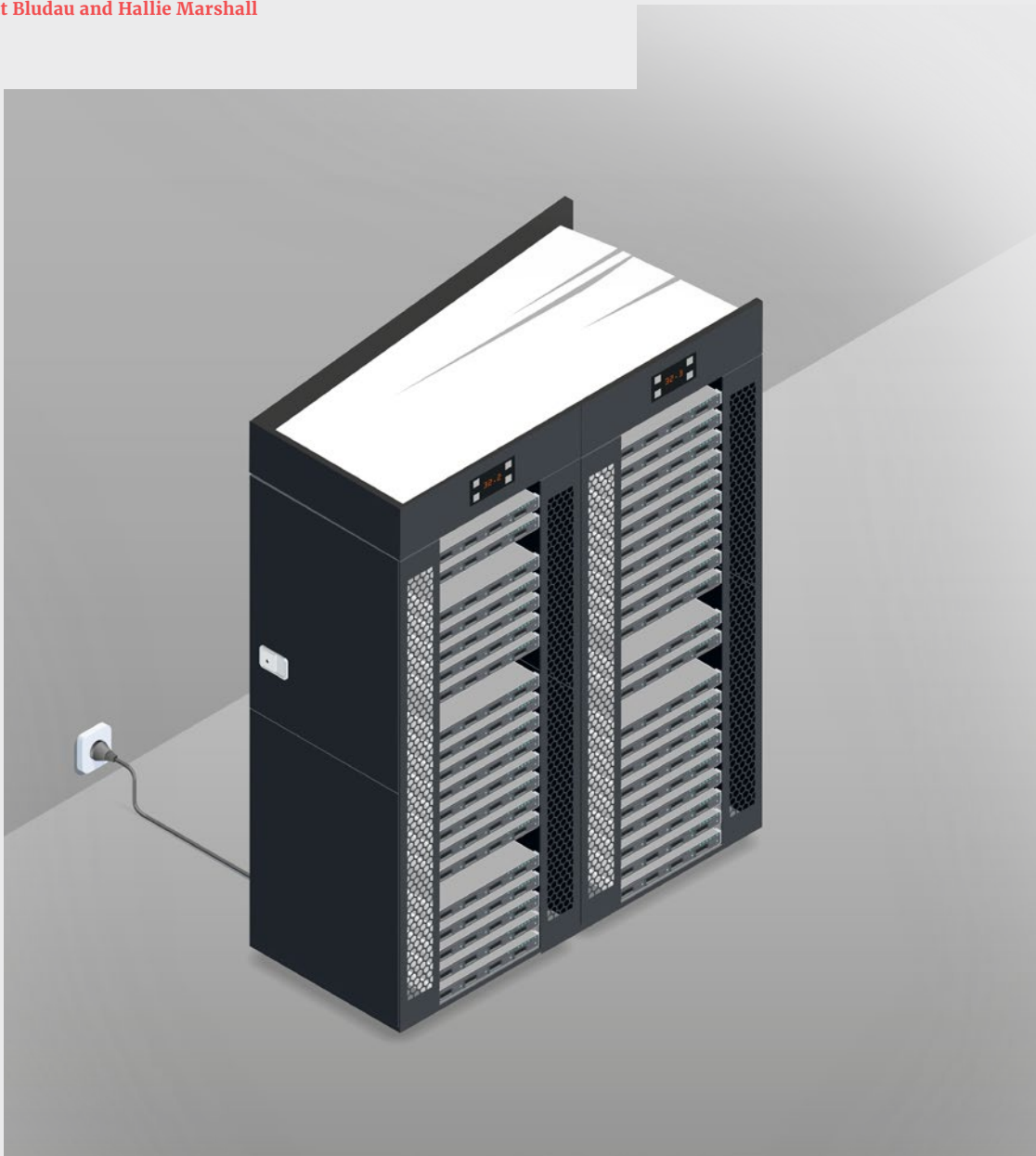# Leveraging Machine Learning to Drive Business Outcomes

By Garrett Bludau and Hallie Marshall

The benefits of machine learning technologies are substantial, and implementing these tools requires significant planning and organizational capabilities.

WHAT IS MACHINE LEARNING?

While much of the recent buzz around artificial intelligence (AI) has dealt with advancements in natural language processing like ChatGPT, organizations continue to leverage more established tools like machine learning to drive value. According to Arthur Samuel, an artificial intelligence pioneer, machine learning is a subfield of artificial intelligence that gives computers the ability to learn without explicitly being programmed.[1] It begins with a set of data — images, text, or quantitative inputs — and builds a foundation of information used to train itself and continue to grow its knowledge set to improve its output. Because of this, AI and machine learning are often used synonymously. Machine learning has been a key component of recent breakthroughs in other fields of AI, including natural language processing by helping better train models on the semantics of human communication and improve accuracy in its responses.

Machine learning technologies allow businesses to analyze large amounts of data, identify trends, and gain insights that can help improve customer experience, optimize operations, and increase profitability. This is particularly valuable in highly competitive industries such as commercial aviation, logistics, and online retail where incremental improvements in customer satisfaction or efficiency can provide significant returns. For example, American Airlines' cargo planning team uses machine learning techniques to analyze historical booking data to improve demand planning. By auto-confirming requests and flagging at-risk shipments, the airline's machine learning models complete confirmation processes 10 times faster than human interactions, allowing for team members to focus on customer needs and more complex requests.[2]

While the potential benefits of employing these technologies are substantial, implementing these tools requires significant planning and organizational capabilities. In this article, we will discuss potential usage cases for machine learning, common challenges businesses face in implementing these technologies, and strategies to employ to ensure successful implementation.

POTENTIAL USE CASES FOR MACHINE LEARNING

Improving Customer Experience: Machine learning is increasingly being used to drive insights that enhance customer experience. Businesses can gain insights into customer preferences, purchasing habits, and behavior patterns by analyzing customer data. These insights can be used to tailor a customer's experience through targeted messaging and custom recommendations based on their previous purchases. For instance, a retailer could use machine learning to track the social media interaction, transaction items, and duration between activities to determine how many advertisements to deploy and which products to feature based on their individual preferences. By leveraging the analysis, the retailer can increase sales, improve customer engagement, and utilize customer service teams for more interactions that benefit from human-to-human communications.

Optimizing Operations: Another common application of machine learning is to optimize operations. There is a variety of data that can be analyzed within operations. Key focus areas include last-mile transportation, logistics networks, production lines, and supply chains. Data from these areas can be leveraged to drive value through efficiencies resulting in improved operational performance. A last-mile logistics provider could employ machine learning techniques to analyze and optimize delivery routes and schedules. Factors such as traffic patterns, customer locations, delivery schedules, and real-time road conditions can be analyzed to determine the most efficient routes for delivery,

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reducing associated costs such as fuel and labor. Additionally, analyzing historical data such as order volumes, customer preferences, and seasonal patterns can help logistics providers better allocate resources, ensuring they have the correct number of people, vehicles, and inventories in the right place at the right time.

Profitability: Machine learning is often used to evaluate sales and other financial data to increase profitability. From a revenue perspective, industries with highly perishable inventories (think airlines and hotels) often use machine learning technologies to analyze capacity, demand, market conditions, customer behavior, and other data to drive dynamic pricing models. These models allow companies to maximize the amount of revenue per unit of inventory in real time. Machine learning can also be used to better predict customer churn by analyzing historical customer churn data, usage patterns, and customer behavior. By proactively identifying customers at risk of leaving, businesses can take steps such as targeted marketing and promotions to retain them. This can help businesses reduce costs associated with customer attrition and new customer acquisition.

WHEN TO USE MACHINE LEARNING

Considering whether to use machine learning requires evaluating several factors, including the nature and objectives of the use case and the availability of related data. Machine learning is best suited when large datasets are available and can provide significant insights into unstructured data, like language and images. Because machine learning technologies can learn and adapt to new data extremely well, they are best applied when the use case or data is expected to change over time. And when a use case requires a complex decision engineering or time-consuming human intervention, machine learning can be used to create relevant features from data versus manually developing them.

For example, the process of routing connecting baggage at an airport includes a complex decision tree based on arrival and departure times, length of the route, availability of resources, and several additional metrics. In this instance, machine learning can be used to analyze historic data and determine the most effective parameters for these criteria to improve on-time delivery of baggage to connecting flights.

POTENTIAL CHALLENGES TO CONSIDER

Skills Gaps: The implementation of machine learning technologies requires a team of skilled analysts and data scientists working in collaboration with subject-matter experts from key business functions to develop and train models. A gap in talent from either a data skills or business expertise perspective can result in a poorly trained model. Determining the set of variables for consideration, along with the proper data to support a successful output, requires great understanding of the fundamental business needs. Constructing the dataset, algorithms, and parameters for the model requires the technical skills to ensure the model is accurate and effective. Additionally, organizations are likely to struggle to lead and execute analytical projects without experienced project management support to ensure effective implementation and usage of the machine learning toolset.

Integration with Legacy Systems: Many organizations have invested heavily in legacy systems that were not designed to integrate machine learning models or other analytical tools. Integrating analytical tools with legacy systems can be costly and time-consuming. Their reporting and data collection capabilities could be set up to centralize and internalize the inputs needed for modeling, leading to missing historical datasets or slow processing speeds for extracting required data. Further, a sunken cost fallacy exists when leaders have prioritized and invested in a legacy system as a past — and most likely, unsuccessful — digital transformation.

Cultural Resistance: Implementing and effectively using machine learning tools and analytics often requires a significant shift in the culture within an organization. Organizational skills and processes need to adapt to fully capture the value of these tools. This can be particularly challenging in organizations that have not fully adopted a data-driven culture. If end users resist the adoption of the new machine learning–enabled tools, businesses will struggle to successfully capture the benefits. While many leaders — and early adopters at various levels — consider the positive business impact and increased efficiencies driven by technological innovation, it may be scary to a substantial group of team members.

Data Availability and Quality: The most common challenge organizations face in implementing machine learning technologies is the availability and quality of the organization's data. Many organizations have incomplete or inaccurate data and lack a comprehensive data strategy, resulting in data that is housed in multiple systems and lacks consistency in formats. Aggregating and analyzing this type of data can present a significant challenge, in availability, time to consolidate, and quality of a final dataset. A machine learning model only learns from the data it is given — the greater the number of inputs, the greater the probability for accuracy. Likewise, the greater the number of missing data points, incorrect structures, and output anomalies — the greater the probability of an insufficient model.

STRATEGIES TO ENSURE SUCCESS

Invest in the Right Expertise: Organizations need to determine if they have the right people or team structures in place to develop and implement machine learning tools. Not only do they need to have the right data and technical skillsets to determine data architecture, the structure of inputs and outputs, and model training needs — but they also need to understand the business case. Having skillsets capable of bridging the technical needs and business requirements is critical to ensure value creation.

Evaluation of System Capabilities: Understanding the capabilities of current systems is key to determining the type of investments required to capture the value of integrating machine learning capabilities. Organizations should conduct a thorough evaluation of system capabilities to determine the best approach to machine learning integration. This could drive considerations around developing custom tools or investing in new systems.

Foster a Culture of Data-Driven Decision-Making: To drive real value, it is imperative that team members across the organization trust the model and leverage its capabilities to improve results. Focus on gaining confidence in the data that is currently available and drive an understanding of its context — where it comes from, how it's measured, what it can be used for. Consistently support the desire of the team to utilize the resources that have been invested in to collect and store your current data so it can be leveraged to improve business outcomes. After all, data is one of your organization's most valuable resources. For a deeper dive into the importance of culture in successfully implementing an organization strategy, check out the article: "Culture Eats Strategy for Breakfast" from the Fall 2019 *Jabian Journal.*

Reevaluate Your Data Architecture: Organizations need to ensure properly stored data is available for the machine's learning technologies to access and derive insights. Data needs to be stored in a consistent format and accessible through a single warehouse or via automated consolidation processes. Execution of consistent data practices requires a mature data strategy. The article "Building Healthy Analytics to Guide Better Decisions" from the Fall 2020 *Jabian Journal* provides additional insights into this topic.

BUSINESS NEEDS TO DRIVE THE DATA STRATEGY

Though machine learning is an exciting prospect to enhance your capabilities, it should be done properly. Don't put the cart before the horse. Your business needs to lead the discussion by answering a specific set of questions to effectively determine and identify use cases suitable for machine learning technologies. The goals of the organization should be to increase the volume of data used for decision-making and to decrease the time and complexity of analysis and results created by humans.

Business leaders should answer the question, "Is machine learning right for our business needs?" In many cases the answer is yes. There are various ways to utilize current technologies to create efficiencies, improve accuracy in outputs, and make well-informed decisions. Making sure it's done properly, through planning and efficient use of resources, is the key.

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Sources:
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