IndustryWeek

TOP TIPS

The Critical Digital Toolbox for OEMs

Getting the Most Value from Your Digitalization Journey

If you're like most manufacturers, you've begun your digitalization journey and completed a few Internet of Things (IoT) pilot projects. However, you also may have landed in the so-called digital pilot purgatory. According to a report from the World Economic Forum (WEF), only 29 percent of industrial companies are actively deploying IoT solutions at scale, while 41 percent are still piloting solutions at a single site or business unit. The remaining 30 percent "have yet to or are about to start the journey." The report also notes that a McKinsey & Company study found that "pilot phases exceeded one year for 84 percent of respondents… and lasted more than two years in 28 percent of the cases."

The WEF report goes on to suggest that companies should follow a practical approach to adopting Industry 4.0 technologies, "based on each technologies' ability to address specific production and business problems." This approach "places business value at the center, with new technologies as enablers for solving problems." To that end, once assets are connected to the IoT, there are some critical and high-impact solutions that manufacturers should plan to build into their IoT digitalization efforts.

1. Applications

An excellent first focus when building out your digitalization strategy is to begin tracking specific metrics for your connected equipment. In many cases, IoT systems offer modular apps for this foundational purpose. For example, a critical component of Siemens MindSphere is Fleet Manager, which is designed to provide you with an overview of your assets. It enables you to define and visualize your assets' properties and configure events you want to be alerted to.

Once your assets are completely connected and streaming data to a centralized industrial IoT solution, look to add a condition monitoring app. This type of app will allow you to view specific parameters (temperature, vibration, pressure, etc.) and key performance indicators (KPIs) of your machines, so you can track operating conditions for all of your connected assets. It also will alert you if metrics deviate from normal operating conditions on an asset, which indicates a problem. The benefit of condition monitoring is that it enables you to:

- Proactively identify production line issues and start remedial actions before an asset fails, which reduces unscheduled downtime.
- Maximize the uptime of critical assets.
- Gain transparency into asset health and performance across global locations.

Condition monitoring sets the stage for deploying asset performance management and predictive maintenance. With an IoT-powered asset performance management app, you can monitor and track the condition and status of your machines against pre-set KPIs. This information enables you to identify which machines are running below peak efficiency and productivity. With this capability, you can reduce unplanned downtime as well as refine baseline KPIs to more precisely determine machine performance. Also, you can continually adjust machines for performance improvement based on real-time data.

Predictive maintenance takes condition monitoring a step further. By actively analyzing a machine's health and performance data, a predictive maintenance app enables you to identify when critical thresholds are met for a part, indicating that it needs to be serviced or replaced. With this advanced warning, you can perform maintenance on a need-only basis, eliminating scheduled maintenance and drastically reducing unscheduled maintenance.

Custom Apps: To address specific business use cases, you'll want to consider building custom apps. MindSphere, for example, has the Mendix platform that manufacturers can use to easily build no-code/low-code applications to integrate into their IoT solution.

2. The Closed-Loop Digital Twin

Many manufacturers have implemented digital twins, digital replicas of products and processes that enable the virtual simulation of designs and production steps. These digital simulations save the time and expense of building and testing physical models. More advanced manufacturers have implemented performance digital twins, which leverage real-time data to confirm that virtual simulations match the output. With the performance digital twin, manufacturers can capture and analyze real-time performance data from connected products and production lines to gain insights that can be used to refine virtual models and improve the performance of systems in production.

The capability to feed performance data back into the product and production digital twins is called a closed-loop digital twin. A closed-loop digital twin requires an open platform that also seamlessly connects with other software, including computer-aided design (CAD), computer-aided manufacturing (CAM), product lifecycle management (PLM), product data management (PDM) and IoT technologies. MindSphere, for instance, uniquely enables the closed-loop digital twin by providing a complete digital thread with Siemens' digital software solutions.

With the data collected through a closed-loop digital twin, you will be able to validate product and process designs earlier, test their configuration and understand the impact of countless variables (design changes, usage scenarios, environmental changes and more).

3. Smart Analytics

With every asset connected and sending vast quantities of data to an IoT system, automating data analysis becomes essential. Smart analytics enable operators to make quicker, more accurate decisions and, more importantly, helps them gain additional insights. As you progress through your digital journey, the following IoT technology capabilities will enhance your smart analytics:

The industrial edge: As digitalization extends to all aspects of your business, sending all your data to and from a centralized cloud system becomes time-consuming, expensive and impractical. Edge computing allows manufacturers to keep and analyze specific data at its source, where it can be processed in real time. This reduces decision latency. It also reduces

the bandwidth required to send the data to a central location and keeps unnecessary data from being sent to the cloud. Most importantly, by performing model-driven streaming analytics at the edge, manufacturers will make the best and fastest decisions closer to the data source.

Integrated data lakes: Given the wide variety of asset types, protocols and communication standards, manufacturers need a system that offers flexible, open connectivity solutions for physical assets as well as multiple systems. A data lake allows you to gather all your data in one place, no matter the source, including historians, enterprise resource planning (ERP), manufacturing execution systems (MES), supervisory control and data acquisition (SCADA) and distributed control systems (DCS). Collecting data into one centralized system allows operation teams, business analysts and data scientists to discover valuable and actionable insights that can profitably transform a business.

Taking it a step further, consider that MindSphere offers the Semantic Data Interconnect (SDI) solution, which correlates disparate data with contextualization to maximize data patterns, profiles and insights. SDI enables comprehensive analytics of data across systems and domains.

Bulk analytics: This capability takes the historical and current operational data collected and aggregated in the cloud and performs analysis on it. With bulk analytics, manufacturers can efficiently extract data for observation and analysis.

4. Prescriptive Maintenance

Too many discussions about machine learning and artificial intelligence (AI) tend toward the extreme, such as a lights-out factory. Instead, these technologies should be deployed to solve a production problem. For example, to enhance your predictive maintenance approach with prescriptive maintenance capabilities.

Prescriptive maintenance is more proactive and automated than predictive maintenance. By using AI and machine learning in combination with sensors, prescriptive maintenance will diagnose the root cause of problems, indicate appropriate remedial actions and manage the entire maintenance process. Additionally, AI- and machine learning-powered prescriptive maintenance systems become better over time based on the accumulation of data and the analysis of equipment characteristics and behavior, failure modes and many other events that occur during operation.

5. Moving Forward

As you begin or proceed to the next stage of your digitalization journey, remember that getting everything connected is only the first step. What matters most is how you augment and customize your connected production and business systems to strengthen or establish your business' competitive advantage. To be most effective, digitalization must be a critical element of your business strategy and evolve as a continual journey, with each new capability building on the previous one. Taking the practical approach, which focuses on deploying technology to solve a production or business problem, will ensure that you achieve a significant return on investment at each step of your digitalization journey.

This content was developed together with Siemens Digital Industries Software.