Expert Insights

A new model for connected assets

How intelligent assets, machine learning, and digital twins drive greater operational efficiency and boost continuity

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Experts on this topic

Joe Berti

Vice President, IBM Applications Offering Management
linkedin.com/in/joeberti/
Joseph.Berti@ibm.com

With more than 25 years of leadership in software and services, Joe Berti provides critical direction on offering features and launches, including key metrics like customer satisfaction, accessibility, revenue, and profitability. As an innovator, he's launched numerous products that transformed entire industries.

Kay Murphy

Leader, IBM Global Asset Optimization Services
linkedin.com/in/kaymurphyral/
kaymur@us.ibm.com

Kay Murphy has over 25 years of business experience serving both the public and private sectors. In addition to the defense industry, she's delivered solutions in the industrial, education, general government, and energy sectors. Kay's background is in IoT, cognitive technology, applied analytics, business intelligence, data warehousing, and asset and facility management.

Terrence O'Hanlon

CEO and Publisher at ReliabilityWeb.com, *Uptime Magazine*, and the Reliability Leadership Institute
linkedin.com/in/reliabilityweb/
Email: terrence@reliabilityweb.com

Terrence O'Hanlon is an asset management leader, specializing in reliability and operational excellence. He is a popular keynote presenter and is co-author of the book, "10 Rights of Asset Management: Achieve Reliability, Asset Performance, and Operational Excellence."

Digital twin technology is merging with AI, IoT, and data analytics.

Talking points

Build more resilient business operations with intelligence and insights
When powered by AI and IoT data, connected and intelligent assets can optimize performance, adapt to changing circumstances, and help ensure business continuity.

Separate the signal from the noise
More resilient decision-making comes out of sorting through massive amounts of real-time and continuous data to cull previously untapped value from connected assets.

Evolve your organization to address future challenges and opportunities
As more physical assets become software-enabled, a new model is needed to operate them, and the availability of digital twins makes that possible.

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Connected assets require a new operating model

More and more high-value physical assets, such as manufacturing equipment, gas turbines, and electric utility transformers, are digitally connected. And it's no wonder. Smart, connected assets feed industries geared toward more efficient use of resources—and reducing costs. Continuously, in real-time, these assets provide data on their current operating conditions, which opens the door to upending the traditional model for operations and maintenance. Organizations that don't keep pace will have difficulty responding to real-time changes and disruptions to their operating environments.

Even with all their benefits, connected assets can also complicate things: Organizations are struggling to glean valuable insights from all the data they're consuming so they can continue resilient and uninterrupted operations. The software connecting these devices also creates its own set of failure points to be managed, for example, what to do when a sensor "dies."

Intelligent workflows incorporate artificial intelligence (AI) and other technologies to manage and improve physical and digital business processes automatically and continuously.

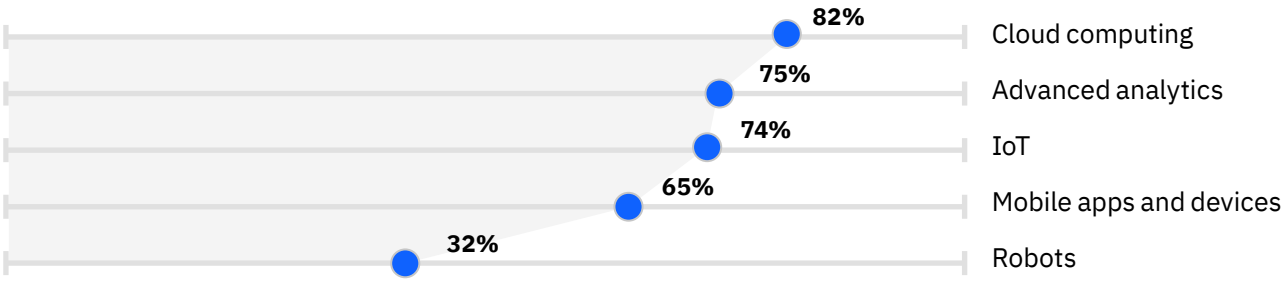
The value of modern assets

In the next few years, Chief Operating Officers plan to invest heavily in the technologies that are key building blocks of intelligent workflows: cloud, advanced analytics, and the Internet of Things (IoT). (see Figure 1).[1] The top outcome of these investments in digital strategy is improved operational uptime.[2]

Digitization can make assets less expensive to maintain and operate. Mining companies, for example, use autonomous vehicles for certain tasks. Equipment can be remotely monitored—sometimes from halfway across the globe—to check for proper oil pressure or temperature and keep the asset running as it should (see sidebar on page 3, “Sandvik Mining and Rock Technology: A real-time view of underground operations”). Robots working in mines underground can operate with no downtime, and mitigate the safety risks of hazardous conditions such as fire, flood, collapse, or toxic atmospheric contaminants.

Figure 1

Large level of investment planned in the next two to three years



Source: IBM Institute for Business Value; https://www.ibm.com/downloads/cas/JPMKDBVZ

Pairing the virtual and physical worlds improves operations

New operating models can use predictive analytics and a "digital twin" version of a physical asset to anticipate how an asset is operating today, when it might fail in the future, and under what conditions. Think of a digital twin as a virtual clone that reflects its physical version's lifecycle, and facilitates remote monitoring, predictive planning, and proactive management. It's estimated that more than 21 billion connected sensors and endpoints will soon exist for potentially billions of things.[3] A digital twin model helps drive a new level of reliability by performing data analysis on physical assets, which can help drive better and more reliable decisions about equipment.

Pending equipment failure is difficult to predict by visual inspection, especially if there are variations in use and operating conditions. A digital twin uses AI to model analytics that determines—for example—if an asset is performing as it should, or how it might decline under different conditions.

An output of asset performance data that runs through complex predictive algorithms, driven by real-time data received from the equipment itself rather than its operator, can also identify which parts might fail first (see sidebar on page 4, "Schiphol: 80,000 reasons to embark on a digital transformation effort").

Sandvik Mining and Rock Technology: A real-time view of underground operations[4]

A global supplier of mining and construction equipment, Sandvik Mining and Rock Technology tap AI, IoT, and predictive analytics to keep equipment and excavation up and running. The technology can better predict and prevent equipment breakdowns, with productivity improvements of between 25-to-30 percent.[5] Sandvik's automation offerings compare the actual layout of a mine to its model for continuous monitoring and increased visibility of the underground environment.

Schiphol: 80,000 reasons to embark on a digital transformation effort[6]

Europe's third-largest airport, Schiphol in Amsterdam, Netherlands, built a digital asset twin to run simulations on potential operational failures throughout the complex and optimize operations. The digital twin organizes data collected in real-time to help Schiphol monitor and manage daily operations and work crews who can now accomplish tasks in minutes not hours, and improve asset failure prediction. With 80,000 individual assets spread over thousands of acres, digital transformation at the airport is expected to save time and money.

Time-based cycles for preventive maintenance are an industry-standard practice. But maintenance schedules are often based on original equipment manufacturer (OEM) recommendations, which tend to be risk-averse, leading to over-maintained equipment. Research shows that up to 30 percent of these activities happen too frequently.[7] And unnecessary preventive maintenance work can actually cause problems if human error leads to collateral damage and additional downtime.[8]

"The maintenance concept has become so mistakenly entwined with reliability that the two terms are often used as synonyms," says Terrence O'Hanlon of Reliabilityweb. He proclaims, "Most CEOs don't want more maintenance, they want more failure-free operations, meaning more value from their assets."

Data gathered from the operating history of one asset—and hundreds of others operating at the same time around the world—can confirm how a specific make and model typically breaks down, and when. Preventive maintenance in the new operating model means taking a piece of equipment out of the field for repair before an impending failure. A bonus: knowing in advance to order a part with a long lead time means it's available when needed.

Understanding an asset's lifecycle and being able to predict maintenance needs can drive cost savings if actions are taken to prevent failure, or fix it most efficiently. This visibility and ability to plan ahead also allows financial managers of an enterprise to improve capital planning and drive equipment acquisition strategies toward more reliable and forward-thinking equipment providers.

Digitalized asset maintenance requires new skill sets and expertise.

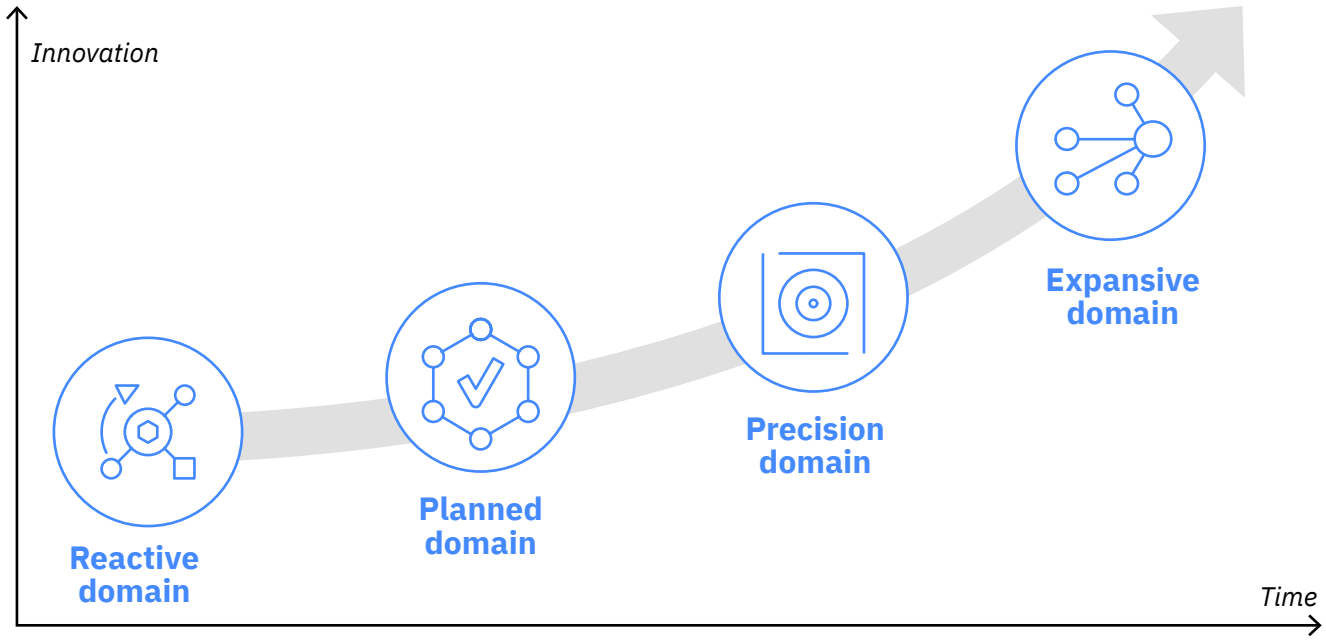
Moving beyond reactive maintenance enables innovation

Beyond reactive and calendar-based planned approaches, a precision—or evidence-based—approach to maintenance can increase asset reliability and performance. Says O'Hanlon, "Without a high-reliability culture, it's likely that everyone across the organization is adding defects into the system faster than the maintenance and inspection system can remove them." Practices, processes, and technologies will likely stretch across both maintenance and operations to include purchasing, HR, engineering, capital projects, and finance.

A business that's not up against reactiveness can, instead, cultivate new ideas and do something extraordinary, as illustrated below.

The planned approach makes work somewhat more efficient but doesn't eliminate any of it. In the precision domain, eliminating defects that lead to production waste, health, safety, or environmental incidents reduces the amount of work to do.

Maintenance tasks are completed efficiently and accurately, with solid attention to detail and safety, by eliminating root causes and changing behaviors. In other words, with a mastery level of precision. There, says O'Hanlon, "the only failures would be wear-out failures or 'personnel avoidable events' where human intervention prevented the wear-out stage from being attained."



Source: ReliabilityWeb.com

Intelligent assets, machine learning, and digital twins can create a new model to avoid operational obsolescence.

The next stop, the expansive domain, is idyllic. Here, talent doesn't spend time spinning in a reactive space but can think expansively and with an opportunity mindset. Sustainability, safety, energy, cost, productivity, and risk can be improved. Benefits are consistently delivered because rules and logic are codified and driven by AI. This leads to an efficient application of automated workflows that results in improved asset lifecycles.

The "new crew" of maintenance technicians becomes digital specialists

Lack of internal skilled personnel in connected predictive maintenance was identified as the top concern by maintenance program managers across more than 20 industries, including power generation, petroleum, and mining.[9] As skilled maintenance technicians in many industries retire, a demographic upheaval—or the "great crew shift"—occurs. New technology will attract the next generation of maintenance technicians, and arm them with the tools to help close the experience gap. Technology will also protect worker wellness for employees in reactive environments, especially in dangerous industries. The "new crew" can engage virtually with an equipment manufacturer's engineer or expert in-house technician to augment and accelerate learning.

Kay Murphy of IBM Global Asset Optimization Services says of the need for new worker training and support, "People with experience and deep knowledge are retiring *en masse*. Organizations need a strategy to train and support new workers to meet the levels of reliability required for critical equipment." As for how, she says, "We have a unique opportunity to use IoT data and AI to provide not only insights about equipment health but guidance to technicians on what actions to take and how to best execute them."

"Digital transformation in maintenance operations is achieved when you have connected assets, the digital footprint for those assets, and a continuous view of their health and performance," says Joe Berti, VP of IBM AI Applications. "Companies that integrate digital data into their maintenance operations achieve results faster, for a lower cost, and are more likely to achieve enterprise scale."

This is how technicians will operate in the future, using AI to advise them on what to do and when (see sidebar on page 7, "Equipment manufacturer: AI and predictive analytics for field service").

Equipment manufacturer: AI and predictive analytics for field service[10]

A manufacturer with hundreds of unique assets uses an AI-enabled analytics platform to facilitate visibility into real-time health of, and advanced warning indicators for, equipment in the field. With access to repair history, work instructions, safety guidance, and illustrations, technicians can service equipment properly the first time, improving "first time to fix" rates, which could drive millions of dollars in savings.

Action guide

A new model for connected assets

The true potential of a connected asset operation is one where the people at the heart of the organization can make better-informed decisions that align with organizational objectives, and enable a more adaptable operations infrastructure. To get there:

1. Embrace an analytics agenda

Putting sensors on things doesn't drive data collection. Valuable insights need to be found in data, then incorporated back into processes and systems to drive operational efficiencies and enable enterprise transformation.

2. Go out of your way to connect

The right preventive, predictive, and prescriptive maintenance actions can help extend the life of an asset, achieve its reliability, and ultimately reduce operational costs.

3. Understand the equipment you have

Having a transparent understanding of risks and consequences, from the impact of an asset failing to when it delivers its maximum value, allows organizations to optimize performance across the enterprise. Pinpoint where new analytic tools can be applied in legacy systems to drive decision support frameworks that streamline operations and lead to building a more efficient, cost-effective, and resilient business.

Notes and sources

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10 Based on an IBM client engagement.

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IBM Corporation
New Orchard Road
Armonk, NY 10504

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