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Siemens MindSphere named a Leader in The Forrester Wave™: Industrial IoT Software Platforms, Q4 2019

FEATURING RESEARCH FROM FORRESTER

The Forrester Wave™: Industrial IoT
Software Platforms, Q4 2019

Siemens believes that its open IoT operating system connects products, plants, systems and machines to the digital world to improve operational efficiency and create new business models

DIGITALIZATION IS THE KEY TO SUCCESS IN INDUSTRY 4.0

The industrial internet of things (IIoT) has completely changed the competitive landscape for manufacturers. It is ushering in entirely new ways of thinking about every business process from product design, engineering and manufacturing to maintenance and asset management—not to mention new business models. It drives greater levels of efficiency that were never thought possible before.

Before the advent of digitalization, competitive advantage was determined by the effectiveness and improvement of specific processes. You or your competitor could accelerate product development by using computer-aided design, manufacturing or product lifecycle management systems. You could increase quality by installing a quality management system; your warehouse efficiency by adding a warehouse management system; or manufacturing effectiveness with a manufacturing execution system. As a result, you could quickly counter most attempts by your competitor to gain a competitive advantage—not anymore.

Connecting to the IIoT and integrating the entire manufacturing process gives manufacturers the capability to implement a wide array of solutions to enhance operational efficiencies and enable personalized customer experiences. IoT-enabled digital twins of product, production and performance, present manufacturers with unparalleled opportunities to continuously optimize every step of manufacturing. Leveraging IoT data in digital twins creates a closed-loop environment and the ability for manufacturers to realize new efficiencies, avoid production issues, improve development and design cycles as well as open the door to new revenue streams.

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The Forrester Wave™: Industrial IoT Software Platforms, Q4 2019

The 14 Providers That Matter Most And How They Stack Up

by Michele Pelino and Paul Miller

November 13, 2019

Why Read This Report

In our 24-criterion evaluation of industrial internet of things (IIoT) software platform providers, we identified the 14 most significant — ABB, Amazon Web Services (AWS), Bosch, C3.ai, GE Digital, Hitachi, IBM, Microsoft, Oracle, PTC, Samsung SDS, SAP, Siemens, and Software AG — and researched, analyzed, and scored them. This report shows how each provider measures up and helps infrastructure and operations (I&O) professionals select the right ones for their needs.

Key Takeaways

Microsoft, C3.ai, PTC, And Siemens Lead The Pack

Forrester's research uncovered a market in which Microsoft, C3.ai, PTC, and Siemens are Leaders; IBM, Software AG, Hitachi, SAP, Amazon Web Services, Oracle, and GE Digital are Strong Performers; and Samsung SDS, ABB, and Bosch are Contenders.

Analytics, Prepackaged Applications, And Integration Are Key Differentiators

As IIoT solutions enter the mainstream, Leaders differentiate by doing far more than simply connecting industrial machinery to the internet — they turn insight into action with powerful analytics. These vendors offer a set of rich prepackaged applications on their platforms and support comprehensive integration capabilities to plug gaps in functionality and deliver the solutions their customers demand.

The Forrester Wave™: Industrial IoT Software Platforms, Q4 2019

The 14 Providers That Matter Most And How They Stack Up

by [Michele Pelino](#) and [Paul Miller](#)

with [Merritt Maxim](#), [Glenn O'Donnell](#), Renee Taylor, Matthew Flug, and Diane Lynch

November 13, 2019

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[The Forrester Tech Tide™: Internet Of Things, Q3 2019](#)

[Internet-Of-Things Heat Maps For Operational Excellence, 2019](#)

[Use Data From The Industrial Internet Of Things To Deliver Customer-Centric Business Models](#)



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IoT Underpins Industrial Leaders' Pivot From Grease To Code

In volatile market conditions, conservative industrial giants must move faster to survive. The digital transformation of traditional manufacturing firms cannot — and must not — simply be about making existing industrial processes more efficient. These organizations must recognize the opportunity to use digital as a way to create more sustainable and more profitable customer relationships, continuously aligning product value to changing customer requirements.¹

But the physical products (and the hard-won industrial skills that created them) don't go away. A rich digital experience doesn't replace a well-built premium car or a dependable and resilient piece of industrial machinery. Rather, digital augments the product and enables designing, building, selling, using, and valuing it in new ways.² While the physical products certainly endure, the companies that built them must change to survive, investing in digital and baking it deeply into everything they do. IoT is core to industrial companies' efforts to bridge the divide between the physical and the virtual.³ Industrial IoT platforms allow I&O pros to support the design of connected products, operate connected business processes, and consume connected insights.

As a result of these trends, industrial IoT software platform customers should look for providers that:

- › **Support a comprehensive set of deployment models, from edge to cloud.** Almost all the significant IIoT software platforms run in at least one of the hyperscale public clouds. IIoT software platform vendors continue to invest in this area, moving from a model by which they simply run their own software in a cloud provider's data centers toward a more complex situation in which they also benefit from cloud providers' more advanced capabilities in areas such as IoT device management or analytics. Investment in edge capabilities also continues to grow, with both customers and vendors recognizing that their short- and medium-term deployment models will be hybrids that include cloud and edge.
- › **Rise above connectivity and device management to deliver business integration.** For an IIoT platform, the ability to identify, manage, secure, extract data from, and send commands to large fleets of connected devices is table stakes. But, on their own, these capabilities are insufficient to support the needs of the modern industrial enterprise. Customers increasingly demand the ability to link IoT workflows to data and processes elsewhere in their business, and industrial IoT software platform vendors are hurrying to comply. Prebuilt applications, powered by the platform, accelerate time to value, and integration with third-party applications elsewhere in the business ensures that organizations can more widely use data from the platform.
- › **Integrate analytics and actionable intelligence.** Industrial firms deploy an array of sensors that capture and generate time-series data in real time. Transforming this data into timely, relevant insight using rich analytics is an important category of IIoT software platform functionality. However, many business analysts lack the expertise and tools to evaluate IIoT data and translate it into actionable insight. Diverse arrays of data in the cloud, at the edge, and captured from digital twin models require data filtering and streaming analytics solutions to effectively assess

and monitor data. Advanced analytics identify patterns and generate insight from captured data, and prepackaged analytics models for relevant industry-specific manufacturing processes further simplify the analytics process.

Evaluation Summary

The Forrester Wave™ evaluation highlights Leaders, Strong Performers, Contenders, and Challengers. It's an assessment of the top vendors in the market and doesn't represent the entire vendor landscape. You'll find more information about this market in our reports on IoT and the industrial sector's shift from grease to code.⁴

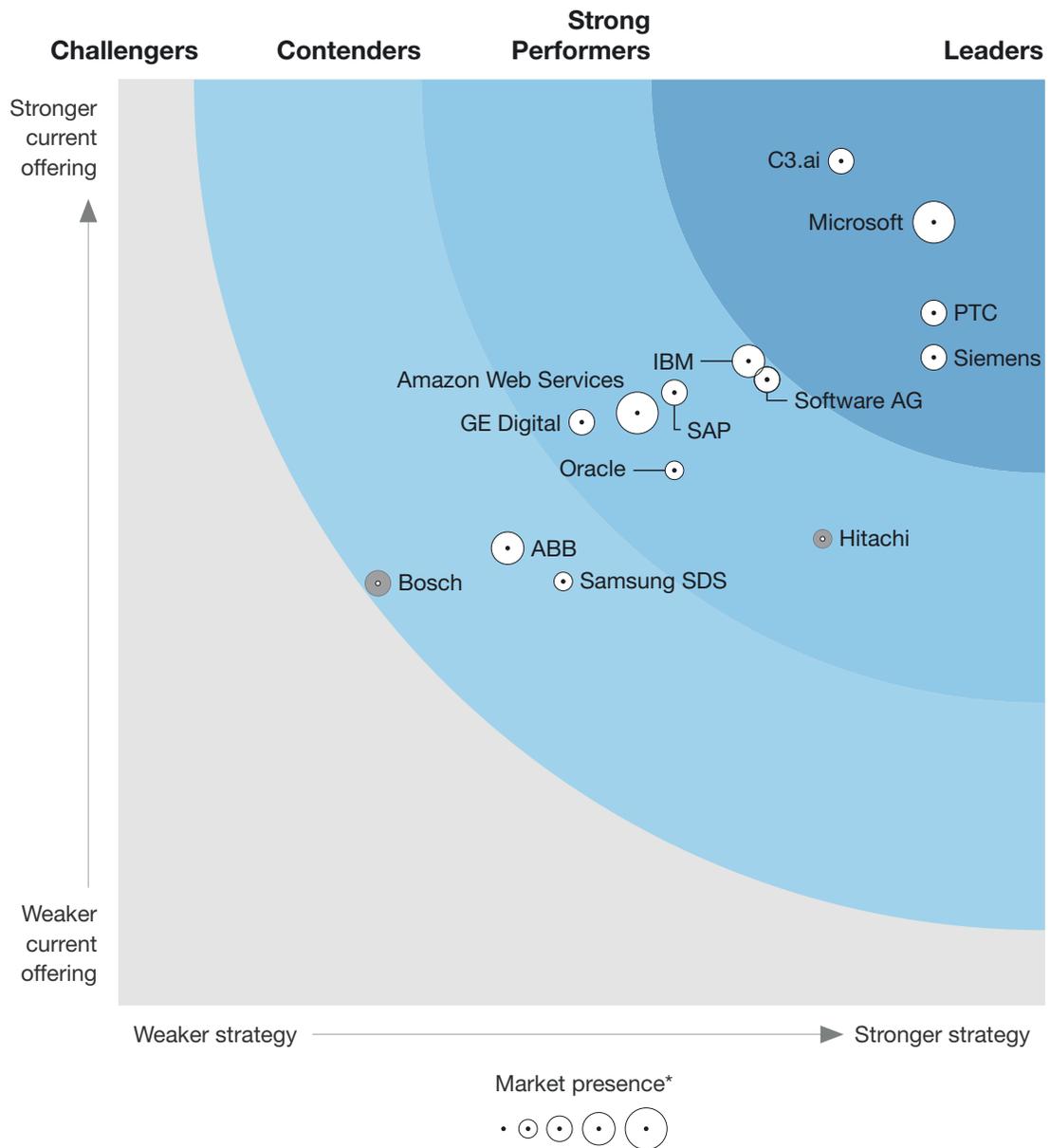
We intend this evaluation to be a starting point only and encourage clients to view product evaluations and adapt criteria weightings using the Excel-based vendor comparison tool (see Figure 1 and see Figure 2). Click the link at the beginning of this report on Forrester.com to download the tool.

FIGURE 1 Forrester Wave™: Industrial IoT Software Platforms, Q4 2019

THE FORRESTER WAVE™

Industrial IoT Software Platforms

Q4 2019



*A gray bubble indicates a nonparticipating vendor.

FIGURE 2 Forrester Wave™: Industrial IoT Software Platforms Scorecard, Q4 2019

	Forrester's weighting	ABB	Amazon Web Services	Bosch*	C3.ai	GE Digital	Hitachi*	IBM
Current offering	50%	2.47	3.20	2.28	4.56	3.15	2.52	3.48
Connectivity, deployment, and security	20%	2.50	2.50	2.80	5.00	3.30	2.80	3.00
Management console	20%	2.20	3.00	2.60	4.60	3.00	1.40	3.00
Application enablement functions	30%	3.30	4.00	1.80	3.80	1.30	2.60	3.40
Analytics and data	30%	1.80	3.00	2.20	5.00	5.00	3.00	4.20
Strategy	50%	2.10	2.80	1.40	3.90	2.50	3.80	3.40
Partner strategy	20%	1.00	5.00	3.00	5.00	3.00	3.00	5.00
Commercial model	15%	1.00	1.00	1.00	3.00	3.00	3.00	3.00
Innovation roadmap	25%	1.00	3.00	1.00	3.00	3.00	5.00	3.00
Platform differentiation	25%	3.00	3.00	1.00	5.00	1.00	3.00	3.00
Delivery model	15%	5.00	1.00	1.00	3.00	3.00	5.00	3.00
Market presence	0%	3.80	4.20	2.60	3.00	3.00	1.40	3.40
Direct customers	40%	3.00	5.00	3.00	1.00	3.00	1.00	3.00
Connected devices	40%	4.00	4.00	2.00	5.00	3.00	2.00	3.00
Geographic customer distribution	20%	5.00	3.00	3.00	3.00	3.00	1.00	5.00

All scores are based on a scale of 0 (weak) to 5 (strong).

*Indicates a nonparticipating vendor.

FIGURE 2 Forrester Wave™: Industrial IoT Software Platforms Scorecard, Q4 2019 (Cont.)

	Forrester's weighting	Microsoft	Oracle	PTC	Samsung SDS	SAP	Siemens	Software AG
Current offering	50%	4.23	2.89	3.74	2.29	3.31	3.50	3.38
Connectivity, deployment, and security	20%	4.00	1.90	4.60	2.40	3.50	3.00	4.80
Management console	20%	4.40	3.40	3.60	1.40	3.60	2.80	4.00
Application enablement functions	30%	4.30	3.10	3.20	2.10	3.30	4.00	2.40
Analytics and data	30%	4.20	3.00	3.80	3.00	3.00	3.80	3.00
Strategy	50%	4.40	3.00	4.40	2.40	3.00	4.40	3.50
Partner strategy	20%	5.00	3.00	5.00	3.00	3.00	5.00	3.00
Commercial model	15%	3.00	3.00	3.00	1.00	3.00	3.00	3.00
Innovation roadmap	25%	5.00	3.00	5.00	3.00	3.00	5.00	5.00
Platform differentiation	25%	5.00	3.00	5.00	3.00	3.00	5.00	3.00
Delivery model	15%	3.00	3.00	3.00	1.00	3.00	3.00	3.00
Market presence	0%	4.60	1.80	3.00	1.80	3.00	3.00	2.20
Direct customers	40%	5.00	1.00	3.00	1.00	3.00	5.00	1.00
Connected devices	40%	5.00	2.00	3.00	2.00	3.00	2.00	3.00
Geographic customer distribution	20%	3.00	3.00	3.00	3.00	3.00	1.00	3.00

All scores are based on a scale of 0 (weak) to 5 (strong).

Vendor Offerings

Forrester included 14 vendors in this assessment: ABB, Amazon Web Services, Bosch, C3.ai, GE Digital, Hitachi, IBM, Microsoft, Oracle, PTC, Samsung SDS, SAP, Siemens, and Software AG (see Figure 3). We invited Dassault to participate in this Forrester Wave, but it chose not to participate, and we couldn't make enough estimates about its capabilities to include it in the assessment as a nonparticipating vendor.

FIGURE 3 Evaluated Vendors

Vendor	Product evaluated
ABB	ABB Ability Platform
Amazon Web Services	AWS
Bosch	Bosch IoT Suite
C3.ai	C3 AI Suite; C3 AI Applications; C3 Integrated Development Studio (C3 IDS)
GE Digital	Predix Platform
Hitachi	Lumada
IBM	IBM Watson IoT Platform
Microsoft	Microsoft Azure IoT
Oracle	Oracle Internet of Things Cloud
PTC	ThingWorx
Samsung SDS	Brightics IoT
SAP	Leonardo IoT
Siemens	MindSphere
Software AG	Cumulocity IoT

Vendor Profiles

Our analysis uncovered the following strengths and weaknesses of individual vendors.

LEADERS

- › **Microsoft powers industrial partners but also delivers a credible platform of its own.** Microsoft's Azure public cloud infrastructure underpins many of the IIoT software platforms we considered in this evaluation. Microsoft also offers a comprehensive set of IoT software platform capabilities that customers use to assemble their own solutions in the cloud and at the edge. Prospective customers see a broad range of increasingly capable solutions but are sometimes bewildered when faced with choosing between assembling Microsoft's building blocks on their own or paying a third party for a solution that has already done that work and added domain-specific value.

Microsoft continues to add features to the platform at an impressive rate, with the richer edge capabilities of Azure IoT Edge and the simplified application and device onboarding offered by Azure IoT Central formally launching since we last evaluated this market.⁵ The Azure Digital Twin service, currently in preview, offers capabilities likely to be of interest to the company's industrial partners and customers. Microsoft continues to favor products and services from its own portfolio: Compelling augmented reality (AR) capabilities still lean heavily on Microsoft's Dynamics software or HoloLens hardware, for example. Microsoft Azure IoT offers a powerful proposition for those with existing investments in the Azure cloud or for customers heavily dependent on industrial equipment makers such as ABB or Schneider Electric that base their own digital efforts exclusively on Azure.

- › **C3.ai delivers IoT analytics solutions at scale.** C3.ai tightly integrates with all major public cloud providers, extending the native capabilities of those platforms to deliver some of the largest IoT deployments we've seen in oil and gas, utilities, defense, and more. Although the learning curve associated with C3.ai's platform is relatively steep, customers consistently speak highly of the nature and depth of their relationship with the company. A new joint venture with Baker Hughes extends C3.ai's reach into oil and gas and may help offset customer concerns about the scalability of the company's high-touch deployment model, at least in that vertical market.

C3.ai's strength remains its analytics prowess: The company recently rebranded from C3 IoT, partly to more clearly signal its focus to the market. The model-driven type system lies at the heart of C3.ai's solution. Powerful and flexible, it's C3.ai's biggest differentiator and is also responsible for the complexity and occasional confusion that customers report in their first engagements with the platform. Alongside the core public-cloud-based offering, partnerships with hardware vendors and chip designers extend C3.ai capabilities to the edge when required. A C3.ai deployment isn't for the faint-hearted: The company makes most sense for oil and gas or utilities customers ready to invest significantly and strategically in the platform and to scale rapidly to extremely large deployments.

- › **PTC fuses device connectivity strength with AR vision.** PTC began in industrial design and is still strong there, but the combination of IoT and AR is key to the company's future growth. PTC's ThingWorx platform offers a rich set of capabilities spanning design, manufacturing, service, and operations. ThingWorx is equally at home in the cloud or deployed at the edge. A strategic partnership with Rockwell Automation gives the company another route to market as well as opportunities to create shared solutions such as the recently launched FactoryTalk Innovation Suite, powered by PTC.

Kepware gives PTC a powerful capability to connect to a broad set of industrial equipment, but it also demonstrates some of the challenges PTC still faces in integrating acquired assets into a customer-friendly whole: The Kepware user interface is familiar to most of its users but looks and works differently than other pieces of the ThingWorx platform. With a vendor-agnostic approach, industrial hardware, and many years of industrial domain experience, ThingWorx is a strong choice for companies with a diverse mix of equipment. Organizations with AR as an important part of their innovation roadmap should consider PTC.

- › **Siemens positions MindSphere as open platform for industrial applications.** Siemens' latest corporate restructure emphasizes the importance of digital industries — and its MindSphere IIoT platform — to the company's future growth. The 2018 acquisition of Mendix continues a recent flurry of digital acquisitions and underpins efforts to make MindSphere's capabilities accessible to nonprofessional developers at the company's industrial customers. The MindSphere Marketplace provides access to a growing catalog of third-party applications powered by the platform, and the member-only MindSphere World community has expanded beyond its initial focus on German industrial companies.

MindSphere builds on Siemens' strength in industrial equipment and controllers but isn't limited to interacting with Siemens hardware. Capabilities around KPI management or device monitoring and alerting are less developed than those we saw from others in this evaluation. The company continues to tell a strong story about the importance of digital twin, and MindSphere plays a key part in turning this vision into something pragmatic and implementable. MindSphere is well suited to customers with existing investments in the Siemens ecosystem but also deserves the attention of any industrial company interested in tapping Siemens' deep domain knowledge and the experience it's gained from its own internal digital transformation.

STRONG PERFORMERS

- › **IBM combines cloud, analytics, and services expertise to address IIoT use cases.** IBM includes a range of device management, security, application enablement, and analytics services as part of its Watson IoT brand. IBM's industrial IoT expertise spans key markets, including manufacturing, utilities, energy, and oil and gas and focuses on industry-specific solutions, such as asset performance management, building and facilities management, and connected vehicle insights.

The Watson IoT Platform provides strong AI-driven analytics solutions via an extensible catalog of analytics functions and supports rapid application development through NodeRED, an open source development environment. IBM's extensive partner ecosystem spans telecoms, connectivity vendors, software development providers, hardware devices and gateway vendors, and services firms. IBM offers prebuilt applications using Watson IoT's integration with the company's Maximo Asset Performance Management solution; the firm will continue to expand these prebuilt application offerings to reduce requirements for resource-intensive professional services projects. IBM's Watson IoT solution is ideal for customers with complex industrial IoT deployments requiring a mix of platform, analytics, and professional services for successful implementation.

- › **Software AG's Cumulocity IoT platform addresses core and edge functionality.** Software AG's IoT platform solution, Cumulocity IoT, includes Cumulocity IoT Core and Cumulocity IoT Edge to address a broad array of requirements such as device connectivity and management, application enablement tools, preconfigured applications, and data management services. In 2019, Software AG established a separate business unit dedicated to IoT and analytics, highlighting the strategic importance of IoT to the firm's future growth. Software AG's IoT customer base is primarily in Europe; however, the firm does have global reach.

Software AG supports a comprehensive array of industrial IoT protocols relative to other firms we evaluated, complemented by a fully functional Cumulocity IoT edge solution. Customers can use Cumulocity IoT in conjunction with Software AG's streaming analytics, time-series, and machine learning capabilities, which are increasingly well integrated with the platform. Cumulocity IoT powers device connectivity functions for a range of white-label telco IoT offerings, for Siemens' MindSphere platform, and for ADAMOS, a joint venture of industrial firms in Germany. Cumulocity IoT also offers white-label services to enterprise customers. However, Software AG's many brands still confuse some customers. Software AG's Cumulocity IoT platform is ideal for enterprises that have European headquarters and require comprehensive device connectivity, edge services, preconfigured applications, and analytics functionality.

- › **Hitachi delivers applications on top of an analytics-powered IoT platform.** With the Lumada industrial IoT platform, Hitachi hopes to harness deep domain knowledge from its home market to deliver digital solutions for global customers. Adoption remains greatest in Japan, and partnerships outside Japan remain less comprehensive than those of other providers we considered, but the company's Vantara division is gaining visibility in international markets. The company offers customer-facing applications powered by the platform and continues to add new applications to the set.

The platform's management console is intuitive, and the company places the digital twin, which it refers to as an asset avatar, at the heart of a range of industrial use cases. Pentaho, which Hitachi acquired in 2015, forms the core of Lumada's analytics capabilities, and the company continues to innovate in this space. Use cases such as video analytics are a particular area of strength. Hitachi declined to participate in the full Forrester Wave evaluation process.

- › **SAP Leonardo embeds IoT into business systems, applications, and processes.** SAP Leonardo is a set of software solutions and microservices enabling customers to leverage IoT, machine learning, predictive analytics, and big data technologies to address industrial digital transformation initiatives. Collectively, these SAP Leonardo solution elements contribute to SAP's strategic focus on enabling the industrial Intelligent Enterprise.

SAP Leonardo IoT is a managed service offered within SAP Cloud Platform and includes a comprehensive array of industrial connectivity protocols. It integrates with SAP Edge Services to extend business processes close to the data source and enable actions, even with intermittent connectivity. Customers use SAP Leonardo IoT to develop IoT applications, connect devices, and use microservices to model a digital twin. SAP's marketing terminology for IoT solutions and the relationship to SAP's Intelligent Enterprise positioning is confusing to some reference customers. SAP Leonardo IoT solutions are particularly relevant to existing SAP customers in industrial markets that require IoT solution integration with a range of advanced technologies, including edge, advanced analytics, and blockchain services.

- › **AWS's industrial IoT solutions span an array of cloud, edge, and managed services.** Amazon Web Services offers customers a portfolio of IoT services on the AWS cloud to access data storage, processing, and analytics functions; it recently released AWS IoT SiteWise, a managed

service, to make it easier for customers to organize and monitor industrial equipment data at scale. In addition to these IoT capabilities in the public cloud, AWS IoT Greengrass provides edge devices with compute, messaging, and machine learning capabilities. AWS's public cloud infrastructure also plays a role in hosting many of the industrial IoT software platforms in this evaluation.

AWS offers a broad array of extensibility options to industrial customers, including low-code development tools; reference architectures to enable predictive maintenance, quality, and asset condition monitoring use cases; and test-and-trial use cases. A wide array of partner-developed IoT applications provides customers with their choice of application capabilities. However, deployment options are limited to AWS public cloud infrastructure and processes running at the edge on Amazon FreeRTOS, AWS IoT Greengrass, or AWS Snowball Edge hardware. Customers that possess the in-house expertise to integrate individual AWS offerings to address end-to-end solution requirements, or that are willing to work with verified AWS partners with relevant industry or operational process expertise, are ideally suited to use AWS's industrial IoT solutions.

- › **Oracle's IIoT strategy focuses on offering customers integrated applications.** The focal point of Oracle's IoT strategy is on preconfigured IIoT applications. These applications address use cases that include asset monitoring, production monitoring, fleet management, and connected workers. Oracle IoT Cloud deploys on the Oracle Java Cloud Suite, giving customers the ability to use Oracle's scalable platform-as-a-service (PaaS) offerings, including Elasticsearch, Oracle Big Data Cloud, Oracle NoSQL, and Oracle Storage Cloud. Oracle's sales representatives can leverage existing relationships with enterprise stakeholders responsible for IoT-enabled enterprise resource planning (ERP) and supply chain management processes related to these integrated applications.

Oracle provides white-label service; comprehensive, localized 24x7 customer support across multiple languages and channels; dedicated customer success managers to ensure successful deployment; and self-help and peer training. However, Oracle's solution provides relatively few native integrations with third-party applications, which limits applicability to non-Oracle customers. In addition, the solution has limited AR/virtual reality (VR) capabilities relative to others in the evaluation. Oracle's IIoT solution is ideal for firms that are already in Oracle's ecosystem and are addressing IIoT use cases for asset monitoring, fleet management, production monitoring, and connected workers.

- › **Market perception of GE Digital's parent is holding back its capable platform.** GE Digital has a new CEO but is only now beginning to emerge from over a year of uncertainty about its strategic direction and its relationship to its parent, General Electric (GE). GE Digital continues to invest in and acquire customers for its Predix IIoT platform, and those customers continue to report success, but these cases attract less attention than speculation about the conglomerate does. Time is running out for GE Digital to communicate a clear vision for itself and its Predix IIoT platform.

Predix Essentials offers prepackaged software-as-a-service (SaaS) solutions to help customers quickly realize value, leveraging the capabilities of the Predix platform while hiding the sometimes-daunting bundle of capabilities from which it was built. A strong digital twin proposition, and good

integration with industrial assets at the edge, link to an increasingly capable remote monitoring and management business. Although Predix Essentials marks a significant move in the right direction, the company's ability to give customers a broad suite of prepackaged industrial IoT applications remains less developed than others considered here. In the current climate, Predix is a fit for organizations that are already deeply invested in GE's products and services and that are comfortable continuing and deepening their GE relationship.

CONTENDERS

- › **Samsung SDS IoT connects devices, data and interfaces with legacy systems.** The Brightics IoT platform supports core IIoT platform functionality, such as device connectivity, device management, and data analytics. Samsung's partner ecosystem spans relevant participants across the IIoT technology ecosystem, including telecom providers, device manufacturers, vertical application developers, local service delivery firms, and AR/VR vendors. The majority of Samsung SDS Brightics IoT customers are currently located in the Asia Pacific (AP) region.

Samsung SDS Brightics IoT platform's out-of-the-box integrations are primarily with Samsung's own vertical solutions, including Cello for logistics, Nexfinance for finance, Nexplant MES for manufacturing, and Nexshop for retail. Samsung SDS's analytics capabilities focus on the Brightics AI Modeler and aren't as comprehensive as those of other vendors in the evaluation. Samsung SDS offers prepackaged applications for predictive maintenance, AR/VR, and blockchain to address emerging opportunities. Customer support is available in Chinese, English, and Korean, with plans to expand to additional support languages in the future. The Samsung SDS Brightics IoT platform is ideal for customers with operations in the AP region, particularly in the manufacturing, construction, building, and logistics markets.

- › **The ABB Ability platform powers a wide array of prepackaged industrial applications.** ABB's Ability platform uses common software technologies and industrial connectivity and builds on decades of industrial expertise to help customers, partners, and developers create industrial device, edge, and cloud applications underpinned by Microsoft Azure infrastructure. ABB's roadmap for its platform includes extending existing technical features and functions aligned with customer requirements, including security, multitenancy, and digital-twin-enabled data models.

The ABB Ability Solutions Catalog is a differentiating feature that includes more than 200 prepackaged applications and offerings addressing industrial devices and processes, such as asset performance management; remote monitoring services for machinery; control solutions for process industries; and specialized vertical offerings for energy, utilities, and oil and gas processes. ABB's partner ecosystem is limited and relies heavily on Microsoft Azure to power the platform capabilities. ABB's management console isn't as advanced as those of others in the evaluation; however, ABB is extending console functionality to include role-based personas by the end of 2019. The ABB Ability platform is ideal for existing ABB customers seeking to extend their industrial operations using the Ability platform and relevant preintegrated applications from the ABB Ability Solutions Catalog.

- › **Bosch IoT Suite's pace of innovation is slowing as the firm makes bigger digital bets.** Bosch was early with its IoT platform and quick to align with open source communities like the Eclipse Foundation, where many of the platform's core projects are incubated, and the OSGi Alliance. The platform meets the internal needs of Bosch product teams, and both buyers and nonbuyers of Bosch hardware use it in core industrial markets and nonadjacent verticals like agriculture and retail. But Bosch's early enthusiasm for extending the functionality of the IoT Suite appears to have cooled. It still wins customers and large deployments, but it's not keeping pace with the rate of platform innovation we observe elsewhere in the market.

The Bosch platform retains its early strength in the remote management of large numbers of connected devices, and the company has delivered on promises to improve analytics capabilities. Support for third-party applications remains an area of relative weakness for the platform, as does data management and digital twin. The Bosch IoT Suite is most relevant for Bosch customers and for organizations looking to graduate from unsupported Eclipse Foundation projects to the supported versions that Bosch sells. Bosch declined to participate in the full Forrester Wave process.

Evaluation Overview

We evaluated vendors against 24 criteria, which we grouped into three high-level categories:

- › **Current offering.** Each vendor's position on the vertical axis of the Forrester Wave graphic indicates the strength of its current offering. Key criteria for these solutions include connectivity, deployment and security, the management console, application enablement functions, and analytics and data.
- › **Strategy.** Placement on the horizontal axis indicates the strength of the vendors' strategies. We evaluated partner strategy, commercial model, innovation roadmap, platform differentiation, and delivery model.
- › **Market presence.** Represented by the size of the markers on the graphic, our market presence scores reflect each vendor's direct customers, connected devices, and geographic customer distribution.

VENDOR INCLUSION CRITERIA

Forrester included 14 vendors in the assessment: ABB, Amazon Web Services, Bosch, C3.ai, GE Digital, Hitachi, IBM, Microsoft, Oracle, PTC, Samsung SDS, SAP, Siemens, and Software AG. Each of these vendors has:

- › **A generally available industrial IoT software platform.** Each vendor offers a standardized IoT software platform that connects to and manages smart devices and infrastructure in industrial and manufacturing environments to integrate operational data and control into business processes. This platform functionality was generally available to paying customers as of July 31, 2019.

- › **A significant focus on the industrial domain and its use cases.** Each vendor demonstrates understanding of and investment in supporting industrial use cases in areas that include oil and gas, manufacturing, construction, and utilities.
- › **Large production deployments of the industrial IoT software platform.** Each vendor has multiple examples of large deployments of its industrial IoT software platform in industrial domains.
- › **Integration with key business systems.** Each vendor can demonstrate native integration between its industrial IoT software platform and other systems, such as ERP, manufacturing execution systems (MES), or product lifecycle management (PLM), and has paying customers using this integration to support production workloads.
- › **Native support for key industrial protocols.** Each vendor's platform provides native support for key protocols of relevance to the industrial domain, such as OPC Unified Architecture.
- › **A strong international presence.** Each vendor demonstrates international reach, with significant numbers of paying customers for its platform in key geographies.
- › **Strong Forrester client interest.** Forrester clients consistently inquire about each of these vendors in the context of industrial IoT software platform provisioning.

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Supplemental Material

ONLINE RESOURCE

We publish all our Forrester Wave scores and weightings in an Excel file that provides detailed product evaluations and customizable rankings; download this tool by clicking the link at the beginning of this report on Forrester.com. We intend these scores and default weightings to serve only as a starting point and encourage readers to adapt the weightings to fit their individual needs.

THE FORRESTER WAVE METHODOLOGY

A Forrester Wave is a guide for buyers considering their purchasing options in a technology marketplace. To offer an equitable process for all participants, Forrester follows [The Forrester Wave™ Methodology Guide](#) to evaluate participating vendors.

In our review, we conduct primary research to develop a list of vendors to consider for the evaluation. From that initial pool of vendors, we narrow our final list based on the inclusion criteria. We then gather details of product and strategy through a detailed questionnaire, demos/briefings, and customer reference surveys/interviews. We use those inputs, along with the analyst's experience and expertise in the marketplace, to score vendors, using a relative rating system that compares each vendor against the others in the evaluation.

We include the Forrester Wave publishing date (quarter and year) clearly in the title of each Forrester Wave report. We evaluated the vendors participating in this Forrester Wave using materials they provided to us by July 31, 2019, and did not allow additional information after that point. We encourage readers to evaluate how the market and vendor offerings change over time.

In accordance with [The Forrester Wave™ Vendor Review Policy](#), Forrester asks vendors to review our findings prior to publishing to check for accuracy. Vendors marked as nonparticipating vendors in the Forrester Wave graphic met our defined inclusion criteria but declined to participate in or contributed only partially to the evaluation. We score these vendors in accordance with [The Forrester Wave™ And The Forrester New Wave™ Nonparticipating And Incomplete Participation Vendor Policy](#) and publish their positioning along with those of the participating vendors.

INTEGRITY POLICY

We conduct all our research, including Forrester Wave evaluations, in accordance with the [Integrity Policy](#) posted on our website.

Endnotes

- ¹ For a more in-depth look into why industrial leaders must pursue digital transformation and how they're already embracing digital, see the Forrester report "[From Grease To Code: Industrial Giants Must Bet Their Futures On Software.](#)"
- ² See the Forrester report "[Use Data From The Industrial Internet Of Things To Deliver Customer-Centric Business Models.](#)"
- ³ To find out which IoT use cases could provide the most value for your company operations, see the Forrester report "[Internet-Of-Things Heat Maps For Operational Excellence, 2019.](#)"
- ⁴ See the Forrester report "[Internet-Of-Things Heat Maps For Operational Excellence, 2019,](#)" see the Forrester report "[The Forrester Tech Tide™: Internet Of Things, Q3 2019,](#)" see the Forrester report "[From Grease To Code: Industrial Giants Must Bet Their Futures On Software,](#)" see the Forrester report "[Use Data From The Industrial Internet Of Things To Deliver Customer-Centric Business Models,](#)" see the Forrester report "[Untangle The Digital Twin As Part Of Your Digital Product Strategy,](#)" see the Forrester report "[Machine Learning Powers The Industrial Internet Of Things,](#)" and see the Forrester report "[Bridge The IT/OT Divide To Win With Smart Manufacturing.](#)"
- ⁵ See the Forrester report "[The Forrester Wave™: Industrial IoT Software Platforms, Q3 2018.](#)"

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