5 Ways Artificial Intelligence and Machine Learning Deliver Business Impacts

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Initiatives: Artificial Intelligence

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

Additional Perspectives

- Summary Translation + Localization: 5 Ways Artificial Intelligence and Machine Learning Deliver Business Impacts
  (14 July 2021)

Overview

Impacts

Properly identifying the nature and tangible benefits of artificial intelligence (AI) projects is a primary condition for their operationalization success.

Recommendations

To ensure artificial intelligence innovations are deployed effectively, data and analytics (D&A) leaders should:

- Leverage the power and diversity of AI techniques by having data scientists and AI experts work closely with business domain experts within every innovation project across the organization.

- Ensure sustainable outcomes from AI techniques by using the AI team to support production teams for continuously improving enterprisewide model management, governance and performance monitoring.

- Draft a portfolio of analytical scenarios and use cases, including those that the organization is already executing or planning. Present it to C-level executives, within the context of business KPIs — revenue growth, process automation or asset optimization — to rationalize funding for AI projects and initiatives.

- Maximize the business impact of AI implementations by maintaining an intense dialogue between the AI team, the business functions (including lines of business and the legal teams) and the executives charting the corporate strategy.

Introduction

Data is already everywhere. It is consistently growing in volume and complexity; consequently, AI problems are becoming increasingly prevalent. Some organizations face a large number of use cases in which AI could be applied (see Note 1). 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 An Executive Leader's Guide to Staffing Effective Data Science Teams).

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	• Disrupt • Discover new business moments • Think deductively	• Transform • Explore unknown issues • Look for discontinuities • Think inductively	• Evolve ideas • Solve new problems • Improve existing solutions by 20% to 300%	• Fine-tune ideas • Improve existing solutions by 1% to 10%	• Remediation • Diagnosis • Hypothesis validation
Plan	• Look for cross-industry insights • Research disruptive indicators • Involve AI experts in innovation • Brainstorm with senior executives	• Fund nondirected exploration • Leverage AI skills • Exploit existing market inefficiencies • Promote iconoclastic business ideas	• Require ROI justification • Involve AI lab • 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

Source: Gartner

Note: LOB = line of business; SWAT = special weapons and tactics.

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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.

Impacts and Recommendations

Identifying the Benefits of AI Projects Is a Primary Condition for Operationalization Success

Innovation: Foster New Thinking Based on Artificial intelligence

Without data scientists or AI experts 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, operations research, graph or search 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. That being said, many problems do not require the involvement of AI techniques, but they just might provide a new perspective.

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

Case in Point: Innovation (Stora Enso)

A global provider of renewable solutions partners with early-stage startups to rapidly develop innovative, custom-made AI solutions to their business problems. The business focuses on startups first as solution providers — not an investment opportunity. The provider's approach has led to more than 26 new products in three years, including a satellite image analysis solution to monitor forest health and a biodegradable straw. [1]

Case in Point: Innovation (Anonymous)

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.

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 it better informed about the actual risks against which it is insuring. [2]

Many online companies have been masters of data-driven innovation. The likes of Airbnb, Amazon, Facebook, Google and Uber constantly introduce new systems to collect better information, enabling 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:

  - **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.

  - **Technology screening** — Learn what you can from successful case studies from your own industry or other industries (see Uncovering Artificial Intelligence Business Opportunities in Over 20 Industries and Business Domains). But be cautious: Many publicly available case studies may not fully reflect exactly what happened, so consider reaching out to the actual implementer.

  - **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 a data dump for diving into and exploring (see Note 4 for more on data labs). 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 in Point: Exploration (City of Turku)**

CITY OF TURKU

A company owned by the Finnish City of Turku offers governments its Smart City Knowledge Graph — a close-to-reality digital model of cities that can be used to make better decisions, create new digital services and automate city workflows. [3]

Case in Point: Exploration (Jaguar Land Rover)

By identifying a common language to speak to both business and data analytics professionals simultaneously, and constructing a connected view of the business from demand to supply, the United Kingdom's largest automotive manufacturer resolved several key business questions. The resulting benefits included increased business value, lower business decision latency and reduced supplier risk as the supply chain embraced graph data and analytics solutions. [4]

Case in Point: Exploration (UrbanShopping)

UrbanShopping* A European retail organization's approach to a D&A strategy led it to create a D&A sandbox that enabled the rapid market testing of new data products and solutions and drove substantial return on investment. One measure of that value is its increase in FTEs 15-fold in the first three years since organizing its D&A teams. [5] (UrbanShopping is a pseudonym.)

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 data-based 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. It can also help you uncover very valuable data assets seen to that point as merely data side effects. 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 Strategic Technology Trends for 2021: AI Engineering). 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 in Point: Prototyping (Anonymous)

A university project is combining radar, machine learning and hardware to create a surveillance system to detect and stop unwanted or "enemy" drones before they reach a protected area in a city. An ML deep neural network trains itself to distinguish between people, cars, bicycles and other objects in a test area on the university campus. The system reportedly has successfully classified drones versus pedestrians, vehicles, cyclists and other objects 98% of the time.

> **Case in Point: Prototyping (Anonymous)**
>
> A predictive analytics and decision support solutions provider offers health insurers an automated solution that leverages natural language processing and AI to cull high-priority insights from medical notes in lengthy, consumer-authorized electronic health records (EHRs). The advanced analytics solution helps insurers to accelerate the time-consuming and difficult underwriting process by scouring EHRs, which can be thousands of pages long.

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 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 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 in Point: Refinement (Honda)

As an automobile race is taking place, a Formula 1 (F1) racing team streams data to the cloud and shares it with the pit crew teams, who are equipped with mobile technology. Researchers at the engine manufacturer's R&D facility in Japan and the U.K.-based F1 team analyze the data in real time. 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. [6]

Case in Point: Refinement (FiveTrain)

A global enterprise defined an enterprise chatbot strategy after finding that chatbot deployments were proliferating across the entire organization. All chatbots use intent-based natural language understanding to identify user needs; the number of intents in each one varies from 10 to 100. Many of the initial chatbots were FAQs, but with experience, business units are undertaking more complex transactional applications. [7] (FiveTrain is a pseudonym.)

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 the team's 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

A crisis situation means 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.

Firefighting Example: Banks

Banks adopted advanced network video recorder technology to process and analyze visual data in near real time, enabling faster decision making to ensure secure buildings and banking institutions, leveraging deep learning for facial recognition. Those institutions (like many others) have turned those systems around. Now, they are using existing cameras to identify whether building occupants are complying with guidelines concerning social distancing and wearing masks; what once was a threat if worn, turned out to be a threat if not worn. The process of quickly adjusting existing AI systems to new situations is part of the firefighting category of problems.

Case in Point: Firefighting (Georgia-Pacific)

Georgia-Pacific, an international manufacturer of tissue, pulp, paper, packaging, building products and related chemicals, has an effective business value framework for monitoring AI models in production to detect and mitigate model performance drifts and value leaks. Its decision analytics team shows how much value degradation is detected in AI models in production and how much of that is prevented from occurring. In a typical global organization, the detected and recovered amount of business value through model monitoring can be substantial. [8]

Basic data discovery/self-service business intelligence (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. [9]

- 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.

Evidence

[1] Case Study: AI Innovation With Startups (Stora Enso).

[2] Telematics and the Future of Auto Insurance, Financial Technology Today.

[3] Data and Analytics Monetization With Knowledge Graphs and AI.

[4] Case Study: Answering Critical Business Questions with Graph Analytics (Jaguar Land Rover).

[5] Continuously Market-Tested Data & Analytics Strategy (UrbanShopping*).

[6] Honda, Watson IoT and Formula 1, IBM Business Operations Blog.

[7] Case Study: Enterprise Chatbot Strategy (FiveTrain*).

[8] Case Study: Monitoring the Business Value of AI Models in Production (Georgia Pacific).

9 [Why You're Not Getting Value From Your Data Science](#), Harvard Business Review.

Note: The organizations profiled in this research are provided for illustrative purposes only, and do not constitute an exhaustive list of examples in this field nor an endorsement by Gartner of the organization or its offerings.

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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Recommended by the Authors

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What Is Artificial Intelligence? Seeing Through the Hype and Focusing on Business Value

5 Steps to Practically Implement AI Techniques

Tool: Sample Use Cases to Help Prioritize AI Investment

A Framework for Applying AI in the Enterprise