



SIEMENS

Make vs. Buy

Understanding the Tradeoffs Between
a Build-Your-Own and
Pre-Built Industrial IoT Solution



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Executive Summary

The industrial Internet of Things (IIoT) is ushering in a new era of manufacturing—one that is centered around using data to create actionable insights that grow competitive advantage. As more advanced IIoT software and hardware continues to be developed, industrial leaders need to consider how best to position their organization to benefit from this innovation. Organizations can either build an IIoT platform or leverage a ready-made solution.

In this paper, we will discuss the growing impact IIoT is having on the global manufacturing industry, including the advantages of adopting smart manufacturing and using digital twins across the complete lifecycle of product design, manufacturing and service. Subsequently, we investigate the challenges of building your own IIoT platform and explain how MindSphere®, a leading industrial IoT as a service solution from Siemens on Microsoft Azure, directly addresses those challenges. We then provide industry examples to demonstrate the potential value an IIoT solution backed by Microsoft and Siemens offers industrial organizations.



How IIoT is Reshaping Global Manufacturing

IIoT is helping organizations build and grow competitive advantages with greater operational efficiency, better customer experiences, new revenue opportunities and more. IIoT enables these advantages by allowing manufacturing organizations to capture, analyze and visualize key operational data and apply computing capabilities via connectivity across products, plants, systems, and machines. By integrating data from physical assets and enterprise systems, companies have unprecedented visibility and control over their production environments. This data, along with an IIoT solution, create the basis for continuous closed-loop feedback within the digital twins to start realizing the value of digitalization across the product lifecycle.

Smart Manufacturing Impacts Business Across the Entire Value Chain

Manufacturers need to become digital enterprises and rethink every element of their business.

Smart manufacturing leverages technology in manufacturing environments to monitor and optimize the production process. It uses IIoT in conjunction with cloud, artificial intelligence and machine learning (AI/ML) and other technologies to help organizations automate operations and improve manufacturing performance. With advances in cloud technology, industrial organizations can now analyze data streaming off an entire factory's worth of machines, or even across multiple facilities in near real time.

As smart manufacturing use cases continue to expand, experts in the space are increasingly finding new ways IIoT can disrupt and ultimately, reinvent industrial sectors around the world. Bain & Company, for example, estimates IIoT to have a \$200B market potential by 2021¹. To capitalize on this potential, manufacturers need to become digital enterprises and rethink every element of their business.

¹ https://www.bain.com/contentassets/c737b279ee6e480a9fdc9d5f2fb0f0e2/bain_brief_beyond_proofs_of_concept_scaling_industrial_iiot.pdf

The Power of Digital Twins and Closed-Loop Integration

As part of their efforts to become a digital enterprise, companies are exploring how to leverage existing product models, such as CAD, CAE, simulation, and others, to build virtual models of their products that can be represented in cloud-based IIoT environments. These virtual models are then integrated with collected sensor data from their physical counterparts. Similarly, production line models can be represented and integrated with factory floor operational data. Interrelating and managing the physical product or production line with the virtual models and collected sensor performance data is the basis for closed-loop digital twins.

Digital Twin: A digital twin is a virtual model of a physical entity representing key characteristics and operation behaviors, that support scenario simulation and validation. The best practice is connecting the digital twin with its physical pair, keeping them in sync over their lifecycle, including changes in configuration, location, and interconnections.

Digital twins can provide greater insights to improve efficiency and product quality. However, while the promise is great, building, implementing and refining digital twins creates various challenges that require expertise and experience, including:

- Keeping up with the large amounts of continuously flowing data generated by device and product sensors.
- Managing the heterogeneous devices generating data, each having different protocols, volume, timing and meaning.
- Collecting data on disparate systems, and not on a centralized, open solution.

The ability to analyze this data in real time is also hampered by current collection and processing constraints. Without the right platform, services, practices and analytics, the ability to analyze the production and performance twin data in real time – or act on it quickly – is lost.

By combining powerful CAD, CAM, CAE, PLM and IIoT technologies together, fully integrated, powerful closed-loop digital twins emerge. Fully integrated digital twins provide the ability to collect data and identify optimization insights to realize ubiquitous and autonomic capabilities.

Determining Whether to Make or Buy Your IIoT Solution

While the value of IIoT is clear, it is still not widely adopted: The World Economic Forum reported in 2017 that 85% of potential IIoT assets remain unconnected.² This number of disconnected assets can be attributed to, among other reasons, security and interoperability concerns. However, by finding the proper IIoT solution now, you can overcome these challenges and begin deriving value from IIoT before the market catches up.

As you begin this endeavor, one of your initial steps will be evaluating whether to build your own solution in-house or to purchase a subscription to one that is pre-built. To inform this decision, you need to consider the following:

- What resources do you have available to build the solution?
- How can you accelerate from proof-of-concept to time to value and quickly build a competitive advantage?
- How will you remain flexible enough to innovate in the future – faced with new market demands, advancing technologies, global competition, and more complex products?
- How do you quickly establish connectivity across new and existing industrial assets?
- How can you ensure that you reap the benefits of digitalization across design, manufacturing and service? How can you enable yourself to do so in the future?
- How can you ensure support for open standards and avoid getting locked into one vendor?
- Do you know what is needed in an IIoT solution to support closed-loop digital twin solutions?

² http://www3.weforum.org/docs/WEF_White_Paper_Technology_Innovation_Future_of_Production_2017.pdf

Leading pre-built IIoT solutions help you answer some of these questions by enabling fast adoption and rapid scalability, while keeping up with perpetual innovation so you can focus on your core business. As such, many companies find buying a pre-built solution to be a more suitable path. Let's dive deeper into this topic, first by walking you through the complexity of building your own IIoT solution and weighing the concerns customers have with pre-built options.

Those without the proper expertise and manpower across IT and OT risk diverting too much attention away from what end users care about – innovation related to business outcomes.

The Complexity of Building Your Own IIoT Solution

Building an IIoT solution is a complex endeavor – it requires a dedicated team and is both expensive and time-consuming. This complexity grows with ongoing maintenance, bug fixes, and feature enhancements. That's because when you opt to build your own solution, your team manages the underlying infrastructure components, creating significant challenges that require the right experience and expertise to handle. Connecting devices and transmitting operational data from your devices also creates security and compliance responsibilities that need to be accounted for.

Companies that choose to build their own solution can fall victim to this complexity. Those without the proper expertise and manpower across IT and OT risk diverting too much attention away from what end users care about – innovation related to business outcomes.

Moreover, the complexity of building an IIoT solution lends itself to protracted adoption lifecycles. The following phases are critical to building your own IIoT solution:

1. **Solution Design:** Defining your IIoT use cases, engineering a platform that enables those use cases, and architecting an IT environment to support your needs. Landing on the right design usually takes multiple iterations.

2. **Capability Development:** Applying domain knowledge to build out IIoT capabilities, such as industrial connectivity, integration with industrial automation systems, application lifecycle management, and management of devices at the edge.
3. **Implementation of First Release:** Syncing with the Research and Development (R&D) team to ensure the first release meets your platform requirements. Then, integrating the solution with your IT and OT environments, as well as your business systems.
4. **Continuous Development and Operations:** Maturing your platform over time by delivering new features, applying updates, fixing bugs, and adding capabilities to scale across new use cases and plants. In order to compete, you must also adopt new and emerging capabilities as the IIoT market evolves.

It may take an organization months to go through each of the first three phases and sometimes years to deploy into production. During this time, significant resources are spent on non-differentiating infrastructure and once in place, you have to spend more time and money actually driving the production improvements you're seeking. By choosing to build your own platform, you also divert resources away from other critical efforts, like digital twin solutions, which offer higher potential return on investment than lower-level platform development.

It is key to consider efficiency and economics, not just your team's ability to create a solution.

The fourth phase above can put a constant strain on your IT department that distracts them from delivering key value through business-specific innovation. Plus, the competitive nature of the IT job market can make it difficult to find personnel with the proper technical proficiency to run your solution like the managed service business users expect.

These factors – the long deployment time and ongoing IT burden – give competitors the opportunity to advance their own market position, minimizing the potential advantage of building your own solution. Thus, it is key to consider efficiency and economics, not just your team's ability to create a solution.

What's Driving Organizations to Build Their Own Solution?

Despite the complexity of building your own IIoT platform, some organizations choose to do so for various reasons, including the desire to empower internal IT teams to drive innovation and the perception of having more customization. On top of this, many organizations have concerns about purchasing a subscription to a pre-built solution. These concerns include:

- **Inability to access and move IIoT data:** Some organizations fear that pre-built solutions provide little data control, inhibiting their applications from accessing IIoT data and limiting their ability to meet data sovereignty requirements.
- **All-encompassing offerings limit flexibility:** Many are reluctant to rely on an all-encompassing offering, as solutions positioned as “all-in-one” often fall short of this claim and lack the flexibility for customers to add the capabilities they need.
- **Slow rate of innovation:** Depending on the provider, a pre-built solution may have a rate of innovation that cannot keep up with new disruptive technologies and emerging best practices in the space.

While these concerns make the case to build more compelling, it's important to understand that the select pre-built solutions can also mitigate these types of concerns, thereby adding more value and reducing the potential risks of buying. To avoid the concerns listed above, look for pre-built solutions that:

- Provide sufficient data access and control to meet business and regulatory requirements.
- Offer the flexibility to leverage the robust solution and the underlying infrastructure to integrate new technologies, adopt new capabilities, and pursue desired use cases.
- Are backed by sufficient resources and industry expertise to keep up with future technology disruptions and emerging best practices.

How You Can Benefit from a Pre-Built Solution

In addition to mitigating the concerns organizations have about pre-built solutions, select providers offer benefits that can make subscribing to an IIoT solution more valuable to your business than building it yourself.

Selecting the right pre-built solution can free up IT time and money, enabling your team to use these resources to drive innovation in the most impactful areas of your business.

Pre-Built IIoT Solutions Free Your Team to Innovate

The decision to build your own IIoT solution in-house often stems from a firm belief in your IT team's ability. What many don't consider, however, is that building an IIoT platform from scratch is a significant undertaking that diverts your team away from its core competency. This is even more the case when closed-loop digital twin capabilities are involved, whether being implemented today or envisioned for the future. Architecting cloud resources to support your IIoT platform is more complex than creating an initial proof-of-concept with basic services. You need personnel that can manage advanced cloud services and account for the associated security and compliance risks as well as the various device data protocols that must be managed. The steep learning curve of these activities means you cannot afford for team members to learn as they build – doing so introduces significant risk to your IIoT project and prolongs development lifecycles, negating the potential advantages of early adoption.

The opportunity cost of building an IIoT solution is high: your team could be focusing on areas of differentiation with higher potential value, instead of spending years building and iterating on the underlying platform. Selecting the right pre-built solution can free up IT time and money, enabling your team to use these resources to drive innovation in the most impactful areas of your business.

Organizations Can Leverage Custom or Third-Party Applications on Select Open Solutions

Every business has unique, industry-specific needs. Many organizations choose to build their own solution because they perceive pre-built solutions as “one-size-fits-all,” failing to meet these specialized needs. By building their own platform, businesses think they are accounting for this problem. However, the do-it-yourself path requires you to spend a majority of your resources building commodity aspects and only a small portion of time on the customization you need.

An open, extensible, standards-driven solution can provide the flexibility to meet your organization’s specific needs. That’s because a truly modern solution offers support for application development tools – low-code or otherwise. Additionally, industry developers have likely already built successful, production-ready applications that can fulfill vertical-specific use cases. It’s beneficial to adopt a solution that allows you to work with these teams and leverage their existing applications to save time and money on in-house development.

Cloud-based IIoT Solutions Enable Future Readiness

When establishing an IT strategy to support IIoT adoption, you should look to a solution that leverages the underlying capabilities of a cloud provider. By doing so, you can ensure your IIoT solution is future-proof: innovation will continue to occur in the IIoT space. To ensure you stay relevant and up-to-date with these changes, cloud-based solution providers will continually deliver seamless feature updates as they become available.

Cloud-based solutions also give your team access to cost-effective, elastic resources, so you can avoid large upfront costs during experimentation and right-size IT resources to optimize spending. Because the cloud enables on-demand resource provisioning, it is easy to not only get started with IIoT, but also to scale up as your IIoT practice matures.

Comparing the Make vs. Buy Decision

When you make your own solution, you must...	Possess proficiency in all aspects of the IIoT ecosystem.
	Determine data, localization, security, and integration requirements.
	Identify and investigate services for fit and compliance.
	Create rules for accessing, monitoring, and managing infrastructure.
	Maintain multiple cloud or physical environments.
	Investigate and track bugs and fixes.
	Update the platform as IoT technologies and your business needs evolve.
Prioritize solution development and maintenance over more value-driven closed-loop digital twin development.	
When you subscribe to a pre-built solution, you...	Gain a flexible, open solution with pre-configured component building blocks.
	Focus IT resources on your core competency.
	Leverage comprehensive, integrated and fully-managed security.
	Receive automatic updates and new features as they are released by the solution provider.
	Can build and/or deploy vertical-specific applications.
	Reduce setup, operating, and maintenance costs.
	Accelerate IIoT adoption and offload the commodity aspects of building the solution.
Focus precious development resources on closed-loop digital twin solutions with greater potential business impact and innovation.	

You gain the industry expertise and first-class rate of innovation with which to shape your business-specific, differentiating solutions.

The Competitive Advantage of Buying Now

By selecting a pre-built IIoT solution, you can avoid months or years of development and implementation, as well as the burden of maintaining and updating the system on a perpetual basis. When you offload these tasks, you accelerate adoption and can focus on the activities that help you proactively build a competitive advantage in your industry.

Specifically, leveraging MindSphere from Siemens on Microsoft Azure gives you a solution you can trust, backed by leaders in the industrial domain and cloud technology. The Siemens and Microsoft partnership gives customers a way to adopt a scalable, secure, and future-proof IIoT solution, without the time and cost of building it themselves. Further, MindSphere on Azure addresses common customer concerns regarding pre-built IIoT approaches by offering a solution for customers to build upon however they please. In this way, you are never locked into an IIoT business model predefined by either Microsoft or Siemens, but instead you gain the industry expertise and first-class rate of innovation with which to shape your business-specific, differentiating solutions.



Microsoft Azure and MindSphere: A Partnership Built on IT and OT Leadership

MindSphere is a leading industrial IoT as a service solution that is built on Microsoft Azure Platform as a service (PaaS) offerings. MindSphere connects products, plants, systems, and machines, enabling companies to harness the wealth of data generated from virtually any number of connected intelligent devices, enterprise systems, and federated sources with advanced analytics and product lifecycle digital twins. The solution offers support for both Siemens and non-Siemens OT devices and equipment, making it simple to implement in your existing environment.

Azure is backed by Microsoft's \$15 billion investments in global data center infrastructure and serves over 95% of Fortune 500 customers. With 54 regions across 140 countries, Azure offers the scale and presence to support IIoT efforts around the world and even in remote areas. Azure employs 3,500+ full time security professionals and spends \$1 billion annually on cybersecurity, enabling you to protect IIoT data at scale. Moreover, Azure is the only consistent and comprehensive hybrid cloud, offering native support to easily manage applications, data, networking, identity and security across on-premises and cloud environments.

Pre-Configured IIoT Building Blocks Enable Flexibility

Some customers are wary of adopting an IIoT solution that is positioned as an all-in-one offering. That's because every business has unique, industry-specific needs and it can be difficult for an IIoT solution to effectively cover this much ground.

MindSphere on Azure helps customers avoid this shortcoming by taking a different approach: instead of providing a solution that attempts to meet every individual's needs, it gives you a pre-configured set of building blocks that are commonly needed

to execute an IIoT project. On top of this, customers can deploy or connect to the specific applications they need. This approach gives customers the flexibility to control their own destiny, allowing them to infuse the capabilities they need and pursue use cases that drive the most value for their business.

MindSphere receives the most recent features as quickly as Azure releases them.

Benefit from an Unparalleled Pace of Innovation

By leveraging MindSphere on Azure, you can adopt a future-proof solution that will enable a competitive advantage even as the IIoT market evolves. That's because Microsoft is a hyperscale cloud provider that delivers an unparalleled pace of innovation, constantly releasing new Azure services that help customers take advantage of emerging technologies. Since MindSphere is built on PaaS offerings, MindSphere receives the most recent features as quickly as Azure releases them, enriching MindSphere with the latest technological advancements as they become available. This allows customers to quickly leverage these innovations to their advantage, rather than being limited by the time and cost of updating the underlying IIoT solution themselves. Additionally, Siemens provides capabilities in closed-loop digital twins, enabling continuous integrations with real data to drive faster insights across the product lifecycle. Siemens' investment in digital twins enables industrial organizations to innovate and deliver a competitive advantage.

Build or Leverage Applications, Tailored to Your Needs

MindSphere on Azure delivers both industry-specific and cross-industry applications that help you execute a number of IIoT use cases, like condition monitoring, asset performance management, and predictive maintenance. These applications are leveraged and trusted by companies around the world, including Siemens' own business units. If these applications don't fit your unique needs, MindSphere offers an extensive partner ecosystem that creates vertical and use-case specific applications, many of which are available in the MindSphere Store. Furthermore, customers can build applications on Azure's native application resources such as Power Apps, Microsoft Power Automate, and Power

BI or using Siemens' Mendix™ platform low-code offering and deploy them on MindSphere. Finally, the MindSphere partner ecosystem also provides extensive consulting and integration service capabilities to help you successfully adopt IIoT.

The Open Solution and Well-Defined APIs Provide Greater Data Control

MindSphere on Azure allows you to enrich your IIoT deployment with third-party resources, while avoiding lock-in to vendor-specific software or hardware.

One of the primary concerns organizations have with pre-built IIoT solutions is the perceived lack of data flexibility: many fear that if they collect data with a specific provider's hardware and transmit it to their solution, the data will be locked-in and they won't be able to access the data from their critical applications. This lack of flexibility also makes it difficult to meet data sovereignty requirements, as it limits the amount of control you have over where the data resides.

MindSphere on Azure addresses these challenges by providing an open solution with well-defined APIs for customers to access data, which helps them create new value and comply with data regulations. The open solution design of MindSphere on Azure allows you to enrich your IIoT deployment with third-party resources, while avoiding lock-in to vendor-specific software or hardware. Furthermore, MindSphere can be integrated with existing enterprise applications and operational systems, whether they were built by Siemens or not, meaning the solution fits well within your established environments.

Get Real Value from Closed-Loop Digital Twins

MindSphere enables you to connect your physical machinery and infrastructure to the digital world via a digital thread, a framework that enables real-time data flow between the digital twin components. This establishes a complete, closed-loop digital twin that allows you to take real-time data from the production and end-product performance, and then immediately apply it upstream with virtual representations for continuous optimization and verification of subsequent modifications.

For example, take a company that produces 1,000 machines and ships them to 700 different global customers. Can they accurately monitor these machines and make decisions based on the real-time data the machines produce? With MindSphere and closed-loop digital twins, the answer is “yes.” The power of IIoT lies in its ability to immediately gather all the data points a machine produces in near-real time, aggregate that with data from machines around the world, and then quickly spot anomalies that may require action. The live performance data are fed back into the virtual models for improved design and triggers fixes to all other machines not yet showing the anomaly.

Accelerate IIoT Adoption and Build Your Advantage

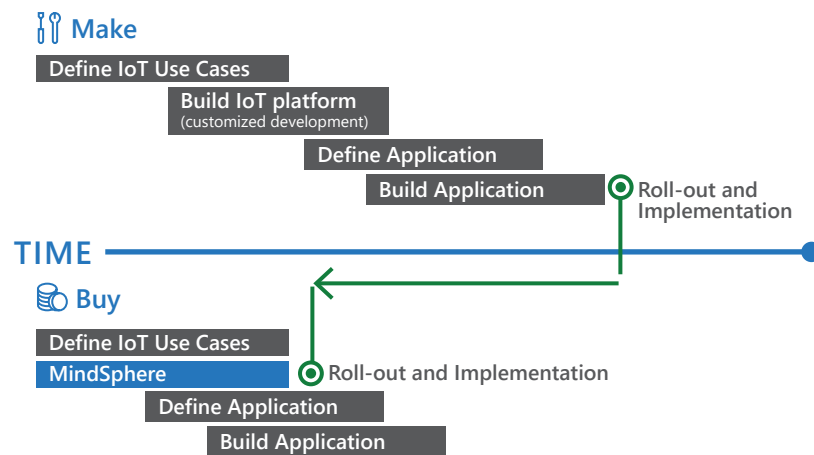


Figure 1: MindSphere on Azure accelerates IIoT adoption by offloading burdensome steps.

Not only does MindSphere on Azure deliver the innovation and opportunities organizations need, but it simplifies adoption.

Not only does MindSphere on Azure deliver the innovation and opportunities that industrial organizations need, but it simplifies adoption. As a ready-made solution, it enables you to realize the value of IIoT in a fraction of the time associated with building a platform in-house. Furthermore, you can do so with lower upfront investments and no costs sunk into solution development iterations. The following two industry examples support this notion and demonstrate how businesses across a number of verticals can quickly build an advantage with MindSphere on Azure:

Case Studies



Automobile Manufacturer Optimizes Assembly Quality

Challenges

A leading automotive manufacturer sought ways to reduce assembly quality-related issues using IIoT. These efforts revolved around the company's hydraulic press machine stations, in which an operator creates component parts with sheet metal and die tooling. Since the parts are used downstream, there is low tolerance for even the slightest flaws, contributing to excessive material waste.

Solution Requirements

- Determine the probability of workers conforming or not conforming to the new operational style.
- Establish clear key performance indicators (KPIs) and threshold controls for individual press operations.
- Create a near-real-time analytical application that detected shifts in component quality.
- Connect multiple data sources to the streaming analytics solution, so they could measure the receiving material (sheet metal), alignment in the press, quality of the material, press settings and the surrounding environment (e.g. temperature, humidity).

To carry out these initiatives, the manufacturer needed to establish connectivity across their legacy OT environment, access and deploy cutting-edge AI/ML and edge computing capabilities and integrate their solution with existing enterprise systems. Not only did the company lack the skills in-house to carry out these efforts but building a solution that could scale across all press machines and all their factory locations would take significant time and capital investment.

The Solution

MindSphere on Azure met the customer's requirements and provided a mature, ready-made solution to enhance assembly quality. The solution could be tightly integrated with many of the manufacturer's existing IT systems and connect to any of their manufacturing assets using different protocols. The combination of these factors streamlined adoption and accelerated time to value.

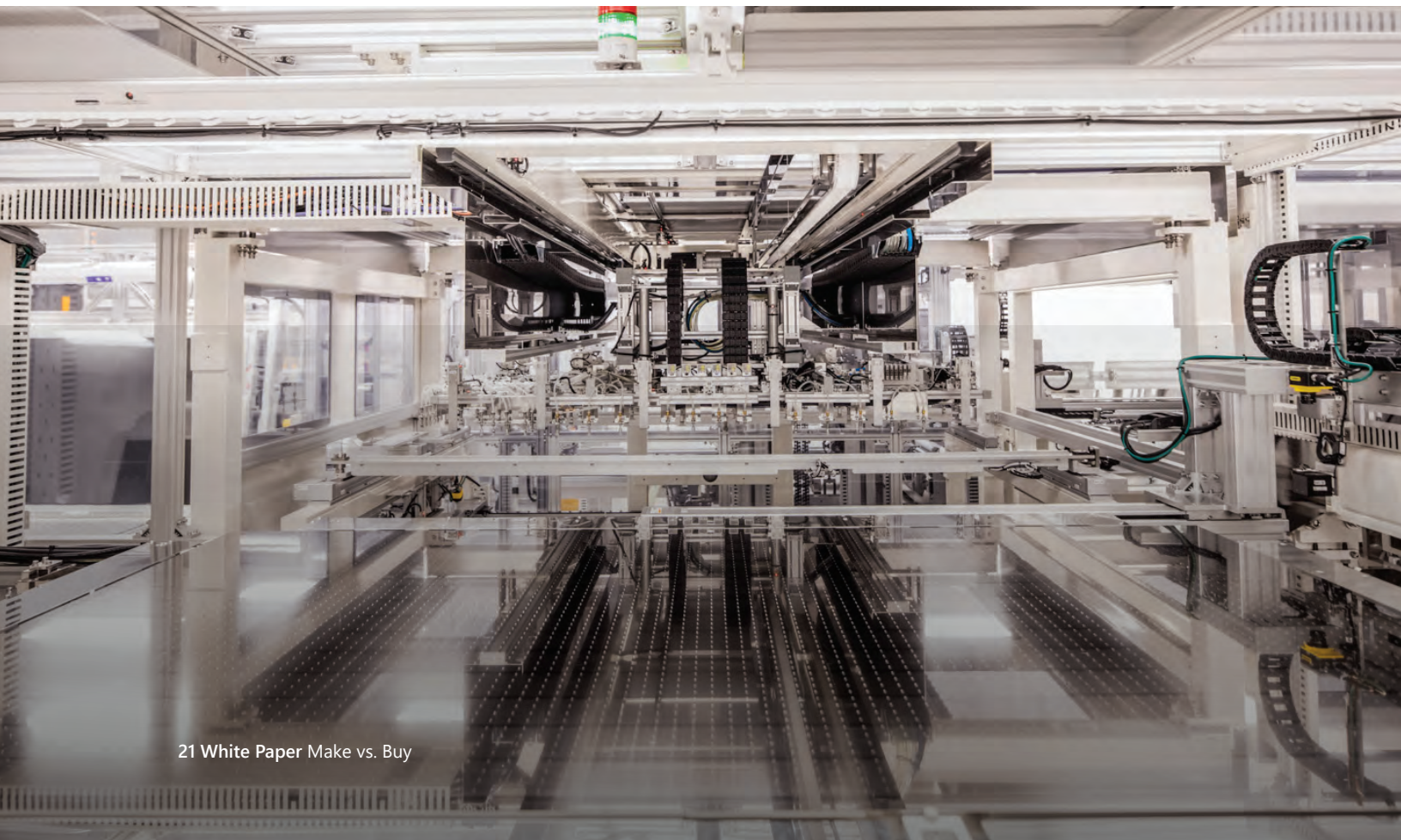
How it Works

- The customer uses AI/ML capabilities from both MindSphere and Azure in tandem with edge analytics devices at each hydraulic press station across all factories. The combination helps determine thresholds for output quality and pinpoint when the machine has shifted towards those thresholds.
- A visual dashboard is provided to the operator with KPIs for their respective operations with alarm notifications on device-setting changes based on trend analysis. If a machine's produced output quality is shifting towards a threshold boundary, an alarm is triggered. This shift could be happening slowly over time, depending on operating and/or environmental conditions and the batch materials. The operator can then make the necessary adjustments to machine settings or materials to ensure tolerance compliance.
- Every night, the AI/ML models are retrained based on the latest operations data and equipment maintenance and configurations. Updated models are downloaded into the edge devices across all locations for the next day operations. Had this customer not bought a solution backed by Azure, they would likely lack the AI/ML and edge technology to enable this process.
- The broad set of compliance offerings from Azure helped the company meet industry, company and operational requirements.

- Manufacturing is able to visually report on the number of machine status suggested 'interventions' along with downstream assembly quality issues. These reports have shown:
 - A significant reduction in rework
 - Improvements in overall machine performance
 - Fewer downstream manufacturing disruptions from poor quality
 - Fewer out-of-tolerance parts in final assembly

The Outcome

MindSphere on Azure helped the customer optimize assembly quality, while enabling fast adoption and a quick path to ROI. Additionally, they tailored edge devices to their specific shop floor needs and enabled continual application improvements based on real-world experience.



Pump and Valve Manufacturer Enacts New Business Model

Challenges

The manufacturer had been looking for ways to expand its services business using IIoT due to fierce competition and their customers' need for greater uptime. The company saw IIoT as a way to provide applications to help monitor, service, and analyze equipment operations and performance for both the customers and the company.

For 18 months, the manufacturer's IT group struggled to build and deliver a market-ready solution. While the initial prototype of connecting pump-equipment was successful and well received, developing a scalable, production-ready solution was more complex than foreseen.

Custom-Built Complexities

Some of the complexities that the company faced included:

- Not understanding or being able to select the advanced cloud services needed to collect, process, analyze and visual data
- Handling the associated data access and security
- Managing the company's DevOps requirements

Ultimately, the IT organization did not have the right resources, skills, or experience to deliver the IIoT solution and applications.

After over a year of development, the company began evaluating third-party providers to assist with the IIoT project. Given Siemens' industry knowledge and experience in water and wastewater, plant building, and low voltage motors, combined with Microsoft's cloud scale and expertise, they decided to evaluate MindSphere on Azure.

The Solution

MindSphere provided a low-code application development approach that fit their team's skillset, while Azure allowed the application to scale. These factors – among others – made it clear that MindSphere on Azure was the right solution. Within weeks, the company had delivered its first condition monitoring application.

How it Works

- MindSphere on Azure enabled the company to start its IoT journey in a best-practice manner, while reducing resources and time needed from IT. Within a few days of adoption, the company had established connectivity of assets and begun asset modelling. Soon after, they began advanced time series visualizations, filtering and aggregation using MindSphere web components.
- Using the event creation and management capabilities of MindSphere, the company could begin tracking the conditions of internal and customer pumps and valves. The IoT asset modelling became directly available for all internal and customer MindSphere applications, allowing reuse and sharing. The company delivered tailored capabilities for each of their customers using MindSphere subtenant and data rollup capabilities.
- Through Azure, data access and security governance services were automatically applied to all services, helping the company protect internal and customer IIoT data at scale.
- From there, the manufacturer's services and product engineering organizations were able to review operations analysis results from both customers and internal users to determine product health and performance.

The Outcome

With MindSphere on Azure, the company was able to fulfill their services initiative in a matter of weeks, compared to the 18 months they spent developing a solution internally. Furthermore, once they adopted MindSphere on Azure, they were able to allocate resources to delivering new customer value – like tailoring capabilities to their customer's specific needs.

Choose a Future-Proof Solution Backed by Industrial and Cloud Expertise

As more industry leaders begin to plan and execute their IIoT strategy, the opportunity to get a head start and develop a competitive advantage will evaporate. Thus, it is imperative to move quickly. Furthermore, you need expertise across industrial and cloud technologies to implement an IIoT solution, manage the underlying infrastructure, maintain health and performance and add new, innovative capabilities. This level of expertise is earned through real-world, hands-on experience with thousands of hours of trial and error.

Choosing MindSphere on Azure allows you to pursue the IIoT-enabled initiatives that help you grow your business.

Choosing MindSphere on Azure allows you to pursue the IIoT-enabled initiatives that help grow your business. Further, the ready-made IIoT solution can easily integrate with your existing IT and OT systems, while allowing you to offload infrastructure management and capability updates. Beyond that, it is paramount to understand the expertise and leadership that Siemens and Microsoft provide across industrial systems and cloud technology. By leveraging a solution backed by this level of know-how, you can dramatically reduce the risk of IIoT adoption and trust that the solution will help you realize the value of digitalization.

Siemens and Microsoft are continuing to invest significant time, money and resources into MindSphere on Azure to ensure customers can take advantage of innovative technologies and the latest IIoT advancements, including those provided by closed-loop digital twins. When determining whether to make or buy your solution, you need to consider whether you're able to match these investments. If the answer is "no," then MindSphere on Azure gives you a better opportunity to build a competitive edge: the solution not only accelerates IIoT adoption, but it enables differentiated value in a crowded marketplace. The unique combination of industry expertise, pace of innovation, and resource dedication generated by the Microsoft and Siemens partnership ensures MindSphere on Azure will be a leading IIoT solution for years to come.

Microsoft

Microsoft is a technology company whose mission is to empower every person and every organization on the planet to achieve more. Our platforms and tools help drive small business productivity, large business competitiveness, and public-sector efficiency. Microsoft offers an array of services, including cloud-based solutions that provide customers with software, services, platforms, and content, and we provide solution support and consulting services. Our products include operating systems; cross-device productivity applications; server applications; business solution applications; desktop and server management tools; and software development tools. We also design, manufacture, and sell devices, including PCs, tablets, gaming and entertainment consoles, other intelligent devices, and related accessories.

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Siemens Digital Industries Software

Siemens Digital Industries Software, a business unit of Siemens Digital Industries, is a leading global provider of software solutions to drive the digital transformation of industry, creating new opportunities for manufacturers to realize innovation. With headquarters in Plano, Texas, and over 140,000 customers worldwide, we work with companies of all sizes to transform the way ideas come to life, the way products are realized, and the way products and assets in operation are used and understood.

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Christoph Berlin

**Head of Azure Industrial IoT
Microsoft**

Christoph Berlin leads Azure Industrial IoT at Microsoft. His team drives product strategy and business growth for the Manufacturing vertical across discrete and process manufacturing segments as well as Industrie 4.0 strategy at Microsoft, including Open Manufacturing strategy, China 2025 and other initiatives across Industrial IoT, the Intelligent Cloud and Intelligent Edge. Christoph also manages strategic customer and partner engagements for all of Azure IoT, driving digital transformation with many manufacturing customers. Before joining Microsoft, Christoph was VP of Product Management for various startups, including hopTo Inc., a leader in mobile productivity solutions. Prior, Christoph was a member of the XenSource Ltd. senior staff, a virtualization startup where he was responsible for OEM partner development and strategy. Christoph holds a Master's degree in Computer Science and Communication from Darmstadt University, Germany.



David Mitchell

**Vice President of MindSphere Products
Siemens Digital Industries Software**

David Mitchell is responsible for the MindSphere solution, leading the team that develops the solution and core applications, facilitates adoption across Siemens, and enables customers across all industries. David has 30+ years of experience in the development and application of Cloud/IoT, Product Lifecycle Management, and Manufacturing Operations Management technologies. He has worked with customers across many industries, including Automotive, Aerospace, Consumer Products, Electronics & Semiconductor, Industrial Machinery and Heavy Equipment, and Shipbuilding. Joining Siemens in 2002, David has held a variety of executive roles including Vice President of Manufacturing Operations Management R&D; CTO, Cloud Services; and Vice President and CTO of Teamcenter. Previously, he was Executive Vice President at Sertan, Director at Electronic Data Systems, and Principal Software Engineer at McDonnell Douglas. David holds a Bachelor of Science degree in Computer Science from California State University, Fresno.

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