Industrial Internet of Things
Buyer's Guide

Selecting the Right IIoT Solutions for Your Business Needs

ptc

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Building a Successful IIoT Strategy

In an era of rapid-fire change and drastic disruption, the need for flexibility, agility, and efficiency has never been so acute. It's why today's industrial businesses are investing heavily in the industrial Internet of Things (IIoT) as a core aspect of digital transformation strategies. And successful adoption is proving its value. IIoT provides the ability to digitally connect people, processes, and products to securely collect, monitor, and analyze data and enable faster, better decision-making across the entire enterprise.

With a vast range of applications and capabilities, IIoT solutions meet different needs for every business. But success is dependent on a consistent factor: a focus on the high-impact use cases that align with and enable strategic business objectives.

To identify the right IIoT projects that will make an impact on your business and achieve a true digital transformation at repeatable scale, consider how you would answer these questions:

- Which business goals will quickly benefit from IIoT capabilities?
- What are the most relevant IIoT projects that best support these business goals?
- Which IIoT functions and capabilities are needed to implement these projects?
- How can you leverage this information to make smart IIoT investments and build a repeatable roadmap for success?

This buyer's guide covers the answers to these questions and other top considerations, helping to remove the guesswork from your IIoT platform evaluations so you can pragmatically apply the technology and accelerate your digital transformation.

"Digital transformation and the IoT are impacting all corners of the product manufacturing market. In fact, within 3 years, 78% of engineering organizations expect their product to leverage the IoT in some way. From functionality and service improvements to business model changes, IoT adoption is reshaping the engineering ecosystem, across device categories as diverse as industrial automation systems, consumer electronics and medical devices."

The Cost of Being Late to IoT. VDC Research, March 2020.

Getting Started with IIoT

Whether it's reducing costs, supporting revenue growth, increasing efficiency, or providing more value to customers, every business's goals for IIoT is unique. And each goal comes with its own challenges, opportunities, IT environment, and operational considerations.

To transform your business through IIoT, your initial step is to identify which challenges the technology can help solve with proven use cases. From there, your connectivity considerations and requirements for IIoT success will become obvious and actionable.

How IIoT is Changing Industrial Markets

Enterprises across industries are embracing IIoT to quickly capitalize on strategic opportunities and gain a competitive edge. Worldwide IoT spending grew 8.2% year over year to $742 billion in 2020, and despite a downturn from COVID-19, is expected to return to double-digit growth rates in 2021.[1] As the IIoT market continues to evolve, four major themes prevail:

Market Maturity, Scale & Value

To replicate the business value achieved by early IIoT adopters, today's business buyers expect faster deployment timelines and strong ROI.

IT-OT Convergence

Early industrial connectivity challenges have underscored the vital importance of vendors accommodating holistic IT-OT strategies.

Capability Commoditization

As hyperscale cloud providers commoditize the lower level capabilities of the IIoT stack, IIoT vendors are pursuing vertical-specific strategies.

Ecosystem Importance

To agilely respond to market trends and deliver new levels of customer value, vendors are creating alliances that bridge the heterogenous IIoT ecosystem.

These forces at work in the marketplace are informing significant changes to technologies, customer demands, and the competitive landscape at-large. To successfully adapt to these trends, you need to ensure your IIoT platform has the right capabilities and your ecosystem of vendors and partners share your strategic priorities.

IIoT Business Value

For your industrial business to get the most out of your investment, IIoT's impact must target specific business functions, benefit numerous roles within your organization, and drive rapid scale and value across every level of the organization.

A holistic strategy ensures that your initiatives don't stagnate in pilots that only benefit one role or target a single siloed pain point. IIoT data can kick off a virtuous cycle of enterprise-wide transformation, from improving manufacturing operations and providing a feedback loop for engineering, to enabling better outcomes for your service, sales, and marketing organizations.

Recognized as an essential enabler of digital transformation, IIoT is an increasingly necessary investment for enterprises seeking to claim their position as a future industry leader.

COMPETITIVE ADVANTAGE

"And gaining competitive advantage sooner rather than later is mission-critical, with **88%** of adopters stating that IIoT is essential to the success of their company."

IoT Signals: Summary of Research Learnings 2019. Microsoft; 2019

With practical and pragmatic IIoT deployments, business value is gained by achieving outcomes, such as:

- **Reduced** operational costs
- **Improved** labor productivity
- **Increased** operational effectiveness
- **Reliable and repeatable** performance across lines and plants
- **Strategic differentiation** in product capabilities and services
- **Higher** rates of customer satisfaction

IIoT Challenges and Risks

While the benefits of IIoT adoption are well-established, it's not without its pitfalls. To navigate the IIoT business landscape and ensure a successful implementation, leaders must prepare to encounter roadblocks.

Strategic Adoption

In an increasingly competitive landscape, the chasm grows between enterprises with no current IIoT plans and early adopters. As first movers gain organizational and market advantages, for late IIoT adopters the cost of inaction mounts. Striking at the moment when your organization is equipped to handle an implementation—yet before you fall behind the competitive curve—is a challenge for many to balance.

- **Longer product development cycles:** Non-IIoT adopters' schedules are 10% longer than those of their peers currently deploying IIoT.[2]
- **Lost revenue:** IoT-enabled products sell better, even when priced at a premium based on their functionality and bundled with additional professional services.[2]
- **Lack of differentiation:** Early IIoT adopters have accumulated new IP and organizational capital in cloud software and analytics that late adopters will struggle to surpass.[2]

The Do-It-Yourself Approach

As industrial companies consider their IIoT journey, some decide that the best approach is to build an in-house or do-it-yourself (DIY) IIoT application. In many DIY cases, enterprises soon become waylaid by significant challenges that jeopardize their ability to gain a competitive edge:

- **Money:** Investments in home-grown solutions often prove costlier than vendor solutions, with the total cost of ownership four-times higher for DIY systems in a factory setting. [3]
- **Time:** DIY solutions take significantly more time to implement and realize value compared to vendor solutions. They often linger on indefinitely without achieving ROI.[4]
- **Expertise:** Industrial companies often struggle with recruiting and retaining best-in-class digital talent.[5]
- **Scaling:** The high cost of scaling efforts, combined with lack of resources, stall the transition from pilots to enterprise-wide rollouts.[6]

Pilot Purgatory

Successful IIoT pilots are achievable within 12 months—and in some cases, as little as three months. If IIoT pilots become stalled for years or more, enterprises face higher project costs, organizational distractions, and lost business opportunities as a result of:

- **Strategic misalignment:** Delays are inevitable when the pilot activities are not aligned with the C-suite's other strategic initiatives across the enterprise.[7]
- **IT-OT roadblocks:** Connecting devices to the network isn't always straightforward and requires the collaboration of multiple technologies and technology domains with respective business owners and stakeholders. [7]
- **Technical and partnership complications:** The business's ecosystem of partners may not be in alignment on network architecture and data governance requirements.[7]
- **Application challenges:** IoT applications are integral to getting a pilot up and running but many enterprises are unable to successfully build applications on their own.[7]

By understanding the potential roadblocks ahead and establishing the proper framework to address them head-on, your IIoT journey stands the best chance for success.

Must-Have IIoT Capabilities

An IIoT platform is a significant investment and not a decision made lightly. With a variety of platforms on the market, your success depends on choosing the one that meets your specific business needs and helps you avoid pilot purgatory and other challenges. As you begin considering different platforms, determine the must-have capabilities that address and support both the current and long-term needs of your digital transformation journey. Platforms recognized by analysts for excellence provide most or all the following end-to-end capabilities.

Connectivity to Industrial Assets and Databases

As the first step towards unlocking digital transformation, connectivity is a key foundational element and critical to success. For industrial environments with disparate systems, legacy equipment, and site-to-site complexities, an IIoT platform must offer standardized connectivity. This capability creates a single source for accessing industrial data across the IT and OT systems of your entire enterprise, including engineering, production, service, and sales.

Pre-Built Tools and Applications

To fast track your digital transformation, your IIoT platform must offer tools that simplify and streamline connected application building–without requiring in-house technical expertise. With drag-and-drop functionality, low-code environments, and pre-built applications, you can quickly deploy and easily scale applications, dashboards, workspaces, and mobile interfaces, based on your organization's needs.

Data Analytics

A robust IIoT platform must include strong analytical capabilities, effectively breaking down the barriers to big data. With the ability to convert high-volume IoT data into actionable, real-time insights, your organization can leverage an analytics strategy that enhances decision-making. Armed with advanced analytics, you can proactively optimize your operations and maintenance, as well as predict and prevent problems that jeopardize uptime, efficiency, and quality.

Device Management

The ongoing success of your implementation hinges on the effective administration, automation, and management of connected devices, processes, and systems. An IIoT platform must provide the capability to centrally monitor and manage daily operations. This enables users across business functions to take empowered actions that ensure the optimal performance of your physical and digital assets.

User-Friendly Experiences

To gain the maximum value from IIoT data, its full potential must be unleashed across your organization. An IIoT platform must offer flexible, effective visualization tools to ensure the right information is presented to the right employee at the right time in the right format. With role-based dashboards, digital interfaces, and augmented reality (AR) integration, employees can easily access, filter, and contextualize data that enables them to be more productive, responsive, and agile.

Results-Driven IIoT Evaluation Criteria

This critical evaluation validates your initial IIoT projects and investments on relevant hardware and software, helping ensure you get the maximum impact for your business.

Depending on the specifics of your organization's needs, you can drive rapid value by prioritizing proven IIoT use cases—and translate your initial successes into scalable and repeatable deployments across your enterprise.

These are the high-impact IIoT uses cases that industry leaders have commonly prioritized in order to achieve their strategic objectives and gain critical business benefits:

Predictive Maintenance

Product as a Service

Remote Condition Monitoring

Digital Work Instructions

Real-Time Visibility

Plant Benchmarking

IIoT Use Case: Predictive Maintenance

Unexpected machine downtime creates a ripple effect of downstream repercussions for you and your customers, jeopardizing revenue, productivity, and service agreements. Instead of reacting to issues, start predicting failures by analyzing real-time and historical equipment performance data to create user-specific alarms and condition-based alerts so your technicians can fix failures before they occur. As part of your IIoT-enabled predictive maintenance strategy, you can gain service intelligence through AI, machine learning, and design simulations to improve service outcomes and design highly reliable, smart connected products.

Leverage Predictive Maintenance to:

- Avoid costly unplanned downtime
- Reduce the need for truck rolls
- Resolve issues faster to meet and beat SLAs

Predictive Maintenance in Action:

Howden, a global manufacturer of industrial products, avoids the challenges and costs associated with unplanned downtime through its connected field maintenance program that uses customer-facing digital twins with IIoT and augmented reality. By connecting in-context data on equipment's operating conditions to real-time performance, Howden can provide their customers with automated predictive alerts, rapid parts identification, and easy-to-follow self-service repair sequences. Through predictive maintenance models, Howden prevents failures and improves uptime by keeping equipment running as efficiently.

IIoT Use Case: Product as a Service

In the face of product commoditization and narrowing profit margins, service transformation offers an opportunity to gain a competitive edge, increase revenue, attract new customers, and deliver more value. By integrating smart product capabilities with your connected service strategy, you can sell performance or outcomes-based offerings, including usage, uptime, and power by the hour. Through customer-centric offerings that deliver your product as a service, you can drive profitability for the entire enterprise.

Leverage Product as a Service to:

- Boost customer experience and drive demand
- Scale to new markets
- Maximize revenue

Product as a Service in Action:

ESAB, a producer of welding and cutting equipment, uses IIoT to connect equipment in the field via a software platform that manages and analyzes data. With visibility into usage and reported events, ESAB can tell if its customers aren't making the most of the equipment's full capabilities. Using this data, ESAB can take the initiative to optimize products and sales best aligned with customers' needs. This enhanced service offerings enables ESAB to acquire new customer bases across the world

IIoT Use Case: Remote Condition Monitoring

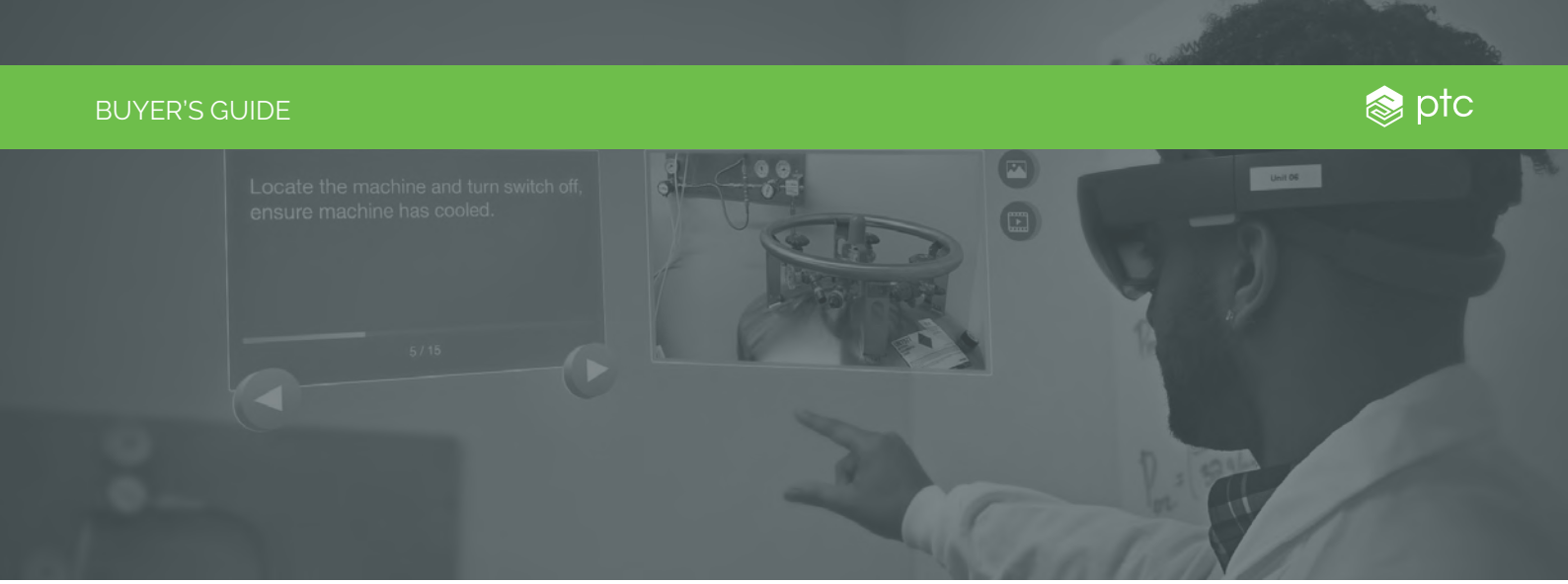
Customer high expectations for uptime and competitive offerings are unwavering. At the same time, your service team is tasked with keeping material and labor costs under control. The key to achieving both is remote condition monitoring. IIoT-enabled connected products provide real-time visibility and insight into equipment performance, enabling technicians to identify failures and resolve issues before they interrupt customers' operations. Your service team can now effectively pivot from a reactive to proactive maintenance approach.

Leverage Remote Condition Monitoring to:

- Prevent downtime
- Minimize on-site service footprint
- Improve customer success and satisfaction

Remote Condition Monitoring in Action:

Without a way to monitor pumps in the field, Flowserve, a leading supplier of industrial and environmental machinery, faced the risk of cavitation, impeller wear, and equipment failure. At the same time, Flowserve detected a shift in customers' expectations for more equipment data. With customer safety, costs, and satisfaction being a top priority for the company, Flowserve invested in an IIoT solution to optimize its service offering. Using robust data insights on asset conditions, utilization, uptime, and performance, technicians now remotely assess and correct problems before they lead to costly unplanned downtime.



IIoT Use Case: Digital Work Instructions

While many operational processes have benefitted from technology's advancements, work instructions have not evolved at the same pace. Paper-based instructions remain pervasive, despite the tedious and complicated work it creates for new and seasoned employees alike. Digital work instructions powered via IIoT collect information from disparate sources and provide it in a simple, unified view through AR integration. Operators can access the real-time, actionable information needed to get their jobs done safely and efficiently, while capturing critical data on overall machine health and maintenance history.

Leverage Digital Work Instructions to:

- Increase quality output
- Reduce scrap and rework
- Improve worker safety, upskilling, and onboarding

Digital Work Instructions in Action:

Labor-intensive production processes require meticulous instructions to ensure quality outcomes. However, for Vestas, a global manufacturing leader of wind turbines, their dependency on paper-based work instructions meant that each upgrade or engineering change called for a new manual that workers needed to comb through for relevant information. To improve worker efficiency, Vestas leverages IIoT to connect systems, capture machine data, and provide in-context details for complex tasks.

IIoT Use Case: Real-Time Data Visibility

Basing decisions on outdated or incomplete information jeopardizes uptime, costs, quality, and worker safety. With the ability to monitoring your production performance in real-time from the factory floor or any location in the world, you can unlock a new competitive edge as a data-driven organization. IIoT provides a constant stream of data about the overall health and performance of your assets and production lines so you can gain a holistic view of operations. With real-time alerts, operators can quickly react to issues before they become major problems that impact costs, time, and plant productivity.

Leverage Real-Time Visibility to:

- Ensure uptime
- Maximize asset efficiency
- Decrease maintenance costs

Real-Time Visibility in Action:

For LACROIX, a top 10 European high-volume manufacturer of more than 10 million components a day, the productivity and financial stakes are high. By leveraging IIoT to gain accurate real-time machine status information, LACROIX operators can quickly identify and react to equipment failures and component defects, avoiding costly unplanned downtime and rework. Production performance information is readily accessible through dashboards displayed on monitors at the end of each line, as well as mobile devices for remote employees, helping to facilitate data-driven decision-making throughout the enterprise.

IIoT Use Case: Plant Benchmarking

In today's increasingly competitive landscape, manufacturers need to find new ways to differentiate themselves and capitalize on critical advantages. Each plant floor is a trove of actionable data, but too often, it's obscured by disparate systems, manual processes, varying yields, and isolated reports across plants. Overcoming this patchwork of data sources requires manufacturers to prioritize IIoT-enabled plant benchmarking. Using IIoT, you can easily collect, validate, and interpret data across plants, equipment, lines, and shifts. With improved data accessibility, comparability, and better KPIs, you can correct deficiencies and scale optimal, repeatable performance across the entire enterprise.

Leverage Plant Benchmarking to:

- Enhance operational efficiencies
- Accelerate time to market
- Enable data-based best practices

Plant Benchmarking in Action:

While capturing and tracking KPIs was already a well-oiled business function for SIG, an international systems and solutions provider for aseptic packaging for beverages and liquid foods, advancing cost and sustainability objectives was a top priority. IIoT enabled SIG's real-time production data and KPIs to unify in a single, automated dashboard, which revealed production process anomalies, including inefficient energy consumption and micro-outages. Using standardized insights and in-context comparisons across plants, SIG's business leaders can leverage benchmarking data to address performance inefficiencies.

IIoT Platform Checklist

As you consider IIoT platforms, one of the most important steps is to identify the must-have capabilities that can support your objectives. However, not all platforms are created equally. Some platforms specialize in certain capabilities, but few offer a robust range of functionality. By evaluating their respective capabilities against your organization's specific challenges, infrastructure, and projects, you can select the right platform to ensure your IIoT success.

Unlike other industrial IoT software, ThingWorx IIoT Solutions Platform offers a complete IIoT platform with end-to-end capabilities that address every facet of their digital transformation journey. Considering multiple platforms? Use this section to compare and contrast how your prospective platform's capabilities stack up.

Must-Have Capabilities	ThingWorx	Vendor 2	Vendor 3
CONNECT: Ubiquitous asset connectivity; out-of-the-box and custom connectors; securable and embeddable for connection across network topologies and communication scenarios; support for edge-to-cloud architectures	☑	☐	☐
BUILD: Visual management of assets, systems, people, and processes; user-friendly codeless development models; tools for administering functionality, access controls, and system configuration	☑	☐	☐
ANALYZE: Automated analytics with AI and machine learning; diagnostic, predictive, and prescriptive outputs; tools for expanding native analytics capabilities and connecting third-party providers	☑	☐	☐
MANAGE: Centralized device management; out-of-the-box functionality to automate business processes; simplified and secure software and file management of remote assets	☑	☐	☐
EXPERIENCE: Visualization tools with customized, actionable dashboards; integrated enterprise system and application data; seamless integration with Vuforia for immersive AR experiences on mobile or wearable devices	☑	☐	☐

Strategic Alliances

As part of PTC's partner network, our global strategic alliances offer deep expertise and broad perspective that deliver more value to our customers and enables them to capitalize on the latest solutions, continuous investments, and shared innovations of these partnerships.

Rockwell Automation is PTC's strategic partner for all Smart Connect Operations factory solutions. Backed by market-leading IoT and AR technologies and decades of industrial expertise, PTC and Rockwell Automation solutions bridge IT and OT.

PTC and **Microsoft** are accelerating digital transformation and bringing smart manufacturing to life, enabling you to connect your business and enterprise processes to industrial applications.

Global System Integrators & Management Consultants

Through our GSI and MC partnerships, we provide access to industrial innovation thought leaders and a breadth of solutions portfolios to help organizations accelerate their digital transformation and achieve better business outcomes.

Developer Portal

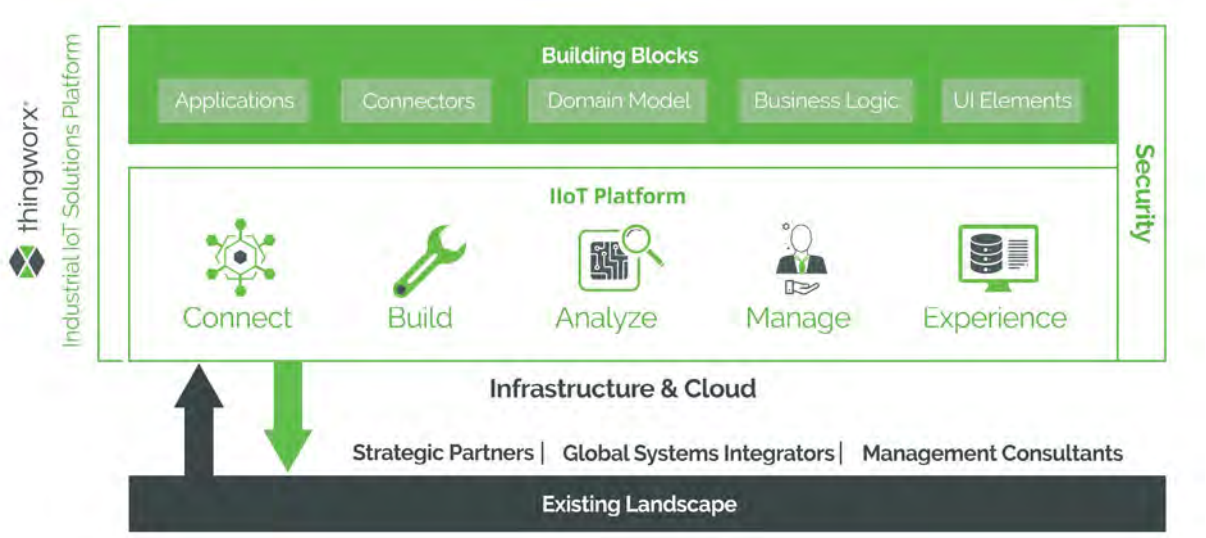
To make the most out of your ThingWorx investment, your users can gain hands-on experience. The ThingWorx Developer Portal hosts a variety of resources, including tutorials, guides, videos, and software trials, to help your users understand the basics, expand on valuable skills, and create solutions that meet your dynamic business needs.

PTC Marketplace

PTC Marketplace is a digital space where customers can access the latest IIoT applications and tools, market-ready solutions, and custom accelerators available from our vast Partner Network. Connect with peers to get inspired and find partners that can help you design, implement, and deploy solutions with ease and speed.

ThingWorx IIoT Solutions Platform from PTC

The ThingWorx IIoT Solutions Platform is a complete, end-to-end technology platform designed for industrial enterprises to digitally transform every aspect of their business–quickly and easily. ThingWorx offers a rich set of capabilities that enable powerful solutions that are simple to create, easy to implement, scalable to meet future needs, and accelerate time-to-value.



- Works with your existing systems: No need to rip and replace
- Includes pre-built solutions: Simplify and accelerate deployments
- Address common challenges: Deploy and scale proven high-value use cases
- Facilitates connections: Enable access to multiple data sources

With decades of domain experience, PTC has an acute understanding of the most common use cases for purpose-built IIoT solutions. ThingWorx delivers everything you need to remove technical barriers to implementation so you can fast-track and maximize your IIoT potential.

- User-friendly tools and technologies to develop, customize, and deploy powerful applications
- Modular functionality that simplifies development
- Pre-built web-enabled applications to get to value faster
- Powerful IIoT enablement across applications, dashboards, workspaces, and mobile interfaces
- Connection and context that enables an enterprise feedback loop for increased visibility, efficiency, and effectiveness

ThingWorx delivers a series of solution building blocks—that is, pre-defined configurations for connections, domain models, and more—so it's simpler to develop solutions. It also provides a variety of role-based starter apps. And that's all you need to get started.

Appendix

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