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TEKSYSTEMS MACHINE LEARNING ISSUE | JUNE 2021



TAKING YOUR DATA TO NEW DEPTHS

How AI/ML Can Help Turn the Tide

Ride the Data Tsunami

Data has been described as 'the new oil' or 'the new gold' in an attempt to communicate its preciousness and incredible value to today's digital enterprises. But unlike gold or oil, data's value lies not in its scarcity or the amount of effort it takes to acquire, process, refine and distribute—exactly the opposite. Enterprises (well, everyone, really) is practically drowning in data. It drips, trickles, floods and rushes in from everywhere, all the time. It's more like a rainstorm followed by a flash flood followed by a tsunami. Technology allows humans to identify and gather pools and lakes and oceans full of data, sure, but the challenge now is what to do with all of it. Trying to capture the information and insights carried along on the current used to be difficult for humans; now it's close to impossible. It's time to put technology to work—that's where artificial intelligence and machine learning come in. AI/ML, powered by the cloud, can process the deluge of data at speed and scale unattainable for humans, helping enterprises deliver greater insights and value faster. Of course, such a major technological shift can't just be bolted on. You need a strategy and a plan to anchor you so you won't get swept away. Ready to ride the wave?



Sharon Florentine
Contributing Editor



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THE CHANGE AGENT

Successful ML adoption requires a holistic cultural and mindset shift, wherein every corner of the organization understands how a data-driven approach will move the company forward. Enter machine-learning operations (MLOps).

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THE CHANGE AGENT

Successful ML adoption requires a holistic cultural and mindset shift, wherein every corner of the organization understands how a data-driven approach will move the company forward.

01

Drowning in Data

Organizations are inundated with data from a myriad of sources. Data is generated from customer, vendor and client interactions, from device sensors, software and application telemetry—and the list goes on. Data is the heart of today's digital enterprise, and having a data strategy is critical to being successful. Companies often start with technology solutions to unlock the value concealed in their data, but the humans tasked with applying that tech can quickly become overwhelmed. That's why savvy organizations are accelerating the use of artificial intelligence and machine-learning technologies in an attempt to harness their data more effectively and create new revenue streams, improve customer experiences, augment employees' intelligence and operate more efficiently. According to Forrester, over 50% of enterprise technology decision-makers have already implemented or are in the process of implementing AI and ML.¹

Enterprises are well-aware of the potential benefits of AI and ML and new use cases continue to emerge that promise to create agility and resiliency in the organization. However, organizations are failing to realize value from AI, deep learning and other machine-learning technologies. Why is it such a struggle?

The biggest challenge is the sheer size and scope of datasets; they are massive. And in many cases, they change in real time. Until recently, most companies were dealing with manageable amounts of data and deploying a relatively small number of models in isolation. That trend has shifted as organizations embed decision automation into a wide range of applications creating new technical challenges that come from building and deploying ML-based systems. Projects frequently stall out when attempts are made to scale up to realize the full potential of AI and ML. In fact, research from IDC indicates that around 28% of AI/ML initiatives fail.³

SECTION 01

Companywide adoption faces several other hurdles to success:

1. **Lack of senior-level buy-in.** Leadership may not view AI/ML initiatives as realistic strategies or leaders have been burned by failed attempts in the past.
2. **Organizational silos.** ML initiatives often operate in isolation from each other, making it difficult to align workflows between disparate teams, systems and datasets.
3. **Technical debt.** ML projects include a broad array of technologies, tools and frameworks. Legacy systems and technical debt can slow transformation.
4. **Models are imperfect.** ML models are trained on data from a snapshot in time; as data changes, the models must be frequently retrained and fine-tuned.

For organizations that have adopted a DevOps culture, many of these challenges are familiar. Similar to DevOps transformations, successful ML adoption requires a holistic cultural and mindset shift, wherein every corner of the organization understands how a data-driven approach will move the company forward. Enter machine-learning operations (MLOps). Creating an environment where this culture will thrive doesn't happen overnight. It starts with being cloud smart. Thinking strategically about how your organization will consume cloud services will enable business agility. Then taking the right platform-based approach so your businesses can enable MLOps to realize the true value of AI and ML at scale.



Total global data storage is projected to exceed **200 zettabytes** by 2025.² But how big is a zettabyte?

Think of it like this. A single zettabyte contains enough high-definition video to play for **36,000 years**.

SECTION 02



MARKET PERSPECTIVE

AWS Global Tech Lead for MLOPs Mario Bourgoïn shares his thoughts about what organizations should think about as they get started with MLOps.

02

Getting Started with MLOps



How do you define MLOps?

Mario O. Bourgoin (AWS)

Machine-learning operations (MLOps) consists of producing, deploying, monitoring and maintaining the machine-learning (ML) components of production systems. This uses a combination of automated tooling and human intervention. **It includes the following:**

- » Gathering, cleaning and labeling operational data.
- » Creating features from the data and storing in a repository.
- » Using ML methods and features to train models, either automatically or under human control.
- » Deploying the models. First, deployments are in a staging environment. Then, they are in production systems. This includes the ability to roll back models to previous versions.
- » Monitoring deployed models for data and model drift. This is done for input data, target concept, prediction bias, prediction explanations and business effectiveness.
- » Retraining models using new data. Retraining is either on demand, on a schedule or triggered by model monitoring.
- » Documenting the execution of the above steps. This includes data and model lineage. It is used in system maintenance and debugging, and to satisfy regulatory obligations.



What are some of the benefits of an MLOps solution?

MB (AWS)

The benefits of MLOps include:

- » Greater visibility into the production of ML components and the use of ML-based systems.
- » Increased reliability of the deployment of ML components and increased performance of the components themselves.
- » Increased ability to scale out the number of models and scale up the complexity of models produced.
- » Better focus on an organization's goals rather than on production of ML components because of the automation of repetitive tasks.
- » Alerts for human intervention for model tuning or replacement.

How should an organization get started with MLOps?

MB (AWS)

They can start with adding MLOps tooling to the production of one ML component to gain experience with the process and its success factors. Then, they can commit to adding MLOps tooling to their other ML components. After that, they inventory and triage the components to prioritize their migration. And they identify each component's sources of data, labeling methods, ML algorithms and addressed business problem. Finally, they align their ML component development process with the requirements of MLOps. This includes tracking the lineage of the data used and ML components developed.



OUR PERSPECTIVE

TEKsystems leaders Brandon Carroll, Jay Mozo and Ramesh Vishwanathan share their points of view on how the right platform-based approach will enable data to work for the organization.

03

Put Data to Work for Your Organization

In an era where data is the catalyst for change, organizations are leveraging MLOps, data-driven development and AI tools to create value, generate new revenue streams and improve customer experiences. In the next evolution of the cloud journey, the focus turns to building the platforms that will enable data to work for the organization.

Data has evolved from being viewed as a supporting asset into a mission-critical component of success. A well-devised data strategy is crucial to maximize the value of enterprise data. **Machine-learning technology can create considerable competitive advantage by:**

- » Improving visibility and uncovering more insights from data
- » Improving efficiency of external and internal processes (i.e., optimizing your value stream and operations)
- » Enabling a better understanding of your customers by anticipating their needs, allowing you to serve them better
- » Reducing costs considerably

From global mining operations that deploy sensors to track maintenance schedules on massive machines to financial institutions using ML models to identify fraudulent transactions in real time, the potential applications of ML in your data strategy and value stream are nearly limitless. The consumers of your data, whether employees or customers, want the fastest and most reliable access to that data. They want data now, and they want repeatable, dependable ways to extract intelligence from it, so they can act on it.

"You're enabling MLOps through the right hybrid cloud strategy."



Brandon Carroll
Executive Director of Transformation,
DevOps & Cloud Services
TEKsystems

"The biggest challenge in most organizations, isn't about lack of activity on the data science team. It's that they fail to embed the analysis into a true outcome-driven process."



Ramesh Vishwanathan
Practice Consulting Director, TEKsystems



SECTION 03

Cloud technologies enable organizations to accelerate the consumption of data products while building long-term resiliency. Hybrid cloud and multicloud environments are the prevailing architecture on which many organizations are building their business. But it's not just about the technology—it's more important to understand why and how to leverage the technology. In fact, starting with the technology and dismissing the need for a solid data strategy frequently stalls the project, and in some cases leads to outright failure. Businesses have been embracing the modern cloud for nearly 20 years, yet they still fail to consider several key aspects of cloud adoption.

- » **Cost.** Buyers often completely underestimate the cost. They're enticed by the ultimate savings potential of the cloud, but initial costs can still be high.
- » **Security.** Data breaches are always a concern, but disjointed messaging and lack of alignment between IT teams, line of business, security teams and leadership are often the biggest barrier to adoption.
- » **Licensing.** Many buyers are caught off guard by complicated licensing terms and how that can affect other software agreements.
- » **Planning.** Regardless of the cloud solution, during modernization efforts you still must leverage legacy systems. Organizations often jump in and act without formalizing a strategic roadmap.

Abraham Lincoln is credited with saying, "If I had six hours to chop down a tree, I'd spend the first four hours sharpening the axe." Whether Lincoln actually spoke these words, the point is worth considering. Approaching the cloud without a plan and, more importantly, failing to take the right strategic approach is the biggest mistake organizations make.

The company frequently starts their journey by selecting a platform. They're seduced by the features and think it will fix all their problems. In some cases, that might even seem like the right approach—until it's too late. For instance, say marketing chooses a product because the API fully integrates with their CRM platform. Or the IT department selects a product based on the capacity for virtual servers or the product's ability to scale containers. Both groups identified benefits that deliver value, but without a holistic approach, they'll never capitalize on the potential of MLOps. Instead of choosing a technology based on features and benefits, think about your end customer and work backwards.

Start with the end in mind

- » **Start with a focus on the outcomes.** What do you want to achieve or provide for your end customer?
- » **Next, think about the processes.** What do you need to enable the desired outcomes?
- » **Lastly, determine the platform.** What platforms or products will enable our process?

Starting with a plan and building a roadmap will help you construct operational value streams and enablement runways that will serve as the foundation for achieving true business and delivery agility.

"Organizations must leverage MLOps across every facet of their business. You improve the full life cycle and benefit from end-to-end value."



Jay Mozo
Director - Transformation Services,
TEKsystems



Thinking cloud smart and insight-driven enables your business to leverage multiple cloud philosophies.



Cloud Agnostic

The organization is thinking strategically with a focus on building a sustainable and automated technology foundation. You're preparing the business to consume cloud services from anywhere.



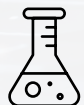
Cloud Appropriate

Your hybrid infrastructure is flexible and allows portability as new service offerings come to market. The business has flexibility without needing to rearchitect the entire network. You have the freedom to choose the cloud services that best meet your needs and deliver the intended outcomes.

TEKsystems' Tips



Plan twice. Act once. Think about what specifically you are trying to deliver to your customers. Once you identify the outcomes, then—and only then—build your roadmap and activate your plan.



Embrace experimentation. Cultivate a culture that thrives on experimenting. Measure the results, assess the outcomes, then learn, iterate and quickly move on.



Think holistically. MLOps must be an evolution across the entire organization; it cannot be thought of as a specialty or adopted by individual functions.



Consciously consider architecture. Your architecture should be intentionally tailored to make downstream efforts of MLOps easier and more efficient.



Define your vision. The path to optimizing your organization with MLOps is a journey—it won't happen overnight. But a well-defined vision will help break down the silos and connect the dots so you can optimize the organization.



Be mindful of model drifting. In the ML world, models are constantly changing. Consider a model trained pre-COVID and then applying that model today. The parameters feeding the model have changed dramatically. Your models must be frequently fine-tuned.

Real-World Application: A.P. Moller-Maersk

Maritime transport companies make a truly global economy possible, with nearly 90% of goods transported by ship at some point. At current growth rates, shipping could represent 10% of global greenhouse gas emissions by 2050, if left unchecked. The shipping industry is leaning on technology as they rethink how goods are transported across the globe. The largest integrated shipping company in the world, [A.P. Moller-Maersk](#), is part of the backbone of global trade, operating a fleet of 708 vessels. As the global integrator of logistics, Maersk wants to change logistics from being an art of problem-solving into a science of opportunity-seeking. Machine learning is helping the shipping industry reduce costs and become more sustainable by saving on fuel, optimizing capacity usage, planning maintenance and operating more efficiently.

Some of the challenges that data analytics and machine learning help solve for the industry include:

- » **Wasted fuel and harmful emissions.** Rather than relying on daily, manual data entry, vessels can use machine learning to move toward automated systems that take into account the constant shifts in a vessel's real-time operating performance and status, creating efficiencies in fuel consumption.
- » **Unplanned maintenance.** Machine learning allows shipping companies to embrace a predictive and proactive approach based on a better understanding of why and when equipment failure may occur.
- » **Anchorage delays and unplanned idling.** Machine learning can predict destination port conditions before arrival to calculate delays and proactively notify supply chain partners.
- » **Half-empty containers.** By using data and machine learning, shipping companies can predict demand and capacity usage and produce a range of cargo configuration options that will allow operators to more easily match smaller cargos from different customers, thereby enabling them to plan efficient capacities.

All information shared herein was accessed from public sources as indicated.



TEKsystems Cloud and Data Portfolios

We believe business success is grounded in data-driven decision-making.

- » Delivering expertise in modern cloud analytics, data modernization service, AI and machine learning, master data management, data governance and quality, real-time analytics and IoT across **300+ customers, including 20% of the Fortune 100**
- » Proprietary tools to accelerate timelines and delivery results with a million+ lines of code of TEKsystems IP leveraged covering **55+ accelerators** across AI, conversational platform, data engineering, data visualization and cloud analytics
- » **500+ successful cloud enablement**, DevOps and application modernization projects completed
- » **\$10B+ of customers' revenue** generated off next-gen, cloud-based apps we've delivered
- » **AWS Machine Learning (ML) Competency status achieved by 1Strategy, a TEKsystems Global Services Company and Amazon Web Services (AWS) Premier Consulting Partner in the AWS Partner Network (APN)**
- » **AWS Advanced Consulting Partner** with superpowers spanning DevOps, modernization, machine-learning migrations, well-architected reviews, data and analytics, and training—all woven across unparalleled scale
- » **Google Cloud Premier Partner**, with machine-learning specialization, supporting the full spectrum of Google Cloud initiatives
- » As a **Snowflake Elite Partner**, we help you leverage the Snowflake Cloud Data Platform and achieve data-driven results
- » We'll help you with everything Microsoft Azure, from automation to integration to optimization—while keeping security front and center, as a **Microsoft Gold-Certified Partner**
- » As a **Red Hat Apex partner**, we provide qualified technical leadership, open-source expertise and scale to help you get the most out of your Red Hat product
- » As a **Tableau Strategic Alliance Partner**, you'll benefit from our 30+ data and analytics accelerators and a library of BI platform capabilities, processes and proven frameworks that are agile, repeatable and scalable across a Tableau environment

The views and opinions expressed in this publication are those of the authors and do not necessarily reflect the views of TEKsystems, Inc. or its related entities.

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Brandon is a results-focused management professional offering 15+ years of senior-level business development and operational leadership for startup corporations and mature, rapidly expanding global operations. He possesses the recognized ability to incorporate innovative management techniques, processes and procedures to enhance business practices, increase productivity and boost revenues. He has a talent for forging strong relationships with key decision-makers, corporate executives, channel partners and employees.



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With over 20 years of experience in the tech industry, Jay has spent most of his career mastering cloud and DevOps. Before TEKsystems, he founded a small IT firm and also worked as the lead architect at State Farm. More recently, Jay was a leader at AWS's professional services organization and helped build out their DevOps practice. Jay is passionate about cloud, DevOps, business modernization and helping customers get delivery done faster and more efficiently.



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About TEKsystems®

We're partners in transformation. We help clients activate ideas and solutions to take advantage of a new world of opportunity. We are a team of 80,000 strong, working with over 6,000 clients, including 80% of the Fortune 500 across North America, Europe and Asia. As an industry leader in Full-Stack Technology Services, Talent Services and real-world application, we work with progressive leaders to drive change. That's the power of true partnership. TEKsystems is an Allegis Group company.

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Sharon Florentine is the contributing editor for *Version Next, Now*, TEKsystems' quarterly publication. She is an award-winning independent writer and editor with more than 20 years of experience in the tech industry. Her work has appeared in Computerworld, PC Magazine, CRN and eWEEK, among others, and she is a passionate advocate for equity, diversity and inclusion in tech and beyond. Most recently, Sharon was a senior writer for CIO.com, where she covered software development, Agile, IT careers, learning and development, and DE&I. She lives near Philadelphia.



Listen Now

Don't miss Brandon Carroll, Jay Mozo and Ramesh Vishwanathan, on The Agile World podcast. In a three-part series, host, author and business expert, Greg Kihlström, sits down with Brandon, Jay and Ramesh to discuss how cloud platforms enable MLOps.



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