



# Reinventing the IoT Platform for Discrete Manufacturers

## DAVID WESTROM

David Westrom is responsible for global business development at MachineMetrics. Dave has spent much of his career in executive team roles at innovative IIoT companies. He has led business development organizations and driven strategy at three IIoT start-ups that experienced successful exits, including most recently ThingWorx (acquired by PTC).

## GRAHAM IMMERMANN

Graham Immerman is responsible for global marketing at MachineMetrics. Graham has spent the majority of his career working at global marketing firms to craft successful digital transformation strategies for brands like Adidas, H&RBlock, and Starbucks. He has quickly become a thought-leader on IIoT technology for the manufacturing industry.

# Contents

—

**OVERVIEW. . . . . 03**

Executive Summary. . . . . 03

An Introduction to MachineMetrics . . . . . 03

The IoT Platform “Revolution” . . . . . 04

The Platform Problem . . . . . 05

—

**THE DISCRETE MANUFACTURING CHALLENGE . . . . . 06**

Limitations of Packaged Applications . . . . . 07

Cloud-Based SaaS Benefits . . . . . 08

—

**A NEW APPROACH: JUMP STARTING THE PLATFORM . . . . . 09**

The Industrial IoT Foundation . . . . . 10

Adding Vertical Use Cases . . . . . 10

Platform Extensibility. . . . . 11

Integrations with Existing 3rd Party Applications . . . . . 12

—

Final Comments. . . . . 12

# Overview

---

## EXECUTIVE SUMMARY

The Industrial Internet of Things (IoT) space is hot as manufacturing represents perhaps the largest greenfield opportunity left for digitization. Yet, IoT platform implementations have historically had a high rate of failure within this vertical. What's contributing to these failure rates, and what needs to change? In this article, we will examine common approaches for enabling Industrial IoT initiatives, the pros and cons, and their culpability for the high failure rate. We will then introduce a new approach that is already driving rapid, continuous value creation for discrete manufacturers and the companies that provide and service their manufacturing assets.

---

## AN INTRODUCTION TO MACHINEMETRICS

Before we get started, please allow us to introduce our company: MachineMetrics is manufacturing's first Industrial IoT platform designed for discrete manufacturing. We like to think of ourselves as the machine data component of the digital factory. MachineMetrics has developed a hybrid solution for manufacturers and machine builders that combines the innovation enablement of an IoT platform with the rapid value creation of vertically focused, packaged SaaS applications to drive both immediate and continuous value for manufacturing data consumers.

MachineMetrics provides an easy to implement platform for connecting to and capturing data from any machine regardless of brand or age.

This data empowers the MachineMetrics platform to simultaneously enable discrete manufacturing customers, machine tool builders, and other partners to add their own intellectual property (IP) both at the edge and cloud layers through analytics technologies and tools, integrations to devices and systems, and enablement of microservices, driving continuous innovation and improvement.

Right now, hundreds of manufacturers and machine builders are using the MachineMetrics platform to measure and analyze the performance of thousands of machines across global factories. Our solutions are providing these companies the necessary real-time data they need to optimize machine performance and productivity, increase capacity

utilization, and ultimately win more business to remain globally competitive.

MachineMetrics is also an [AWS Partner Network](#) (APN) Advanced Technology Partner with the AWS Industrial Software Competency.



## THE IOT PLATFORM "REVOLUTION"

The term Industry 4.0 encompasses a promise of a new industrial revolution—for the industrial sector, one that marries advanced manufacturing techniques with the Internet of Things to create systems that are not only interconnected, but communicate, analyze, and use information to drive further intelligent action back in the physical world ([source; Deloitte](#)). Today is the internet moment for manufacturing, and with it comes the gold rush of providers ready to enable the industry's digital transformation. At this point, it would be impossible to work within the manufacturing space and not have spent the past few years bombarded by pitches for Industrial IoT platforms claiming to best support the Industry 4.0 revolution.

These magical platforms market their unique machine learning (ML), artificial intelligence (AI), and edge/cloud/fog technologies to enable the fabled digital transformation of any industry through predictive models, digital twins, and fully-automated workflows.

There are more than 450 IoT platforms to choose from, according to [IoT Analytics](#), and it can be easy to think Industry 4.0 has indeed arrived and manufacturing's digital transformation is finally at hand. The data, however, tells another story.

IoT implementations have had a historically high rate of failure. Cisco produced a report of [survey results](#)

indicating that companies considered 76 percent of their Industrial IoT initiatives failures. This has led to greater hesitation on the part of manufacturers to embark on digital transformation journeys.

So what's driving companies to fail at such a high rate when a majority said that IoT initiatives looked good on paper? We explore some of the organizational causes in our ebook, "[Why Most Industrial IoT Implementations Fail](#)." In this article, however, we focus on the story's technology component and IoT platforms specifically, with the goal of both identifying and proposing a new approach to solving manufacturing's platform problem.



## THE PLATFORM PROBLEM

There are many different types of IoT platforms, including application enablement platforms, device management platforms, analytics platforms, and others.

In July 2019, Gartner published its first-ever [2018 Magic Quadrant for Industrial IoT](#), which included companies that provide IoT platforms that work in multiple verticals. No company crossed Gartner's bar for execution, however, and no one made it above the midway horizontal line (indicating a strong ability to execute). This demonstrates that successful execution and value attainment is elusive.

At MachineMetrics, we define a platform as a set of technologies and tools that can be leveraged to create applications and solutions. The beauty of a platform approach is that it drives innovation. Partners and customers can generate new insights, create new business processes, and drive continuous improvement.

The challenge with a platform is that it can be time-consuming and expensive to implement and deploy. The investment required to be trained on the platform, and model and build the initial applications and solutions that generate value for the customer, can be prohibitive.

When evaluating return on investment (ROI), use cases, and not the underlying platforms, ultimately drive value. Since most generic IoT platforms can't deliver packaged manufacturing use cases in the form of services, applications, or solutions by themselves, the onus of enabling a use case using an IoT platform falls on the customer or systems integrator.

Many manufacturing transformation leaders have struggled with determining a tangible and acceptable ROI from their IoT platform investments. More often than not, their projects go over budget, deployment times run long, interoperability issues occur across legacy systems, or planning and resources aren't allocated appropriately. This all leads to a disappointing ROI, or even cancellation of the initiative.

# The Discrete Manufacturing Challenge

## MANUFACTURING HAS UNIQUE CHALLENGES THAT ARE DIFFICULT TO ADDRESS WITH GENERIC IOT PLATFORMS:

- **Data Variety:** Not only are there many distinct types of equipment – Lathes, Mills, Plastic Injection Molding, Stamping, Laser Cutters, Robotics, etc – depending on the mechanisms available for acquiring data from those systems, the data points can be very diverse. To provide effective tools for analyzing that data across these distinct systems, the data must be transformed into a common data model. Not only does each machine control have its own mechanism for gathering data, data points can even differ by the Family, Make, and Model of the machine using that control as well as the version of the software running on that control.
- **Data Volume:** Manufacturing equipment, and discrete manufacturing equipment in particular, is very complex. A machine is a large system of components that work in coordination resulting in hundreds of distinct data points that change constantly. Depending on the application, there may be situations where it is required to capture data at rates of 100Hz or 100KHz. Platforms consuming this must analyze data at multiple levels within the system to avoid sending and storing unnecessary data when only the aggregate or computed result is sufficient. These systems must be capable of performing complex processing where it is most appropriate – at both the edge and in the cloud.
- **Data Speed:** While some systems can provide value with low fidelity and high latency, certain IoT use cases require much more real-time data to be effective. Edge technology is required to process high volumes of data, make decisions in milliseconds or less, and act to potentially prevent damage to the machine or the workpiece. Even dashboards that provide visibility into a jobs performance can gain tremendous value from low latencies – drawing immediate attention into a process that's falling behind or failing.
- **Number of Disparate Systems:** There are numerous systems on the shop floor that often run disparately: ERP, MES, SPC, Asset Management / CMMS, BI, for example,

create their own silos of data that require interconnectedness to deliver truly actionable insights. Integrating legacy systems is a complex task. Having robust data models for each application serving the vertical is required to adequately capture events. Further, having a deep understanding of how the data from each of those systems interacts within manufacturing is also necessary to be able to make correlations and provide coherent analysis for process improvement.

- **IT Infrastructure:** Highly elastic and scalable systems are a new entrant to manufacturers and their IT organizations. Due to the intense processing and storage requirements of IoT, it can be prohibitively costly to overprovision a system for peak load at all times. Systems must automatically adjust, adding and removing resources as necessary. Utilizing secure cloud systems with virtual hardware architectures programmed to be highly available, scalable, and fault tolerant with multiple data centers separated geographically for disaster recovery is even more important when considering the value that a successful IoT initiative can bring an organization.

With the complexity introduced by these challenges, it should be no surprise that generic IoT platforms often fall short when it comes to manufacturing.

Discrete manufacturing introduces even more complexity. This starts with the variability of the machines in discrete manufacturing plants. There are many different machine manufacturers, and no one plant has only one brand of machine.

The many different machines also have different control systems and communication protocols. They are of different vintages, ranging from new with modern controls to 20-30 years old with limited control capability.

Connecting to, and collecting data from, the various plant assets is a significant undertaking as well, considering most of these machines were never designed to provide data for the kind of holistic, factory, or enterprise-wide analytics solutions companies are focused on enabling today.

Discrete manufacturing plants not only require data to be collected and transformed, but also presented in real-time, in a standard and consistent format that can be analyzed and leveraged to optimize processes and operations across the plant. Thus, it's extremely difficult for multi-industry IoT platforms to account for these manufacturing industry-specific relationships.

Discrete manufacturers invest in IoT platforms to answer four basic questions: "What is happening?", "Why is it happening?", "What is about to happen", and "What am I supposed to do about it"? To properly answer these questions, one needs to understand the data within the context of their own operations. This requires a singular focus on the vertical in order to realize the immediate and continuous value promised when undertaking an Industry 4.0 initiative.

---

## LIMITATIONS OF PACKAGED APPLICATIONS

Currently, manufacturers have options to embrace data-driven manufacturing other than IoT platforms. Instead of building out applications and solutions that meet specific needs using a platform, manufacturers often opt to buy a packaged application or solution, or hire a third-party to build a solution for them leveraging various platforms, tools, and technologies.

These packaged applications and solutions have proliferated the market for decades, and the primary benefit is time to value. They can be set up

quickly at a relatively lower cost and rapidly drive incremental value.

One disadvantage of packaged applications and solutions is the customer must adapt their processes to conform to the software. While this may serve as an effective means to automate a process, it limits the ability of the manufacturer to innovate and differentiate themselves.

Packaged applications and solutions can also be difficult to customize, extend, and integrate with the many disparate systems that exist in a manufacturing facility. The customization of packaged applications and solutions along with customized integrations to other disparate applications and systems across the manufacturing enterprise can create a maintenance nightmare and has resulted in a state of paralysis at many global manufacturers.

This issue is one of many that has led to the emergence of cloud-based software-as-a-service (SaaS) applications.

---

## CLOUD-BASED SaaS BENEFITS

The cloud has many advantages over dedicated data centers and on-premise systems. Opportunities for high availability, elasticity, and disaster recovery are only possible when the infrastructure can be abstracted away in code. Tools and services allow systems to be architected to scale up automatically when more resources are required during peak hours or when more intensive tasks are being performed. With multiple data centers in a region and multiple regions available globally, cloud software can be resilient to network outages, software and hardware failures, and natural disasters. Additionally, data redundancy that is also separated geographically

provides a mechanism for data recovery that is not possible on-premise.

SaaS offerings add yet another layer of abstraction – allowing for faster, more vertically-integrated extendability. Being in the cloud, SaaS products can offer APIs that are always available no matter where you are. This allows for unique connection points to other solutions in the cloud and on-premise, and by leveraging the internet's ecosystem of API integration tools, systems can be connected with less effort. For SaaS offerings that have the context of the industry vertical baked into their architecture, the platform to build upon is even more capable.

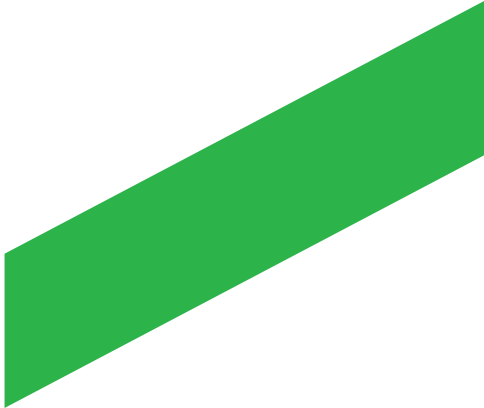
The cost to support and maintain a platform, application, and/or solution is a major consideration for any enterprise when evaluating IoT investment. Companies that create their own solutions or extend packaged applications, either directly or through third parties, must sustain these customizations over their lifecycle. They may also need to continuously update and extend them, and potentially integrate them into other systems in their enterprise. This can be time-consuming and expensive.

Often, after many years of adding new technologies, software tools, and applications, and customizing them and integrating with other systems, IT organizations find themselves consumed with simply keeping these systems up and running. Any change to an application could cause the entire enterprise to come crashing down.

The idea of innovating and creating new value is outweighed by the cost and risk associated with change. Organizations become paralyzed with a singular focus on maintaining the status quo. In recent years, cloud-based SaaS applications and services have emerged to help reduce the cost and complexity of supporting IT infrastructure and many disparate applications and solutions.



# A New Approach: Jump Starting the Platform



Until recently, the options for enabling IoT initiatives and driving digital transformation for discrete manufacturers were limited to the horizontal platform approach, the integration of a packaged application or solution, or some combination of each through a myriad of disparate product and service vendors.

But what if you could have your cake and eat it, too? What if you could have the continuous improvement and innovation opportunity provided by a platform with the immediate benefit and ROI of a packaged service, application, or solution?

This was the question that drove the creation of MachineMetrics. Our goal is to supercharge the platform approach by combining the innovation enablement of an Industrial IoT data analytics platform with the rapid value creation of vertically packaged SaaS applications. This optimal hybrid approach automates the collection and transformation of real-time machine data, augmented with data from people, other devices, and other systems, to provide descriptive, diagnostic, predictive, and prescriptive analytics through our packaged SaaS applications that provide immediate ROI for discrete manufacturers.

The MachineMetrics platform simultaneously enables discrete manufacturing customers and partners to add their own intellectual property (IP) both at the edge and cloud layers through analytics technologies and tools, integrations to devices and systems, and enablement of microservices, driving continuous innovation and improvement.

Today, we present to you our methodology behind why we built MachineMetrics and lay out a new approach to solving manufacturing's platform problem; an approach that has driven tremendous value to the tune of 20% increase in manufacturing efficiency on average for our customers within the first month.

**TODAY, WE PRESENT TO YOU A NEW APPROACH TO SOLVING MANUFACTURING'S PLATFORM PROBLEM; AN APPROACH THAT HAS DRIVEN TREMENDOUS VALUE TO THE TUNE OF 20% INCREASE IN MANUFACTURING EFFICIENCY ON AVERAGE FOR OUR CUSTOMERS WITHIN THE FIRST MONTH.**

## THE INDUSTRIAL IOT FOUNDATION

Enabling any Industry 4.0 initiative starts with a data infrastructure that facilitates rapid connection to any type of asset. Regardless of brand or age, it's necessary to capture and transform data into a standard format that is stored in a secure manner in a cloud infrastructure that can easily be consumed by any technology.

This is not a simple task: we first simplified IoT connectivity with an inexpensive edge device that enables secure ethernet, wifi, and cellular communication while connecting directly to machine tool PLCs and controls. This device is programmed with dozens of custom software adaptors developed to automatically unlock, map out, collect, and standardize the available data points (Status, Modes, Alarms, Overrides, Load, Speeds, Feeds, and more). We then add the ability to connect additional sensors or collect data from legacy equipment with digital and analog I/O that is configured and managed remotely through a web interface. This task, to enable the connection, collection, and standardization of every piece of discrete manufacturing equipment, is paramount as every manufacturer has a wide variety of equipment types and ages that require data to be collected from to drive analytics.

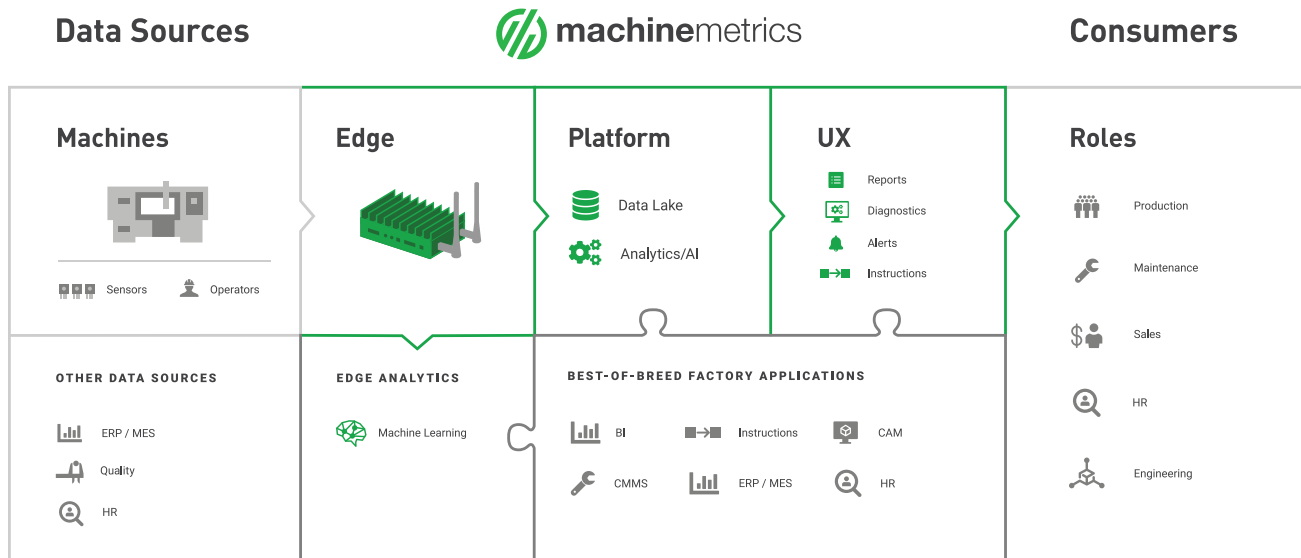
Our data collection infrastructure is the foundation of the MachineMetrics IIoT Platform. Once collected and transformed, the data can be made actionable through vertically focused applications delivered either by MachineMetrics, through 3rd parties, or with custom applications built by our customers using the available APIs.

## ADDING VERTICAL USE CASES

In order to offer quick time to value, vertically focused use cases that provide actionable information for specific user personas is necessary. The foundation itself provides the data, but the value is in making the data actionable. There are many opportunities to deliver packaged applications that make manufacturing data actionable for a variety of consumers within the manufacturing lifecycle. Here are a few examples we've developed to ensure our users are able to create rapid value:

Built-in capacity utilization reporting allows plant managers to make capital equipment purchase decisions. Knowing how your factory's machine utilization compares with the industry average can drive the decisions to purchase new equipment, as well as whether or not to invest in internal operations to optimize the utilization of existing equipment.

A tablet application mounted at the machine empowers machine operators to meet production goals and add human context to machine data. Through text and email notifications delivered to their mobile phone, the app enables them to respond to problems faster and more efficiently with instructions that display when a machine needs attention such as an inspection, a tool change, or maintenance. The app also tracks changeovers and setups so that if the process exceeds the expected time, the supervisor is called over to proactively manage the issue.



For OEMs and distributors of manufacturing equipment, a packaged application enables remote monitoring and diagnosis of machine health problems in the field and at customer sites in real-time. With the application, service technicians can remotely visualize machine diagnostics and conditions to quickly identify problems, allowing them to either help troubleshoot and resolve the problem without the on-site visit or, if they need to go to the plant, bring the right tools and order the right parts in advance of a plant trip. The result is better service and improved machine uptime for the customer, but also a reduction of costly on-site service visits.

## PLATFORM EXTENSIBILITY

One challenge with vertically packaged applications is that there are more use cases that drive rapid value creation with manufacturing data than any one company can build and support alone. Thus, robust APIs are required to allow 3rd parties to extend the platform and build their own vertically packaged applications. This enables even more value creation

opportunities to be driven with the data. It also requires more investment of time and risk, but the payoff can be large. The MachineMetrics Platform is extensible at multiple levels including at the edge, via API access to data in the cloud, and through our operator interface. This enables our manufacturing customers and partners to leverage their deep domain expertise to add their own unique IP to the platform and optimize the value created for our mutual data consumers.

For example, machine builders have unique domain expertise with regards to the design and operation of their own machines. This gives them a natural advantage when it comes to the optimization of these complex and highly specialized assets. The challenge, however, to the machine builder is to actually deliver a solution to leverage this expertise. It's tremendously difficult to seamlessly deploy an application across a fleet of machines, not to mention maintaining the solution over time. For the customer who has many different assets, the challenge is to leverage as few apps as possible to monitor, analyze, and manage the proper notifications for their various equipment types.

Leveraging MachineMetrics, machine builders can now provide advanced analytics and custom micro-services to their customers through our scalable,

vertically integrated cloud platform. For example, machine builders can offer algorithms customized for their own equipment that can deliver predictive health notifications of spindle life. This has created a competitive differentiation for our machine builder partners and an opportunity to drive incremental growth through new services and business models.

The ultimate end customer, the discrete manufacturer, along with their consulting partners, also possess unique insight and expertise with regards to their manufacturing operations, processes, and products. This domain knowledge can be leveraged by the manufacturer to extend the MachineMetrics Platform to drive continuous operational improvement. One example is monitoring SPC of part cycles where outliers can be configured as a trigger to indicate a problem cycle or a bad part.

---

### INTEGRATIONS WITH EXISTING 3RD PARTY APPLICATIONS

There is an ecosystem being developed of modern, cloud SaaS manufacturing applications. These applications are designed to easily integrate with other SaaS applications through APIs. For manufacturers who use these applications, integrations and time to value is shortened. Industrial IoT data can drive value across this ecosystem with integrations into ERP/MES, BI, Quality, HR, and CMMS/Maintenance. As this ecosystem evolves with more vertically focused applications in the market, the time to value and need for customization is greatly reduced. This provides the manufacturer a complete solution across the entire manufacturing stack that is vertically integrated for your business, flexible for changes in business processes, and easily updated and maintained through cloud deployments. Legacy ERP/MRP systems that try to tackle every problem

do not support integrations, require very expensive customization and configuration, and are highly resistant to innovation or changes to business processes.

---

### FINAL COMMENTS

At MachineMetrics, our mission has always been to provide manufacturers with the data and insights they need to increase productivity, win more business, and stay competitive. In the age Manufacturing 4.0, discrete manufacturing's digital transformation requires a new approach that creates confidence and inspires future innovation.

Our approach provides the necessary rapid value creation for implementations to break free of the standard "pilot purgatory" as C-level executives have been able to achieve ROI numbers that justify larger roll out plans, while shop floor workers are simultaneously experiencing the benefits of real time visibility and automation. The initial success of an implementation is so important not just to demonstrate the value of the initial technology but to realize the belief in the benefits enabled through Industrial IoT technology.

This is, of course, not the end of the digital transformation story; it's just the beginning. As users gain confidence in the value of the technology, it's essential to provide customers a roadmap to continuous innovation enablement. We call this roadmap the manufacturing analytics journey.

Only by incorporating this approach can IoT platforms deliver real business impact for discrete manufacturing. Without it, most of them will continue struggling to deliver on the promise of Industry 4.0.

---

#### **ABOUT MACHINEMETRICS**

MachineMetrics is the machine data component of the Digital Factory; manufacturing's first Industrial IoT platform designed for discrete manufacturing. Right now, hundreds of manufacturers are using the MachineMetrics platform to measure and analyze the performance of thousands of machines across their global factories. Their solutions are providing these companies the necessary real-time data they need to optimize machine performance and productivity, increase capacity utilization and ultimately win more business to remain globally competitive..



#### **CONTACT US**

413-341-5747

[info@machinemetrics.com](mailto:info@machinemetrics.com)

[machinemetrics.com](http://machinemetrics.com)