Glossary Terms

AI	artificial intelligence
BI	business intelligence

Evidence

[1] "Cracking the Data Conundrum: How Successful Companies Make Big Data Operational," Capgemini Consulting, 14 January 2015.

[2] "How Retailers Can Keep Up With Consumers," McKinsey Quarterly, October 2013.

[3] "ORION Backgrounder," UPS.

[4] "IBM Puts Its Faith in Watson," E-Commerce Times, 20 January 2014.

[5] "Pratt & Whitney Taps IBM to Capture Value of Big Data to Improve Aircraft Engine Performance," IBM, 17 July 2014.

[6] "ClassNK, IHIMU, DU and IBM Develop Ship Maintenance Software," The Maritime Executive, 12 November 2012; "ClassNK Develops Ship Maintenance Software With IHIMU, DU and IBM," gCaptain, 12 November 2012.

[7] The Diabetic Retinopathy Detection competition on Kaggle started on 17 February 2015 and finished on 27 July 2015. The California Healthcare Foundation sponsored it with a reward of $100,000.

[8] "Memphis Police Department Reduces Crime Rates With IBM Predictive Analytics Software," IBM, 21 July 2010.

[9] "Honda, Watson IoT and Formula 1," IBM, 22 November 2016.

[10] "Why You're Not Getting Value From Your Data Science," Harvard Business Review, 7 December 2016.

Note 1
Artificial Intelligence

Artificial Intelligence applies advanced analysis and logic-based techniques — including machine learning — to interpret events, support and automate decisions, and take actions.

AI is mainly a computer engineering discipline. It is made of software tools aimed at solving problems, not replicating the human mind. From that perspective, AI disciplines, and the tools used to create them, are composed of a series of mathematical or logic-based techniques that are used to uncover, capture and code knowledge; and sophisticated and clever mechanisms that help to solve problems.

Note 2
Business Moments

Gartner defines a business moment as a transient opportunity that is exploited dynamically. It is very short in duration — perhaps only seconds, depending on the nature of the opportunity. This catalyst sets in motion a series of events involving people, businesses and things that span multiple industries and multiple ecosystems.

Note 3
Inductive Reasoning

Inductive reasoning aims at creating broader generalization from observations. Even though the facts that produce the generalization can be true, the generalization itself might not always be accurate. For example, if it is sunny every time you visit your favorite city, you might conclude — falsely — that it is *always* sunny there.

Note 4
Data Science Labs/Teams

A data science lab is a team disconnected from — but close to — the BI competency center. Its individual members usually have different skills. For example, these might be in:

- Advanced statistics
- Business process engineering
- Programming of distributed processing
- Information architecture
- Management

A data science team becomes a "lab" when you provide it with resources, such as server and storage sandboxes or relief from daily workload. It often has a ratio of solutions to "dead-end" efforts in the region of 1:10.

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