

WHITE PAPER

MAXIMIZE YOUR IIoT STRATEGY IN THE CLOUD

AT A GLANCE

Manufacturers lose plant floor efficiency gains when they don't have a full view of production.

Silo'd data makes it tough to analyze insights used to drive everyday business.

The industrial Internet of things (IIoT) is a network of always-connected "things" and systems that produce data to drive efficiency.

Maximize IIoT using cloud ERP and manufacturing systems as the hub for connecting and sharing important, value-added business insights across the business.



Manufacturers can streamline their operations and boost their competitive advantage, but disconnected processes, systems, and data are roadblocks. Many companies manage an already complex environment with an equally complex web of systems for financials, CRM, manufacturing execution, supply chain planning, and more. In addition, when decision-makers lack visibility into shop floor operations, planning and execution become a guessing game. The problem intensifies when demand fluctuates or supply chain disruptions occur—especially for businesses with multiple locations.

Manual or disconnected shop floor processes often create problems like:

Lax reporting. When reports on material usage, machine efficiency, and manpower are incomplete or too late to be useful, they prevent decisionmakers from optimizing production.

Poor reaction time. Many manufacturers take days to respond to challenges or new business opportunities because they lack easy access to information on inventory levels, production schedules, and raw materials constraints.

Insufficient real-time data. Many manufacturers lack adequate inventory traceability and tracking so they buy more stock than they need to account for uncertainty, which unnecessarily increases costs.

Bad data. Manufacturers that want to incorporate production data into their overall enterprise data (such as financials, order management, and customer data) often must re-enter this data manually, causing errors.

Disconnected Manufacturing Leaves Opportunities Stuck in Silos

Scrap. Defective parts, poorly measured quality, and unplanned equipment downtime can cause scrap and waste, and eat up a staggering amount of time and budget.

To try to solve this problem, many manufacturers have built sophisticated integrations between point solutions, only to run into the challenges of maintaining ever-changing systems and never-ending upgrades. One common workaround is to dump data from each point solution into spreadsheets—but this approach wastes time, gathers data that is already outdated, and doesn't scale well for a growing business. Not to mention the manual, potentially errorprone work involved collecting data, and the reality that much of this data still ends up unused.

To gain the visibility, control, and agility that will enable them to stay competitive, manufacturers should focus on not only optimizing production but also connecting critical information across their enterprise.

The Internet of Things (IoT) - A Game Changer

While manufacturers wrestle with these challenges, a massive technology evolution continues. New machines, tools, and computers are being built with embedded hardware or software that enables them to talk to each other with limited need for human intervention. It's known as IoT—

and it shows no sign of slowing down. Older machines can be connected by inexpensive sensors to measure anything from vibration to temperature to pressure.

According to IDC analysts, by 2021, 90 percent of manufacturers will leverage real-time equipment and asset performance data to self-diagnose issues in advance and trigger a service intervention to avoid unplanned downtime.¹

The Industrial Internet of Things (IIoT), as it applies to manufacturing, delivers increased efficiency by eliminating repetitive, non-value-added tasks such as manual inventory counts and manual production tracking. It also adds visibility and intelligence, enabling predictability, trending and downtime avoidance. Companies are also connecting new tools and equipment to their networks and allowing these tools to communicate in real time. These tools include tablets and smartphones that replace outdated clipboards, static workstations, and stacks of paper.

The IIoT and Digital Transformation

You might hear related terms like Industry 4.0, Smart Manufacturing, Factory of the Future. All center around the digital and business transformation taking place in manufacturing that includes the growing intelligence and communication capabilities in industrial systems—and it is accomplishing far more than simply automating existing processes and reducing paperwork. Digital transformation is key to supporting IIoT, promoting greater connectivity and automation.

IIoT began on the shop floor. It is the network of physical objects—devices, sensors, machines, tools, vehicles, buildings, and products—that collects, measures, receives, transmits, acts, and exchanges data in an industrial application. This proliferation of always-connected “things” and systems work together to leverage data collected from one part of the business to enhance the other parts of the business.

The list includes:

- **Machine2Machine.** Equipment sensors and communication capabilities on capital equipment enable machines to communicate and react to each other—even making autonomous decisions --creating an ecosystem of connected products, devices, and machines.
- **Machine2People.** The ability for people to respond to communications sent from machines—and vice-versa—extends connectivity to customers, suppliers, and partners.
- **Machine2System.** When applications connect to systems, manufacturers can form a unified, consistent, trustworthy view of the business.
- **Connected tools.** The list includes connected calipers, torque wrenches, augmented-reality vision systems, and apps that receive and share information in real time with manufacturing systems.

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At the same time, we're also seeing the advent of human-readable visualizations of data sets that would otherwise be too complex for understanding:

Dashboards and analytics. By aggregating data from multiple sources onto a single screen, manufacturers can visualize complex data sets and monitor key areas such as production quality through a single pane of glass.

Augmented reality. Specialized wearable devices enable production workers to see real objects and virtual reality at the same time, enhancing the amount of information they have available as they examine products or machinery.

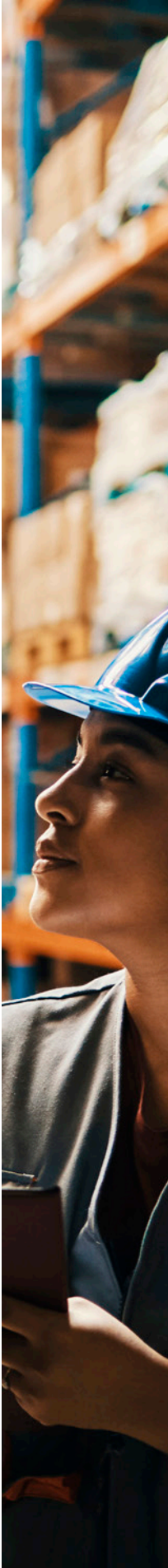
As Industry Week explains:

“Instead of trying to guess what’s wrong with a particular part, you can have the part actually show you whether it’s within tolerance and whether it’s working correctly using a combination of the Internet of Things and augmented reality...The device or item will not only tell you something is wrong, but will also show you what is happening (or will happen) if it isn’t repaired or replaced, making it easier for technicians to do their jobs.”³

Vision systems. Vision systems are essentially computers with eyes that measure materials, provide guidance in positioning machines, inspect materials or products for quality control purposes, and count items in packaging. They can be combined with robots to increase automation and accuracy on the production line.

You'll continue to hear about these technologies because they're key to delivering results for manufacturers. According to McKinsey Digital:

“The disruptive technologies of Industry 4.0, such as IT-enabled manufacturing and increased computing capacity, hold the promise of smart factories that are highly efficient and increasingly data integrated. Data is the core driver: leaders across industries are leveraging data and analytics to achieve a step change in value creation. A big data/advanced analytics approach can result in a 20 to 25 percent increase in production volume and up to a 45 percent reduction in downtime.”⁴



It's no wonder, then, that IIoT is spurring a global trend for smart factories. Programs include Industrie 4.0 in Germany, Smart Manufacturing in the U.S., and Manufacturing 2025 in China. In fact, a 2019 Plex survey showed that nearly 75% of those surveyed are either piloting or implementing a smart manufacturing initiative. Smart manufacturing and its brethren - Industry 4.0, smart factory or factory of the future or whatever terms you choose - is here.

Whether they're participating in a national program or taking their own initiative, forward-thinking manufacturers don't view IIoT as merely a set of products or technologies—they see it as a business shift. Rather than evaluating a new piece of technology and attack it with technology solutions, for example figuring out how they might find a use for it in their business, they identify a business problem and then consider how IIoT technology can help solve it. Manufacturers can select the specific technologies that address their challenges and then develop a plan to meet their goals.

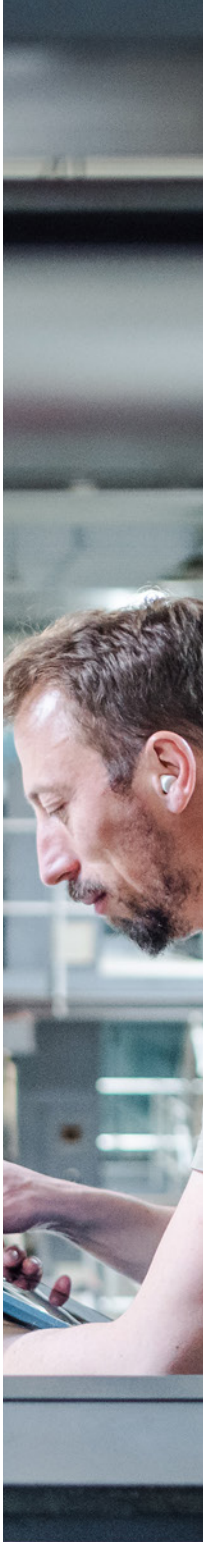
Leading Manufacturers Embrace IIoT

As the pace and complexity of manufacturing increases, the ability to make more informed decisions about the supply chain and how customer demand affects overall production will not simply be an imperative—it will be how manufacturers operate to sustain a viable business. IIoT fosters a data-driven approach to running a manufacturing business. Always-connected machines, tools, and systems generate unparalleled amounts of data. Digitizing nearly all aspects of their operations enables manufacturers to gather more business and manufacturing intelligence that increases their awareness of the health of their business and helps them identify opportunities to differentiate themselves.

Having this volume of data on hand empowers manufacturers to make better-informed decisions. It enables machines to make autonomous decisions. Perhaps best of all, when manufacturers discover new facts and trends about their businesses, they're better able to offer differentiated products and services to customers. They gain the wisdom to know what customers need before they ask

for it, solve efficiency issues before they happen, and can design products that anticipate the expectations of their market.

IIoT is even driving change in the way manufacturers deploy personnel. With so much more data at their fingertips, and with ongoing skilled worker shortages, high-value database administrators can now become even higher-value data scientists and business analysts who decide on behalf of the company which data is most important to collect and how best to use it. This from a combination of automating manual or repetitive tasks and having more process automation to free up time for your valuable resources. Today's massive data stores present modern manufacturers with a huge opportunity. Forward-thinking manufacturers are finding ways to exploit this opportunity by mining, analyzing, and acting on these huge volumes of data generated by IIoT technology. But they can only do this if they've simplified their operations to one platform: the cloud.



Cloud is the Foundation for IIoT

Leading manufacturers understand that the scalable compute and storage capabilities offered in the cloud is the way to manage data going forward. The cloud also makes it easy for manufacturers to integrate new devices and machines into a fully communicating ecosystem. And it's the most essential technology for managing a diverse set of data points and communications.

A cloud MES or ERP system acts as a hub for all of your production systems and represents a single source of truth. The Plex Smart Manufacturing Platform is designed to help you make decisions with confidence and speed. It gives you one source of data from which you can translate structured data into actionable insight. This enables you to deliver the right information to the right person, to empower your executives to make strategic decisions, to drive production efficiencies. You can view and act on this data from anywhere in the enterprise or remotely over any mobile device with role-specific capabilities, creating the most complete, unified, comprehensive manufacturing infrastructure in the cloud.

Connect Your Business

Increasing the efficiency of your shop floor operations is about more than simply preventing waste or boosting productivity. It's also about leveraging data about your operations to gain the insights you need to optimize your entire manufacturing business, not just production. That's why the Plex Smart Manufacturing Platform connects your business to everything to ensure that data communication will continue, from the top floor to the shop floor and from customers to suppliers, even while you sleep.

Plex enables you to:

Connect your people. Everyone can see how their job relates to the health of your business—and can work smarter as a result. Executives can bring in data from the shop floor to make decisions based on information at the manufacturing moment. Line workers can more easily share information through tablets, smartphones, and wearables—information that helps reduce errors and minimize redundant data entry.

Connect your equipment. With a cloud ERP system as your hub, it's easy to collect data from anywhere and make it instantly

available for the business to leverage from a single source of truth. There is no more collection of production data on paper forms only to be re-entered into a different system at the end of the shift – too late to react to issues.

Extend to other software.

Use Plex in tandem with the point solutions you've always trusted—through direct API data connections—maximizing your ROI from all your software. You can form the truly connected manufacturing environment that's essential for you to get the most out of IIoT.

Digitize and Automate Your Enterprise

Every manufacturer understands at the end of the day the goal is to get the most out of your finite resources to deliver on customer demand. Plex helps manufacturers digitize their enterprise, which enables process automation and frees key resources for other high-value needs.

With Plex you can:

Re-focus high value employees. According to the 2016 Enterprise Solutions Study by Mint Jutras, 93 percent of Plex Systems' customers have been able to redirect technical resources to more strategic tasks when they moved to the cloud.⁵ But most manufacturers have untapped value in their current workforces. With a cloud manufacturing solution in place, your brightest employees can spend less time managing technology and more time improving processes and finding the most valuable insights hidden in your massive data volumes.

Manage data about costs, quality, and efficiency as you grow. Plex's digital transformation approach turns your manual, paper-based processes

into automated, paperless data-driven operations. As a result, your valuable people resources can spend their time improving processes with the data instead of writing it down themselves—naturally increasing your output per employee.

Scale to changing needs. You'll find it easier to sustain profitable growth when your business system scales seamlessly to support your people, minimizing unnecessary software and hardware upgrades for always on access to the latest tools and functionality simply by opening a browser.

Control Your Shop Floor

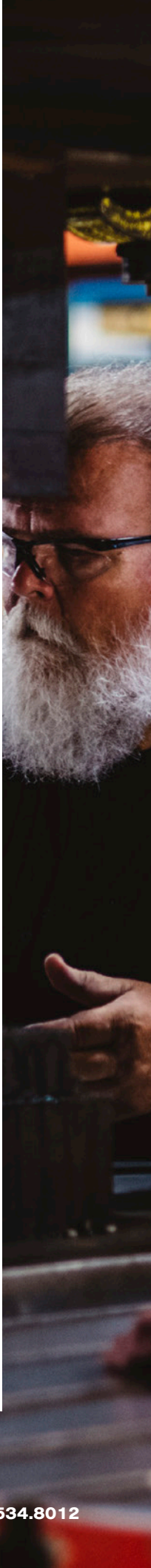
The Plex Smart Manufacturing Platform helps you control your shop floor. It includes a manufacturing execution system (MES) with communications from your IIoT enabled machines and automation to give you a comprehensive, real-time view of what's happening in production at the "manufacturing moment." Plex's control panel, a central digital interface that houses all relevant production data on one screen, gives your operators a single source of the truth regarding manufacturing operations.

As a result, you get:

Real-time error-proof production. You gain the insight to maximize the uptime and effectiveness of your equipment with operator controls that increase yields, minimize errors, and boost overall productivity.

High-resolution traceability. Rather than guessing about quality issues or production problems, you can pinpoint the causes by tracking all materials from the moment they enter your system.

Connected data-driven quality. Quality control plans are produced within Plex and control the material, processes, and automatically present check sheets to ensure that quality processes follow the plan.



Three Manufacturing Companies on the IIoT Journey Today

For most companies, any new technology must have operational meaning, purpose, and application. Those who have begun their IIoT journey have done so to achieve realistic, incremental enhancements to support their business strategies. This approach will not only set the foundation for long-term improvements, but also provide justification for investments in IIoT and cloud ERP technology.

Plex customers are doing just that.

Metals Manufacturer Avoiding Downtime

One Plex customer was looking for ways to better predict equipment failure in order to decrease costs and minimize business impact. Because they had a heat treating operation, and furnace outages required a multiple day cool down before maintenance could be performed, followed by another

day or two to fully restart and calibrate furnaces for production.

This company was able to add inexpensive sensors to its steel conveyor belt that moved parts through the furnace. By doing so, it could detect any potentially lateral belt movement which could cause belt fraying and speed alterations, leading to either a very expensive belt repair or improper part heat treating. By trending belt and furnace performance over time, the company can identify potential issues before they occur and predict future performance to optimize planning.

Aerospace Manufacturer Uses Advanced Visualization

Another Plex customer is in the early stages of introducing advanced technology – Microsoft HoloLens® – to the shop floor for advanced visualization and manufacturing operations. Use cases include delivering shop floor details to HoloLens wearers via the heads-up display, enabling them to receive and use production information while on

the move, hands-free. This allows them to make adjustments as needed based on deep levels of data measurements.

The customer also plans to test overlaying work instructions specific to a role or work center on HoloLens to simplify worker tasks and ensure more efficient on-the-job training. With HoloLens expected to decrease considerably in price once it hits mass availability, the customer expects this to be a new way to use manufacturing data and manage production.



Cloud is Your Path Forward

Yesterday's on-premises manufacturing software systems and siloed databases can't offer the level of connectivity you need to take full advantage of IIoT. Only cloud solutions can.

The convergence of IIoT, digital transformation and the cloud lay the foundation for an unparalleled level of connectivity, automation, efficiency and collaboration, leading to manufacturing control. The potential upside for your business is nearly endless—in fact, it's limited only by your creativity in using your own data to enhance your future business strategy. Are you ready? Because the cloud is ready for you

1. Source: IDC, IDC FutureScape: Worldwide Manufacturing 2019 Predictions, doc # EMEA43135818, Oct 2018.

3. Sanjiv, K.R. "How Augmented Reality Can Revolutionize Manufacturing." Industry Week. September 29, 2016.

4 McKinsey & Company. "Industry 4.0: How to navigate digitization of the manufacturing sector." McKinsey Digital. 2015.

5. Mint Jutras. "2016 Enterprise Solutions Study." September 2016.

ABOUT PLEX

Plex Systems, Inc., a Rockwell Automation company, is the leader in cloud-delivered smart manufacturing solutions, empowering the world's manufacturers to make awesome products. Our platform gives manufacturers the ability to connect, automate, track and analyze every aspect of their business to drive transformation. The

Plex Smart Manufacturing Platform includes solutions for manufacturing execution (MES), ERP, quality, supply chain planning and management, Industrial IoT and analytics to connect people, systems, machines, and supply chains, enabling them to lead with precision, efficiency, and agility. Learn more at www.plex.com