



# The Industrial IoT Dictionary

FOR MANUFACTURING

by Graham Immerman, Director of Marketing, MachineMetrics



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**At MachineMetrics, we work with manufacturers at different stages of their digital transformations; many of whom have very different levels of understanding regarding these concepts and definitions. Some of our customers are already immersed in their digitization efforts, have a deep knowledge of the latest and greatest technology/industry standards, and speak the language of IIoT terminology fluently. Some other manufacturers who might not have the same background in technology are just embarking on their transformation journey, and are often either underexposed or even overwhelmed with IIoT lingo.**

**That's why we figured it would be helpful to create "The MachineMetrics IIoT Manufacturing Dictionary": a reference resource for those seeking definition or better understanding of any buzzword, keyword, or term pertaining to the new age of manufacturing. The following is not the end product but merely a beginning. As this dictionary will be a constantly evolving collaborative effort, we welcome any and all definition feedback, definition requests, and definition refinement.**



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# Glossary

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### **ADVANCED MANUFACTURING**

The process of leveraging the most advanced technology available at the current time in order to maximize the output and/or product quality of a manufacturing facility.

### **APPLICATION PROGRAMMING INTERFACE (API)**

A collection of commands and protocols used to interact with an operating system, device, or specific software component. In IoT, an API lets the developer access the functionality of a device or sensor, such as a thermometer's readings. APIs can be public or restricted to authorized users only.

### **ARTIFICIAL INTELLIGENCE (AI)**

A technology that gives computers the ability to learn based on data, previous experiences, and their environment in order to make decisions in order maximize results.

### **BIG DATA**

Large compilations of data that can be analyzed in order to reveal patterns, trends, and associations. Big data is especially used in order to detect bottlenecks in productivity, predict outcomes, and find patterns that otherwise wouldn't be noticeable through informal analysis.

### **BLUETOOTH**

Short range wireless technology standard which operates on the 2.4 Mz band. Bluetooth can be used for sending both data and audio, with popular uses including wireless headsets and cordless keyboards. Bluetooth devices can be set up with different hardware profiles to help perform specific tasks, for example audio adapter, audio headset, serial, and keyboard profiles.

### **(THE) CLOUD**

An information technology paradigm that enables ubiquitous access to shared pools of configurable system resources and higher-level services that can be rapidly provisioned with minimal management effort, often over the Internet.

### **CONDITION MONITORING**

the process of monitoring a parameter of condition in machinery (vibration, temperature etc.), in order to identify a significant change which is indicative of a developing fault. It is a major component of predictive maintenance.

### **DATA CENTER**

A collective term for the physical site, network elements, systems, etc., that supports computing and network services



### **DIGITAL MANUFACTURING**

Digital manufacturing is the use of an integrated, computer based system comprised of simulation, 3D visualization, analytics and collaboration tools to create product and manufacturing process definitions simultaneously.

### **DIGITAL TRANSFORMATION**

Digital transformation is the profound transformation of business and organizational activities, processes, competencies and models to fully leverage the changes and opportunities of a mix of digital technologies and their accelerating impact across society in a strategic and prioritized way, with present and future shifts in mind.

### **DIGITAL TWIN**

A reference to a digital replica of physical assets, processes and systems that can be used for various purposes....A digital twin continuously learns and updates itself from multiple sources to represent its near real-time status, working condition or position.

### **DIGITAL THREAD**

A communication framework that connects traditionally silo-ed elements in manufacturing processes and provides an integrated view of an asset throughout the manufacturing lifecycle.

### **DIGITIZATION**

The process of moving information onto a format that can be understood by a computer in order for that data to be used in computational calculations.

### **DIRECT NUMERIC CONTROL (DNC)**

Also known as distributed numerical control (also DNC), is a common manufacturing term for networking CNC machine tools. DNC networking or DNC communication is always required when CAM programs are to run on some CNC machine controls.

### **ERP**

The systems and software packages used by organizations to manage day-to-day business activities, such as accounting, procurement, project management, and manufacturing. systems tie together and define a plethora of business processes and enable the flow of data between them.



#### **GATEWAY**

A link between two computer systems or programs. This way they can share information with each other. The router for your home Internet is one type of gateway.

#### **HUMAN-MACHINE INTERFACE (HMI)**

A user-interface consisting of hardware and software that lets a person send request/commands to a machine. Typically HMI's are meant to make it as easy as possible for a person to control a machine with little difficulty. With a smart phone, for example, a user would perform various actions in order to navigate to the phone-call application and place a call.

#### **INDUSTRY 4.0**

The current trend in the manufacturing industry that uses a combination of IoT, big data, and cloud computing in order to develop factories that can make decisions based on large amounts of data. A couple benefits that Industry 4.0 offers is the ability to detect bottlenecks and deficiencies using big data, high level customization, and automation of production.

#### **INDUSTRIAL AUTOMATION**

The use of set technologies and automatic control devices that results the automatic operation and control of industrial processes without significant human intervention and achieving superior performance than manual control.

#### **INDUSTRIAL IOT (IIOT)**

A sub-discipline of IoT, encompassing connected large-scale machinery and industrial systems such as factory-floor monitoring, HVAC, smart lighting, and security. This is M2M communication where, for example, equipment can send real-time information to an application so operators can better understand how efficiently that equipment is running. Also referred to as Industry 4.0 or Industrie 4.0,

#### **INTERNET OF THINGS (IOT)**

The concept of connecting otherwise separate machines or data sources so that people can take better decisions and actions faster. This large number of data gathering devices is the backbone of Industry4.0 that allows people to make decisions in alignment with varying productivity goals.



### **MACHINE 2 MACHINE (M2M)**

The ability of machines to communicate together and make decisions using information without the need of human intervention.

### **MACHINE-TO-PERSON (M2P)**

Analytics for big data in a human readable form e.g., dashboards.

### **MACHINE DATA**

Also known as machine generated data, this is digital information created by the activity of computers, mobile phones, embedded systems, and other networked devices.

### **MACHINE LEARNING**

Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.

### **MANUFACTURING ANALYTICS**

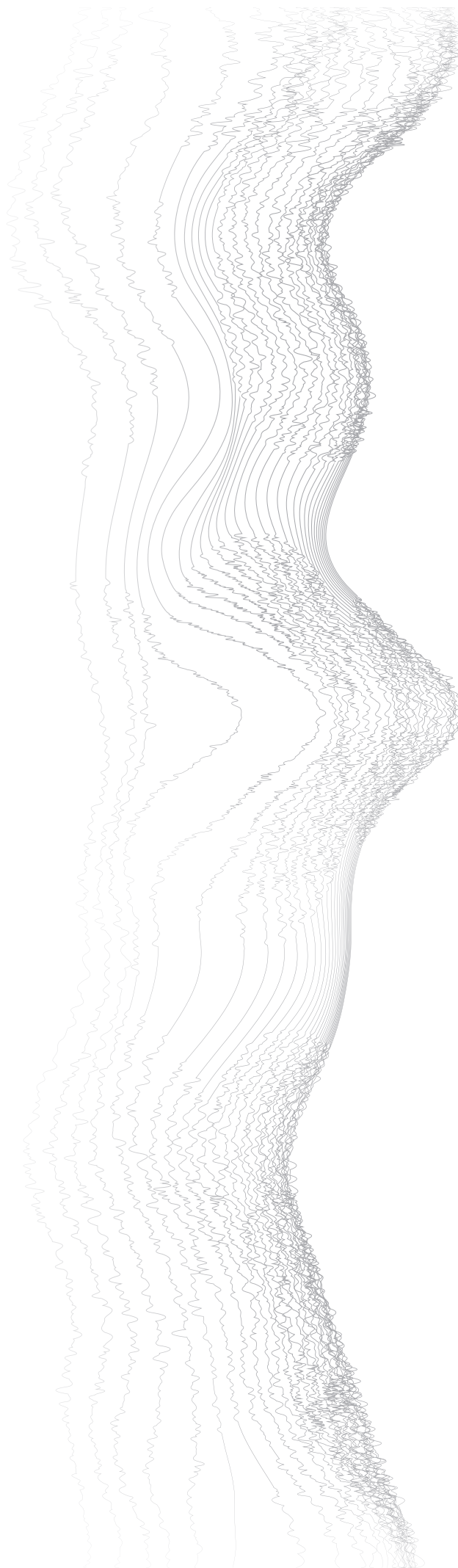
Manufacturing analytics is a set of advanced analytical tools that help in generating insights from historical and present process data and identifying relationships and patterns from various manufacturing processes.

### **MANUFACTURING EXECUTION SYSTEMS (MES)**

Computerized systems used in manufacturing, to track and document the transformation of raw materials to finished goods.

### **MTCONNECT**

MTConnect is a protocol designed for the exchange of data between shop floor equipment and software applications used for monitoring and data analysis.



### **OPEN PLATFORM COMMUNICATIONS (OPC)**

The interoperability standard for the secure and reliable exchange of data in the industrial automation space and in other industries. It is platform independent and ensures the seamless flow of information among devices from multiple vendors. The OPC Foundation is responsible for the development and maintenance of this standard.

### **OVERALL EQUIPMENT EFFECTIVENESS (OEE)**

A valuable metric that measures the efficiency of a machine. OEE takes into consideration the Availability, Performance, and Quality of a machine. In mathematical terms,  $OEE = \text{Availability} * \text{Performance} * \text{Quality}$

### **OVERALL OPERATIONAL EFFECTIVENESS (OOE)**

OOE takes into account Availability, Performance, and Quality but also takes into account unscheduled time that occurs during normal working shifts. OOE gives you a more realistic gauge of performance during time that your machines could have been running—but weren't because there was no scheduled work. Thus,  $OOE = \text{Performance} * \text{Quality} * \text{Availability}$  (where  $\text{Availability} = \text{Actual Production Time} / \text{Operating Time}$ ).

### **PREDICTIVE ANALYTICS**

The use of data, statistical algorithms and machine learning techniques to identify the likelihood of future outcomes based on historical data. The goal is to go beyond knowing what has happened to providing a best assessment of what will happen in the future.

### **PREDICTIVE MAINTENANCE**

Techniques designed to help determine the condition of in-service equipment in order to predict when maintenance should be performed. This approach promises cost savings over routine or time-based preventive maintenance, because tasks are performed only when warranted.

### **PREVENTATIVE MAINTENANCE**

The care and servicing by personnel for the purpose of maintaining equipment in satisfactory operating condition by providing for systematic inspection, detection, and correction of incipient failures either before they occur or before they develop into major defects.



### **SOFTWARE AS A SERVICE (SaaS)**

A software licensing and delivery model in which software is licensed on a subscription basis from a third-party provider who hosts the application and makes it available to customers over secure Internet connection. SaaS removes the need for organizations to install and run applications on their own computers or in their own data centers. This eliminates the expense of hardware acquisition, provisioning and maintenance, as well as software licensing, installation and support.

### **SMART FACTORY**

The smart factory represents a leap forward from more traditional automation to a fully connected and flexible system—one that can use a constant stream of data from connected operations and production systems to learn and adapt to new demands.

### **SMART MANUFACTURING**

Smart manufacturing marries information, technology and human ingenuity to bring about a rapid revolution in the development and application of manufacturing intelligence to every aspect of business.

### **TOTAL EFFECTIVE EQUIPMENT PERFORMANCE (TEEP)**

Very similar to OOE, TEEP takes into account non-operator time such as off shifts and holidays. If you are attempting to maximize utilization of your machines, no matter what the time, then TEEP could be an interesting metric. Therefore,  $TEEP = \text{Performance} \times \text{Quality} \times \text{Availability}$  (where  $\text{Availability} = \text{Actual Production Time} / \text{All Time}$ ).

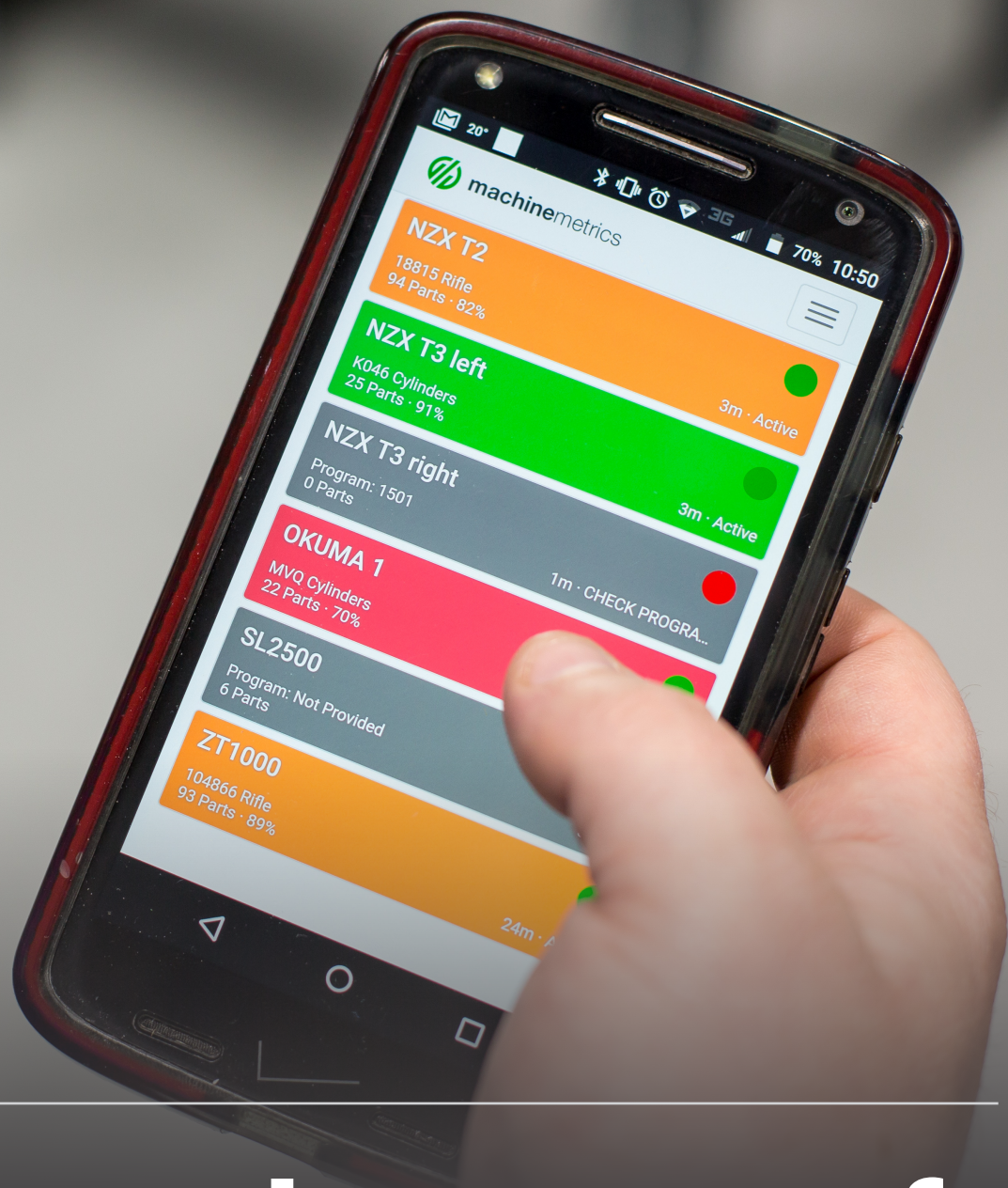
### **VIRTUAL PRIVATE CLOUD (VPC)**

An on-demand configurable pool of shared computing resources allocated within a public cloud environment, providing a certain level of isolation between the different organizations.

### **VIRTUAL PRIVATE NETWORK (VPN)**

A technology that creates a safe and encrypted connection over a less secure network, such as the internet. VPN technology was developed as a way to allow remote users and branch offices to securely access corporate applications and other resources





# Harness the power of machine learning and predictive analytics.

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# Product Description



## THE OPERATOR VIEW

Our touchscreen interface allows for operators to add human-context to machine data with touch screen tablet interfaces mounted right at the machine tool. Having a touchscreen at each machine with an intuitive interface that asks the operator to categorize downtime as it's happening allows this information to be made available in real-time to managers in downtime pareto charts. Operators can also reject a part using the Operator View to manage and record quality data. Quality managers are able to view the quality pareto in real-time and when there are new rejects, head to the machine in question, re-inspect the parts and re-allocate as necessary.



## SUPERIOR USABILITY

From the performance dashboard to the operator workcenter to our reporting features, the MachineMetrics interface is designed to be user-friendly for operators, managers, and upper-management. Our customers agree is that our aesthetic is both visually appealing and intuitive. Because of the platform's simplicity, minimal training is required to get your team using the system and confident interfacing with the product.



## EASY INSTALLATION/ SET-UP

MachineMetrics is incredibly easy to integrate and requires far less time for setup than most other machine analytics and monitoring platforms. We allow for the option of self-integration or to work with our on-site integration team. With MachineMetrics, manufacturers can start collecting data in minutes from networked machines. As MachineMetrics is a cloud application, there are no servers to manage, and no applications to update. All that's required is available internet and that your machines are on your network and accessible from our gateway.



## POWERFUL, ACTION- ABLE REPORTING

MachineMetrics provides robust and superior reporting features including better OEE reports, job reports, downtime and quality pareto reports. Real-time OEE is available in various reports including the real-time dashboard, historical reports that can be compared by shift, and when viewing individual job/part reports. Utilization, TEEP and OOE are also measured and visible in historical reports. Information such as cycle times, performance, number of parts produced, rejects, downtime reasons, and reject reasons can be reported on for each part operation. This information is presented in eminently understandable form, allowing managers to quickly identify issues that are related to a specific machining operation and help measure the effect of process improvements.

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## PRODUCT DESCRIPTION, CONTINUED



### CONNECTIVITY, API, AND INTEGRATIONS

MachineMetrics has the unique capability to connect to other types of software, including the ability to tie into a manufacturer's production goals / ERP to give real-time feedback on a job's performance, and a comparison with previous job runs. To date we have released deep integrations with Epicor and Infor Visual and our open API will allow MachineMetrics to directly integrate with any ERP. By partnering with other best in class manufacturing software, we provide seamless connectivity of information silos via our digital threading.



### FAST UPDATES AND PRODUCT AGILITY

MachineMetrics is dynamic; we have a team of developers that are adding new features weekly including ideas brought to us by our current customers. We understand that every manufacturer is unique and we don't want to shoe-horn them into a profile to sell them our software. Rather, we offer a set of tools to our customers and support them to use the tools for whatever fits them best.



### CLOUD AND IT-SUPPORT

Because MachineMetrics is cloud-based, there's minimal IT infrastructure required. Our mobile friendly software allows you to access your data from anywhere with a secure connection from your mobile phone or home PC without IT support or complicated firewalls and VPNs. We can also roll out new features instantly upon approval. MachineMetrics also provides Full-Time unlimited support forever, with absolutely no hidden costs.



### CUSTOMER SUCCESS

MachineMetrics provides all customers with a customer success manager (CSM) that, through routine meetings, helps train their team on our software and meeting their performance goals. Customers often make feature suggestions, and CSMs are dedicated to making those requests a reality. CSMs are there to not only ensure success using MachineMetrics, but to know the right questions to ask and to make sure that our users are happy with their product experience.



## MACHINOMETRICS CUSTOMERS INCLUDE:

**FASTENAL**

 **SHILOH**

**SECO**

**WHELEN**

 **TURBOCAM**  
INTERNATIONAL

**Snap-on**

**BENCHMADE**

**EPIC**  
LIFT SYSTEMS

 **SilencerCo**

 **Omni**  
COMPONENTS CORP.

 **PRAXAIR**

**Gardner**  
**Denver**

## ESTABLISHED PARTNERSHIPS INCLUDE:

**U+LABS**

McKinsey&Company

**Morris**  
The Robert E. Morris Company

**TSUGAMI**  
Automation

**WIPFLI**  
CPAs and Consultants

**Mastercam**

## AWARDS:

### TECH-ECOSYSTEM PARTNER

MachineMetrics was chosen by McKinsey & Company as one of only twenty companies out of 600 to become a Tech- Ecosystem Partner for the new Digital Capability Center (DCC) in Chicago.



### SMART MANUFACTURING PRODUCT OF THE YEAR, 2018

IoT Breakthrough Committee

### TOP 10 MANUFACTURING INTELLIGENCE SOLUTION PROVIDER, 2017

Manufacturing Technology Insights

**TechHUB**  
COLLABORATIVE

### MASSACHUSETTS TECHHUB'S NEXTGEN TECHNOLOGY AWARD



### NEW ENGLAND INNOVATION AWARDS NOMINEED, 2018

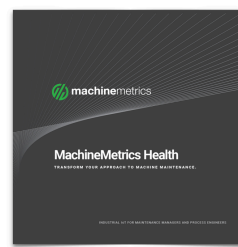
New England Business Association

## MARKETING MATERIALS

### BROCHURES



MachineMetrics Production



MachineMetrics Health



MachineMetrics Service

### CASE STUDIES



Carolina Precision Manufacturing  
SWISS CNC



Fastenal  
PRECISION METALWORKING

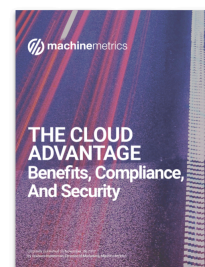


Carlson Products  
METAL STAMPING AND FABRICATION

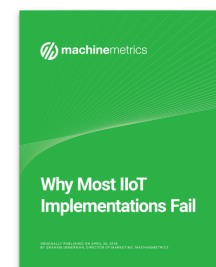
### EBOOKS



Digital Transformation



The Cloud Advantage

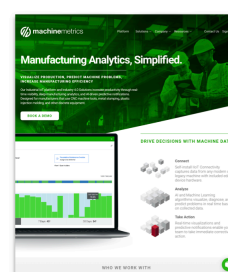


Why most IIoT implementations Fail

### MARKETING



MachineMetrics Presentation Slides



MachineMetrics Website  
RUNNER-UP, HANNOVER MESSE  
"BEST MANUFACTURING  
WEBSITE OF 2018" AWARD



MachineMetrics Blog  
WINNER, HANNOVER MESSE  
"BEST MANUFACTURING BLOG  
OF 2018" AWARD



**CONTACT US**

413-341-5747

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

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