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Industrial IoT Platforms Pave the Way for the Smart Factory

Adapted from *Perspective: IoT Accelerates in Manufacturing,* by Heather Ashton, IDC #US41959316

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The Industrial Internet of Things (IoT) is transforming the way manufacturers instrument, manage, and optimize their operational assets. Through a combination of sensors, software, and connectivity, factory operators can gather data from a mixed environment of devices, equipment, and machines to improve plant efficiency, enhance energy management, and achieve greater asset uptime. This Technology Spotlight examines how the Industrial IoT (IIoT) is transforming the relationship between information technology (IT) and operations technology (OT). It also examines the role that Tridium's Niagara Framework plays in supporting digital transformation in discrete manufacturing.

Introduction

Manufacturers continue to lead the adoption of and spending in industrial IoT. Smart Manufacturing initiatives share the objective of improving the throughput, quality, and asset utilization across the factory network, and connecting the shop floor to the top floor. In our recent research around IoT, about half of U.S. manufacturers are in pilot or production mode with IoT initiatives. One of the primary reasons for this level of active investment in IoT is the urgency many of these manufacturers are feeling to digitally transform their operations.

Digital transformation, as IDC defines it, is an organization's use of the 3rd Platform – namely cloud, mobile, social, and data analytics – to create value and competitive advantage through new offerings, new business models, and new relationships. Digital transformation has technology as its foundation, and it redefines the way companies operate internally and with their suppliers, partners, and customers.

Within manufacturing, digital transformation is driving the convergence of IT and OT to support business transformation, moving beyond being efficiency-driven to becoming fulfilment-driven. Early examples of this IT/OT integration can be seen in building management systems – for example, energy, lighting, HVAC, water and building access – into one managed system using software and sensors to optimize building energy usage, manage access control, enable remote monitoring, and improve maintenance, reliability, and life of assets. These are just a few of the examples of how IT/OT integration is already well-established for commercial building management systems, and this integration can be applied to manufacturing plants for similar business outcomes. Energy and resource management is a top priority inside the plant, as is maximizing the uptime of factory or plant assets.

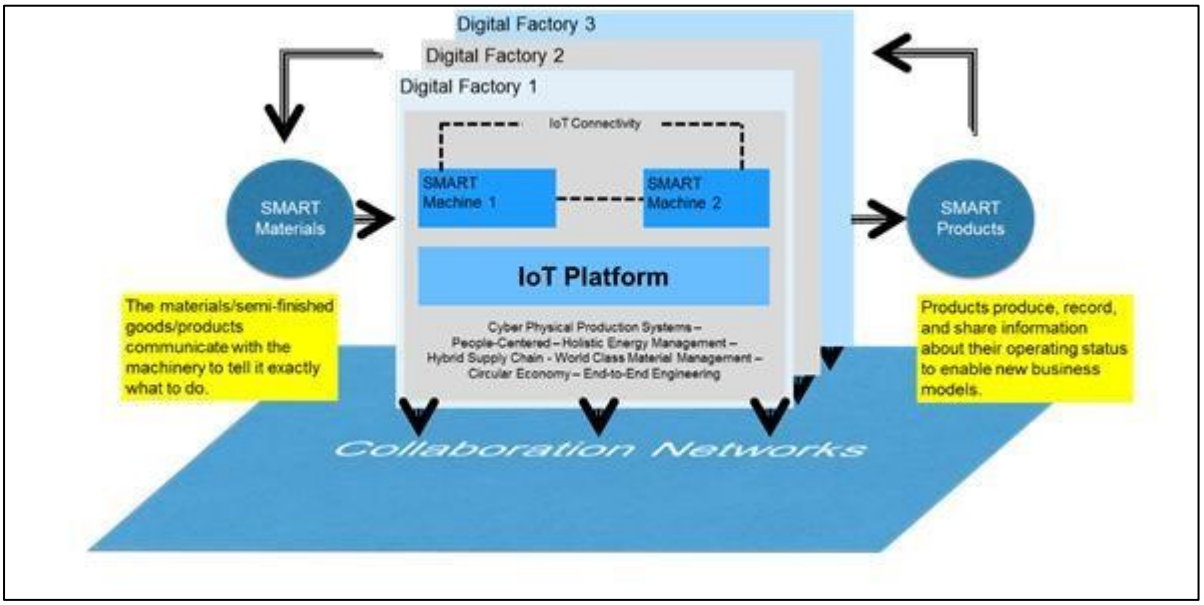
Applying this same IT/OT integration on the factory floor yields an even greater potential for transformation. This transformation allows manufacturing lines to execute processes in an automated and autonomic way, aligning people, machines, and resources with the ability to adjust tactics in real-

time according to how business is changing. IDC Manufacturing Insights predicts that by 2019, 35% of large global manufacturers with Smart Manufacturing initiatives will integrate IT and OT systems to achieve advantages in efficiency and response time. This integration is largely possible due to advanced technologies such as cloud, big data/analytics, and IoT.

IoT is an important enabling technology to support digital transformation in the plant, as it helps create a "digital thread" that connects IT and OT and thus helps manufacturers optimize key metrics such as OEE (Overall Equipment Effectiveness). By adding IoT technology to the factory floor, a plant manager can identify line bottlenecks and move production to another line while proactively scheduling repair of the impacted machine. Figure 1 highlights how an IoT platform is a critical foundation for a smart factory.

Figure 1

IoT Platforms are Central to the Smart Factory



Source: IDC Manufacturing Insights, 2017

As the above figure demonstrates, the benefits of IoT extend beyond the Smart Factory. IoT can be applied upstream to the supply chain to bring "Smart Materials" into the factory just when they are needed, and downstream to create "Smart Products," which are IoT-powered products that can enable new business models like "product as a service." Digitally transformed manufacturers are using IoT across the flow of materials, products, and services.

As manufacturers look to adopt IoT for Smart Materials, Smart Manufacturing, and Smart Products, a key to the success of IoT on the factory floor is the presence of an open, standards-based IoT platform that provides the ability to connect and ingest data from heterogeneous sources, integrate with ERP and other systems of record, and extend into the application layer to support analytics on rich sets of data, as well as support the broader ecosystem of technology providers for futureproofing.

Benefits

Manufacturers are turning to Industrial IoT and Smart Manufacturing to improve productivity, increase efficiency and machine uptime, overcome departmental silos, and tune the factory more directly to the market, customer orders, and customer service. To achieve the benefits of Smart Manufacturing

and IT/OT integration, manufacturers need an open platform for IoT. The benefits provided by an open IoT framework for the smart factory include:

- **Connecting heterogenous assets.** By connecting all heterogeneous network and edge plant-based assets and data sources, the open IoT platform enables a responsive and unified, one-stop-shop view of the manufacturing production environment.
- **Providing data normalization.** An open IoT platform provides the ability to normalize data coming from the multitude of sources, which can then be consumed by enterprise applications, analytics, and visual displays.
- **Unifying and achieving key metrics.** With connected endpoints across the factory floor, the IoT platform unifies key metrics and KPIs across operations and offers actionable insights through the user interface layer to operators, analysts, and management. The results include better energy management, operational excellence, enhanced security, optimized labor, cost avoidance, and end-to-end efficiency.
- **Providing actionable insight.** The IoT platform creates the capacity for answering complex questions such as "what is the optimal combination of assets, energy management, resources, and functionality to produce our product?" that plant operators and business managers need to understand.
- **Improving everyday tasks.** Using IoT to link assets, provide insight, and impact key performance metrics, the daily tasks of operators in manufacturing cells and business groups like engineering and service are improved.
- **Enabling preventive maintenance.** Connected assets on the factory floor enable maintenance practices to move from reactive, or break-fix, to preventative and eventually predictive, as service managers can apply data analytics to common performance patterns, detect anomalies that signal the equipment may be heading for a breakdown, and launch the corrective action to prevent that from happening.

The business value from using an open IoT platform for Smart Manufacturing can be tremendous. This value includes higher levels of productivity, greater efficiency, reduced resource waste, and the ability to respond more quickly to customer demands.

What to Look for in an Industrial IoT Platform

As manufacturers seek to instrument their factories to enable Smart Manufacturing, there are considerations. One very important initial decision involves the IoT platform, which becomes the governing approach to Industrial IoT.

In *IDC's 2016 Global IoT Decision Maker Survey*, 79.8% of manufacturers indicate that a common set of data and connectivity standards are extremely or very important to their organization's deployment of IoT; 66.3% of manufacturers take standards a step further, indicating that open source (as opposed to just common) standards are extremely or very important to their IoT deployments. While instrumenting a factory to become "smart" is a significant undertaking, the benefits of an open, IoT platform are top of mind for manufacturers as they move down the path toward Smart Manufacturing.

IDC recommends manufacturers look for the following features as they evaluate IoT platforms for Smart Manufacturing:

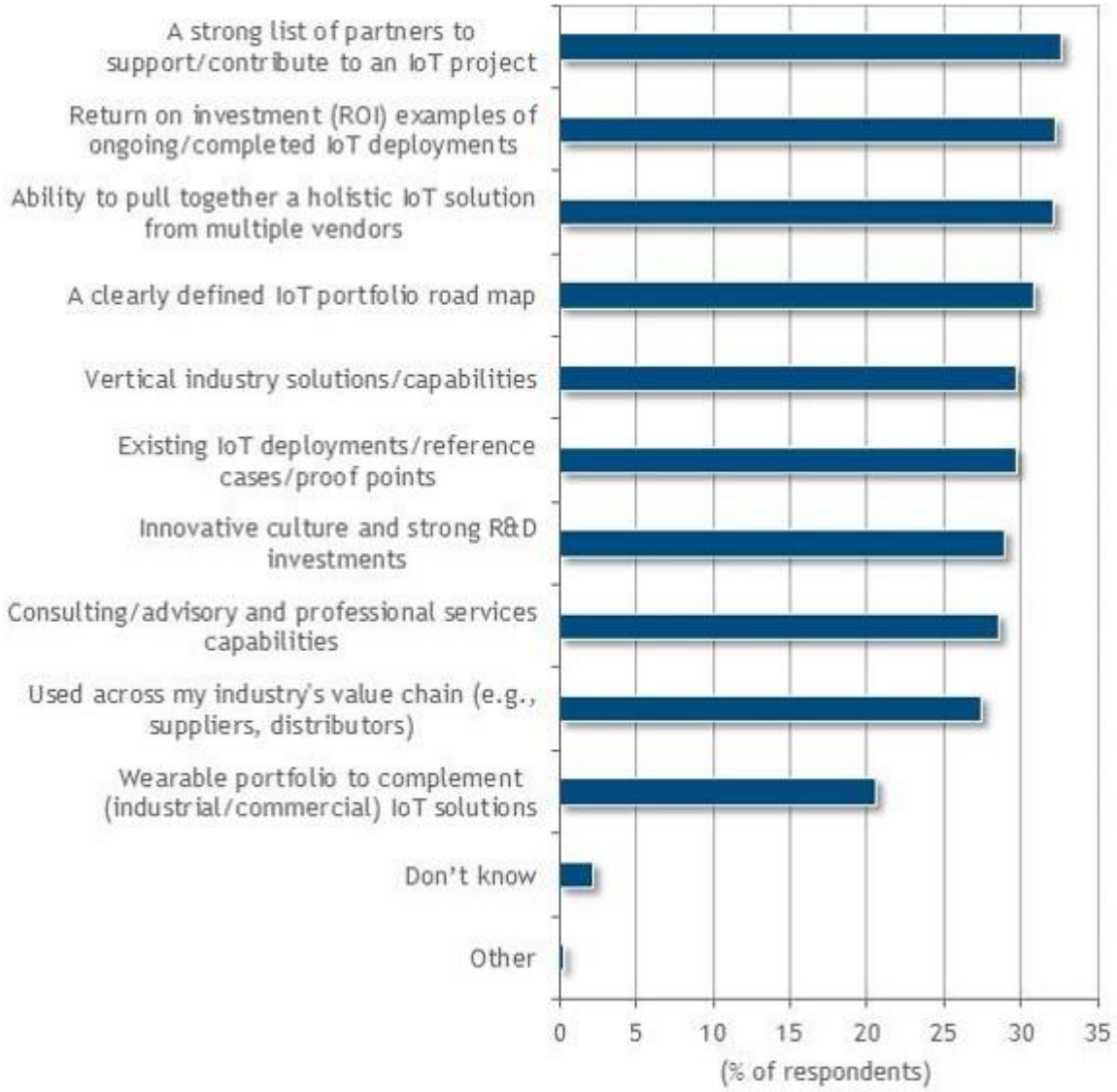
- **Open platform.** As IDC's data highlights, having an open platform that can connect disparate systems, both those that already exist and any new systems, as well as existing and new sensors, devices, and protocols is critical to enabling the fully-instrumented smart factory.

- **Extensibility.** In addition to enabling connectivity at the device, protocol, and system level, it is important that the IoT platform is extensible into the application layer, including ERP and cloud analytics. This extensibility will enable the action-taking necessary to receive the highest level of benefits from Smart Manufacturing.
- **Native historians and industrial drivers.** Support for a broad variety of industrial drivers is essential to the success of instrumenting a smart factory. Providing a native historian can help manufacturers quickly implement their IoT platform and reduce the time required to add on or integrate with another historian.
- **Ecosystem of partners.** The very nature of an IoT platform should encourage interoperability with heterogeneous systems and solutions. Equally important is a broader ecosystem of partners (systems integrators, factory automation vendors, etc.) that can work within the framework to ensure that the Smart Factory can continue to evolve along with the technology and changing business needs.

On the last point, IDC research has emphasized that manufacturers care strongly about an ecosystem approach to IoT projects. In IDC's *2016 Global IoT Decision Maker Survey,* the top criteria for manufacturers when choosing an IoT vendor is its ecosystem (see Figure 2). The complexity of IoT projects is clearly understood by manufacturers as they move toward instrumenting smart factories, and a strong partner ecosystem is a primary requirement.

Figure 2

IoT Vendor Criteria for Manufacturers



Source: IDC's Global IoT Decision Maker Survey, 2016. Note: n= 920, Multiple responses were allowed

Tridium's Niagara Framework

Tridium's Niagara Framework is an open IoT software platform that enables manufacturers to transform operations to Smart Manufacturing, or the Industrial IoT. The Niagara Framework enables manufacturers to connect and control their factory-based devices while normalizing, visualizing, and analyzing data in real time across the heterogeneous factory environment. It provides manufacturers with a flexible and customizable approach to connecting factory-floor assets to create visibility into operations and to drive business KPIs such as increased throughput, higher yield, and equipment uptime. The Niagara Framework includes the following key features:

- **Connectivity.** The Niagara Framework enables connectivity to a variety of disparate systems, sensors, and devices, regardless of protocol or manufacturer. Niagara includes a templating feature that enables tags to be applied to devices quickly; it also allows applications to be prebuilt against a set of standardized templates. The templates can be reused for increased efficiency.
- **Extensibility.** As an open platform, Niagara provides the ability for developers to build on top of its framework to create new applications or to feed data into existing systems like ERP or cloud analytics to enable functional leaders to take further action.
- **Distribution.** Niagara is sold by a global community of systems integrators, OEMs, distributors, and resellers, creating a broad ecosystem of partners that manufacturers can have confidence will support current and future Smart Manufacturing innovations.

In addition to the above key features of Niagara, the platform also includes the following capabilities and extensions:

- **Modern user interface.** The user interface for Niagara utilizes HTML5 to provide a variety of features to facilitate greater productivity for operators and managers.
- **Developer tools.** For developers within the Niagara environment, there is comprehensive documentation, an open API library, Maven, Gradle, and semantic data modeling via tags to support development.
- **Robust security.** Niagara includes a multi-faceted security approach that starts with user authentication that requires strong credentials. It uses role-based access control, and can be integrated with existing enterprise identity and access management systems. Both data in motion and sensitive data at rest are encrypted.
- **Niagara Analytics.** Niagara Analytics 2.0 is a value-added offering of the Niagara platform that includes pre-existing data models for users to quickly build data views. It comes equipped with predefined algorithms that can be customized to a specific project. The dashboard feature allows users to visually display key metrics, alerts, and outputs.

Challenges

The process of integrating IT and OT through a Smart Manufacturing initiative is complex and can be very challenging. Manufacturers are in the process of instrumenting existing factory floor equipment and substantially improving connectivity to bring pieces together, transitioning from segregated to coordinated and eventually fully integrated. Among the challenges are the need to integrate existing IT and OT systems into the IoT platform, and to expose the data that is being collected and normalized to the necessary applications. Another challenge for these initiatives is the potential that an IoT platform creates – suddenly there is the ability for collaboration among previously separate business functions. To make sense of this unprecedented volume, velocity, and variety of data coming from factory equipment in real time, manufacturers will need to leverage advanced analytics on top of the IoT platform. Otherwise, the Smart Manufacturing initiatives will fail to deliver the desired results.

The competitive market for industrial IoT platforms is extremely crowded, and there is confusion as to what features comprise a comprehensive IoT platform for IIoT. Therefore, it is important for IoT platform providers such as Tridium to educate and articulate the capabilities of the platform, as well as reference customers in each targeted vertical to help manufacturers understand how the IoT platform works in a live environment. This is where an extended ecosystem such as Tridium's comes into play, because it can help demonstrate the value of an IoT platform across products, devices, and service providers.

Conclusion

As manufacturers move toward instrumenting their factories to enable Smart Manufacturing, they are focusing on the integration of information technology with operational technology, and IoT provides the foundation to enable this move. While IoT use cases often start with line-of-business and functional leadership, factors like analytics, integration, and security make it clear that IT needs to be an active participant in IoT adoption within the factory. Starting with an IoT framework helps provide an organizing construct to Smart Manufacturing. The optimal IoT platform will be open, extensible, and support a heterogeneous environment of technologies, standards, protocols, and vendors. With this approach, manufacturers can digitally transform their factories to increase productivity, uptime, and efficiency.
