
# Industrial IoT & Big Data Analytics:

## Capturing Value in the PLM Environment

# Agenda

- ❑ About LNS Research
- ❑ What is the IoT and Digital Transformation?
- ❑ A New Model for System Architecture
- ❑ Closing the Data Science Divide
- ❑ Actionable Recommendations

# About LNS Research

## *Our Mission is Driving Industrial Transformation*

**We are thought leaders and trusted advisors for Business, IT, and Automation executives**

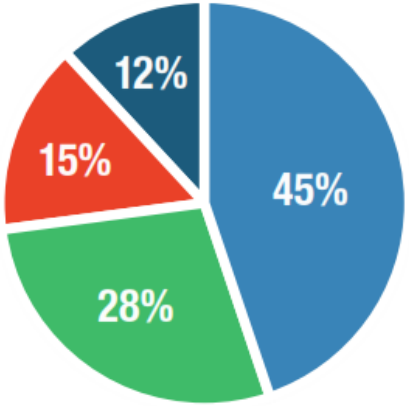
**Our differentiators:**

- ❑ Experienced analysts
- ❑ Primary social research
- ❑ Deep industry contacts
- ❑ Interactive data visualizations

# LNS Research's Council Members Include

# Research Demographics: Metrics that Matter Survey

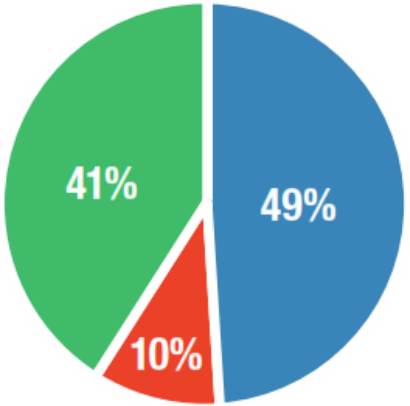
## 300+ executives and senior leaders took LNS Research's MtM Survey in 2015 & 2016




**2016 Metrics That Matter Survey**
**GEOGRAPHY**

COLOR BY HQ LOCATION

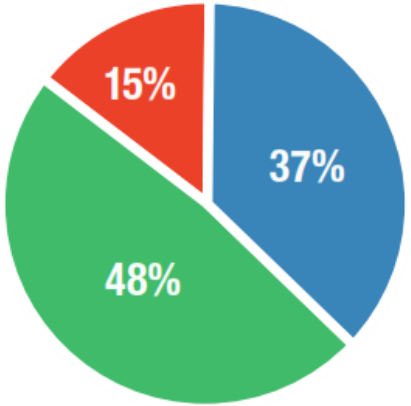
- North America
- Europe
- Asia/Pacific
- Rest of World




**2016 Metrics That Matter Survey**
**REVENUE**

COLOR BY COMPANY REVENUE

- Small: Less than $250 Million
- Medium: $250 Million - $1 Billion
- Large: More than $1 Billion




**2016 Metrics That Matter Survey**
**INDUSTRY**

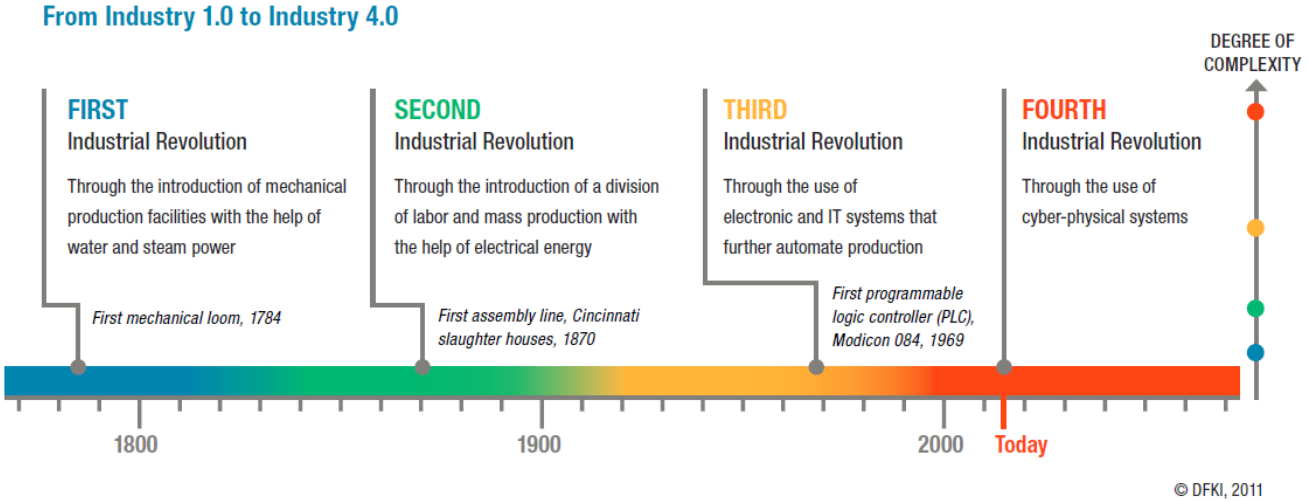
COLOR BY INDUSTRY

- Process Manufacturing
- Discrete Manufacturing
- Batch Manufacturing

# What is the IoT and Digital Transformation?

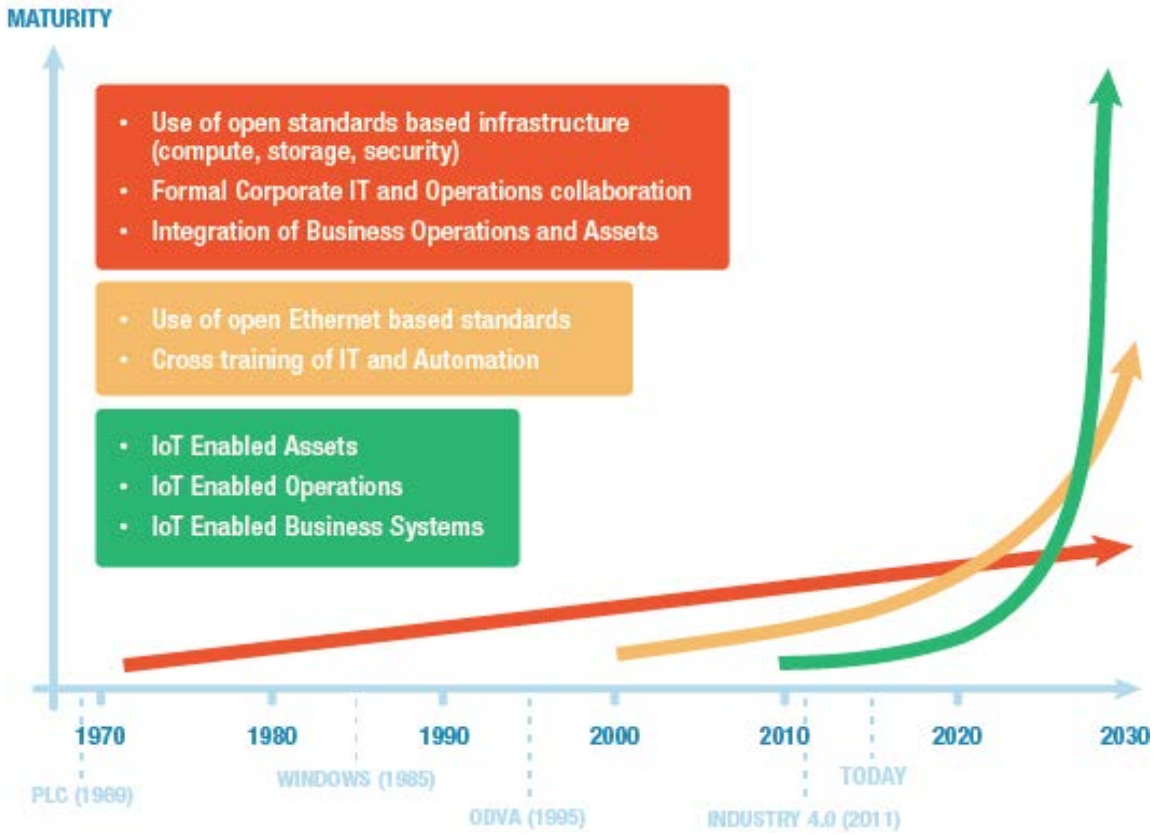
# Initiatives, Forums, and Associations

## In 2011 we saw the emergence of Industry 4.0 as a concept.




- Governments of U.S. and Germany have invested $1B+
  - Smart Manufacturing Leadership Coalition
  - Industry 4.0 (Steam, Division of Labor, Automation, Cyber-Physical Systems)
- Industry Associations
  - Industrial Internet Consortia
  - IoT World Forum

# IT-OT Convergence




## OT is new name for Industrial Automation.

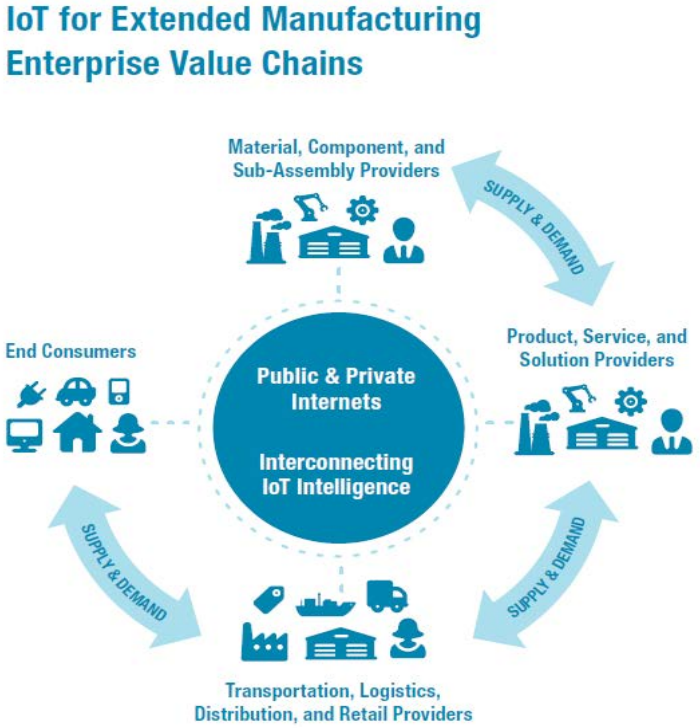
## Three ongoing and accelerating trends.

- Automation and Industrial Software on Windows/Linus
- Automation on Standard unmodified Ethernet
- Devices on Internet

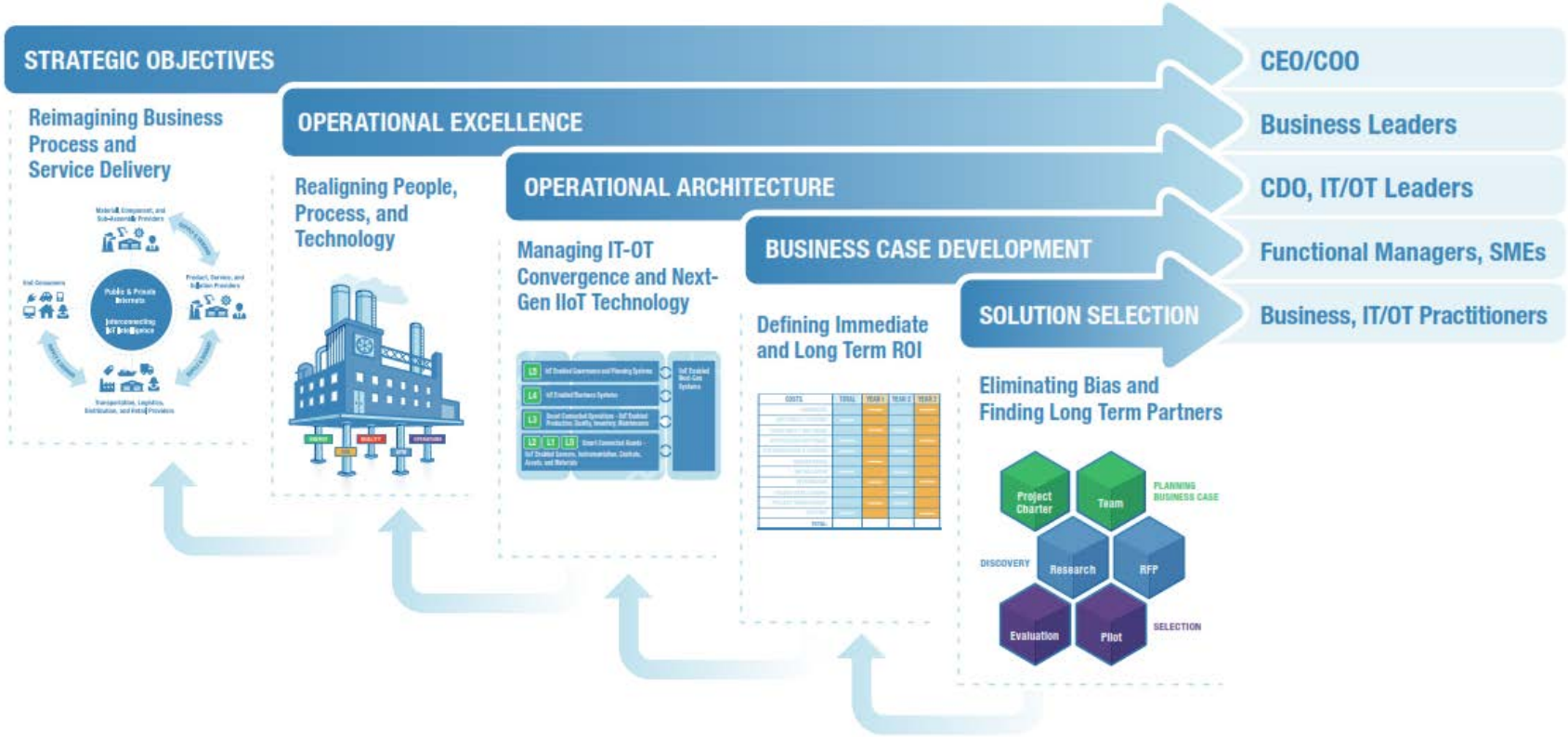
## Also refers to enterprise organization – hybrid IT and automation groups.

# (Industrial) Internet of Things

- IoT refers to network of networks enabling new cyber-physical systems
- By 2020, over 50 billion devices expected to be connected via IoT (Cisco)
- Digital Transformation refers to the social and business disruption



# Digital Transformation Framework



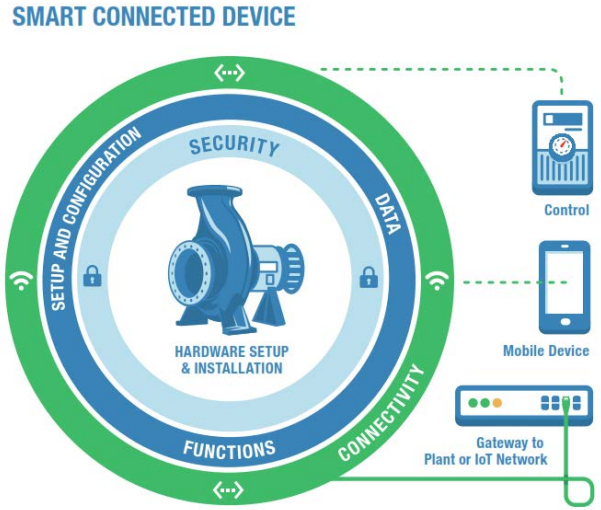
# Setting Strategic Objectives: Role of PLM = V+R

## Internal

- **Smart Connected Enterprise: Real Time->Predictive->Autonomous**

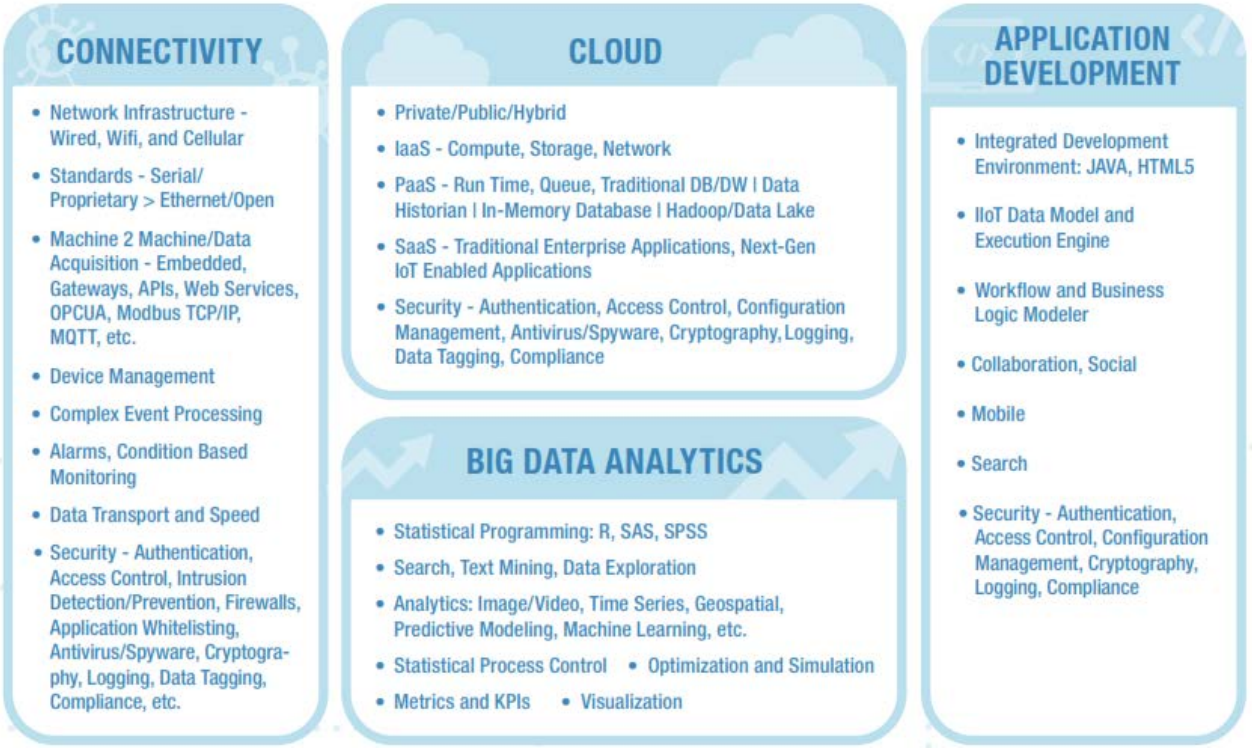

## External

- **Smart Connected Products: Product->Service->Experience**



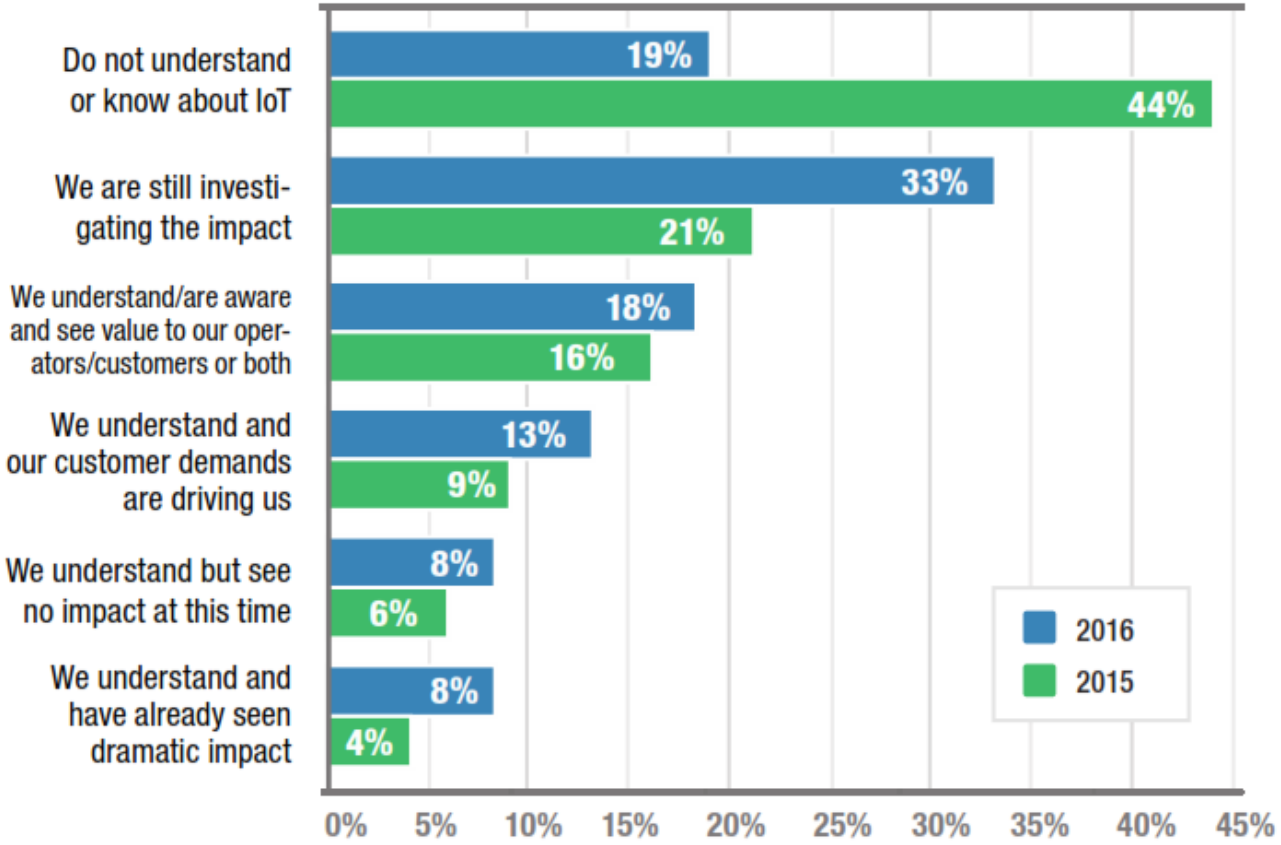
# A New Model for System Architecture

# Enabling Tech: Industrial Internet of Things Platform



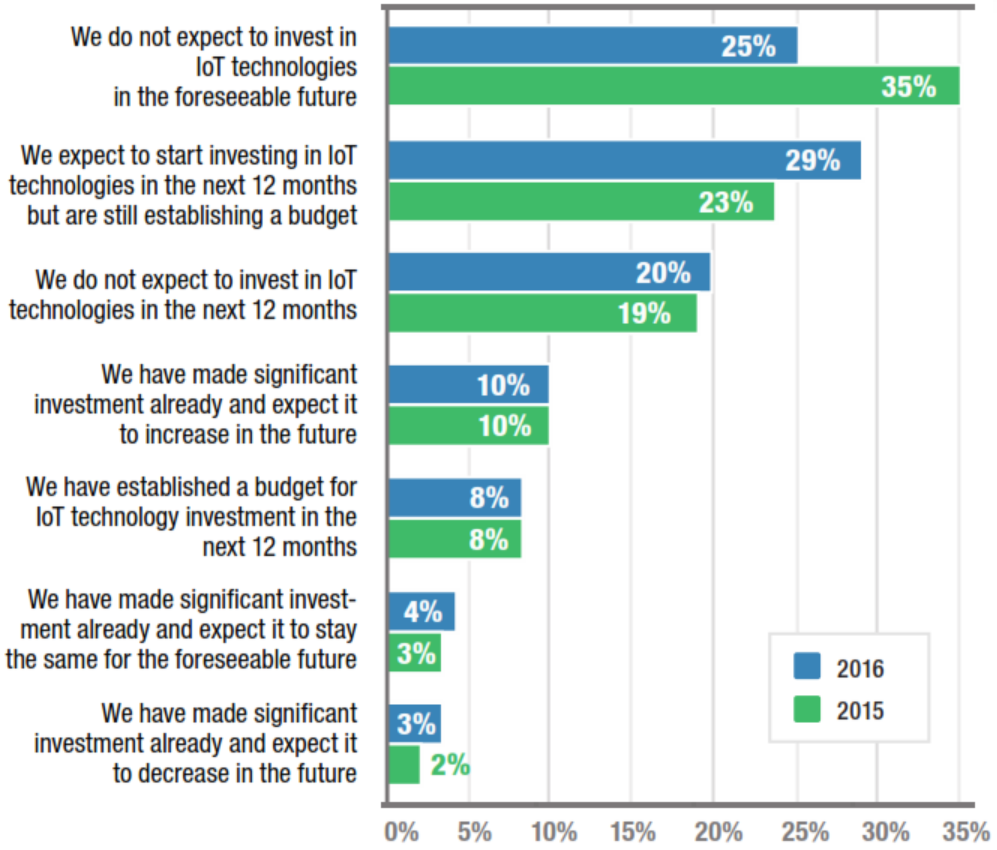

- **Starting in 2014 a battle of the platforms started.**
- **Still an ecosystem play today.**
- **Space still needs definition.**

# The Impact of IIoT Today




- Lack of education is diminishing rapidly
- Strong correlation between lack of education and adoption plan

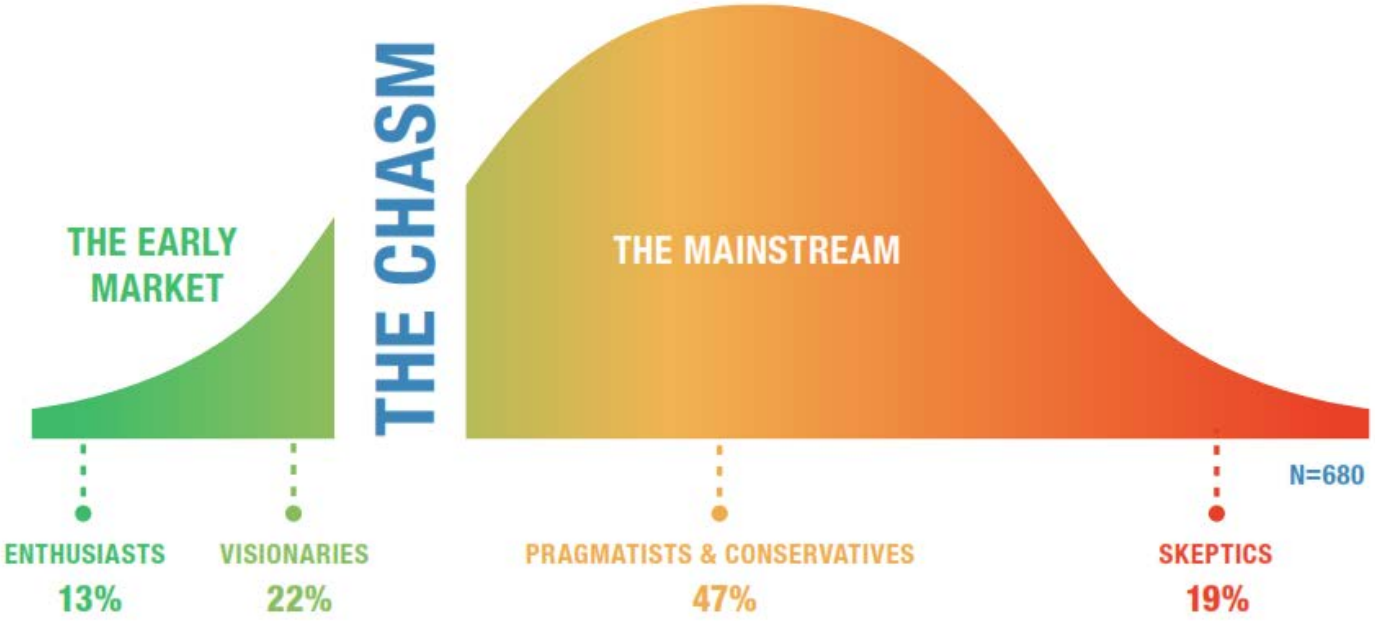
# Current IIoT Adoption



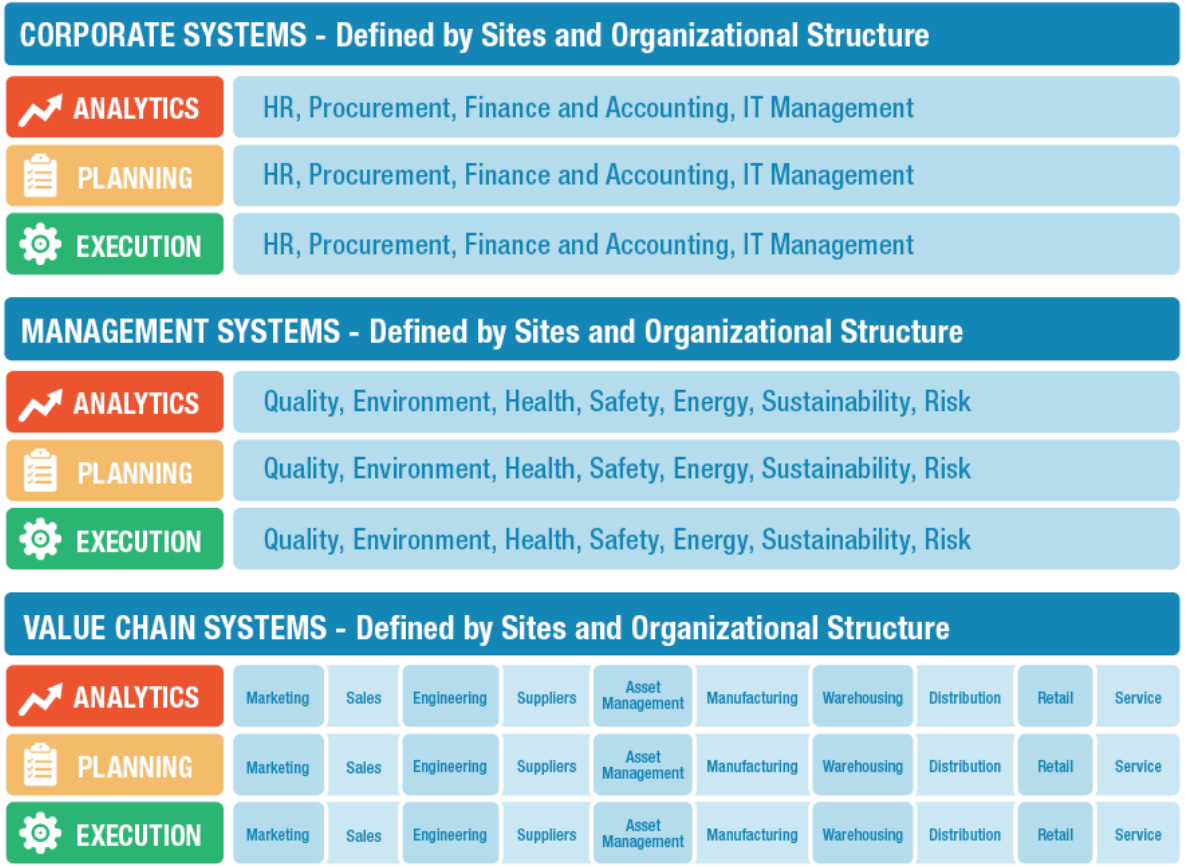

- 3/4 of market is eventually expecting to Invest in IIoT
- 51% of market making investment in next 12 months

# Crossing the Chasm

- We are at the tipping point of IIoT adoption
- Early adopters are spread across industries



# Traditional Enterprise Architecture (ERP) View




- Enterprise Architecture has traditionally been managed by IT
- No room for IoT or cyber-physical systems

# Traditional Enterprise Architecture (Automation) View

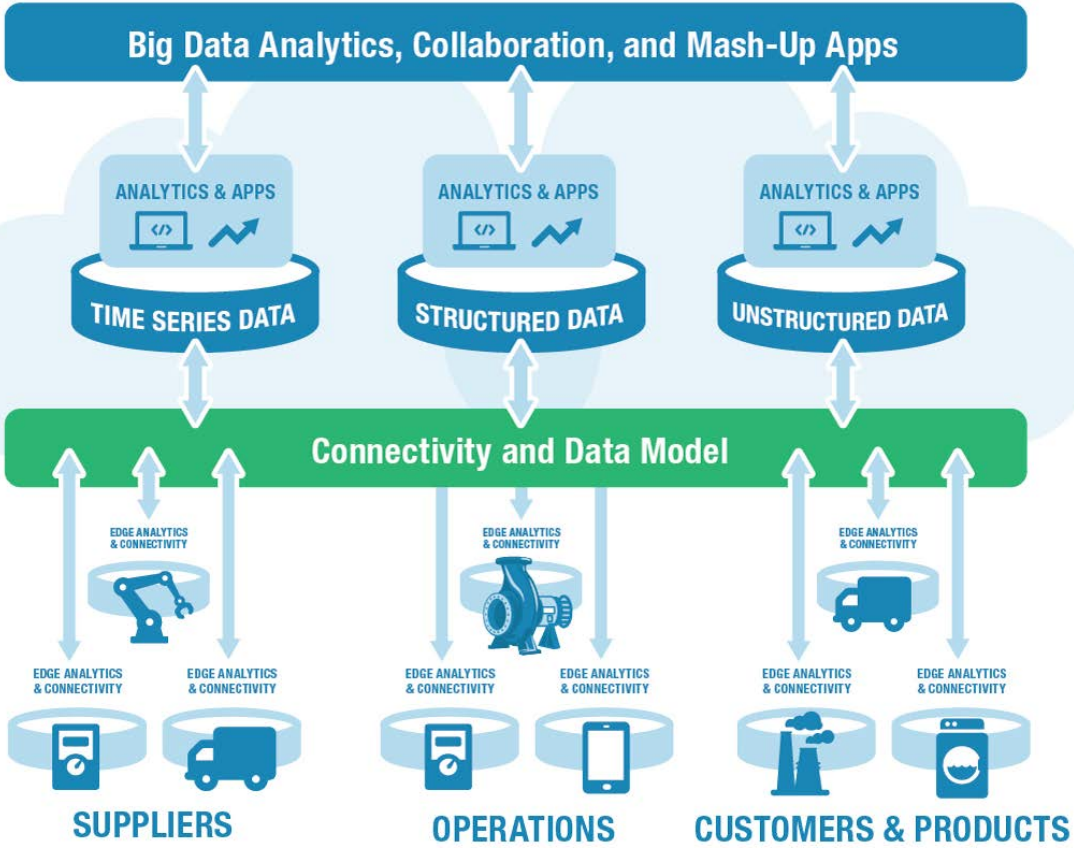

## Purdue/ISA95 Model

- No Value Chain View
- Limited integration and adoption across hierarchy

# Traditional Enterprise Architecture (PLM) View

- Enabling the Digital Thread and Digital Twin
- Bring together the virtual and real across the value chain.
- Limited view of business and transactions

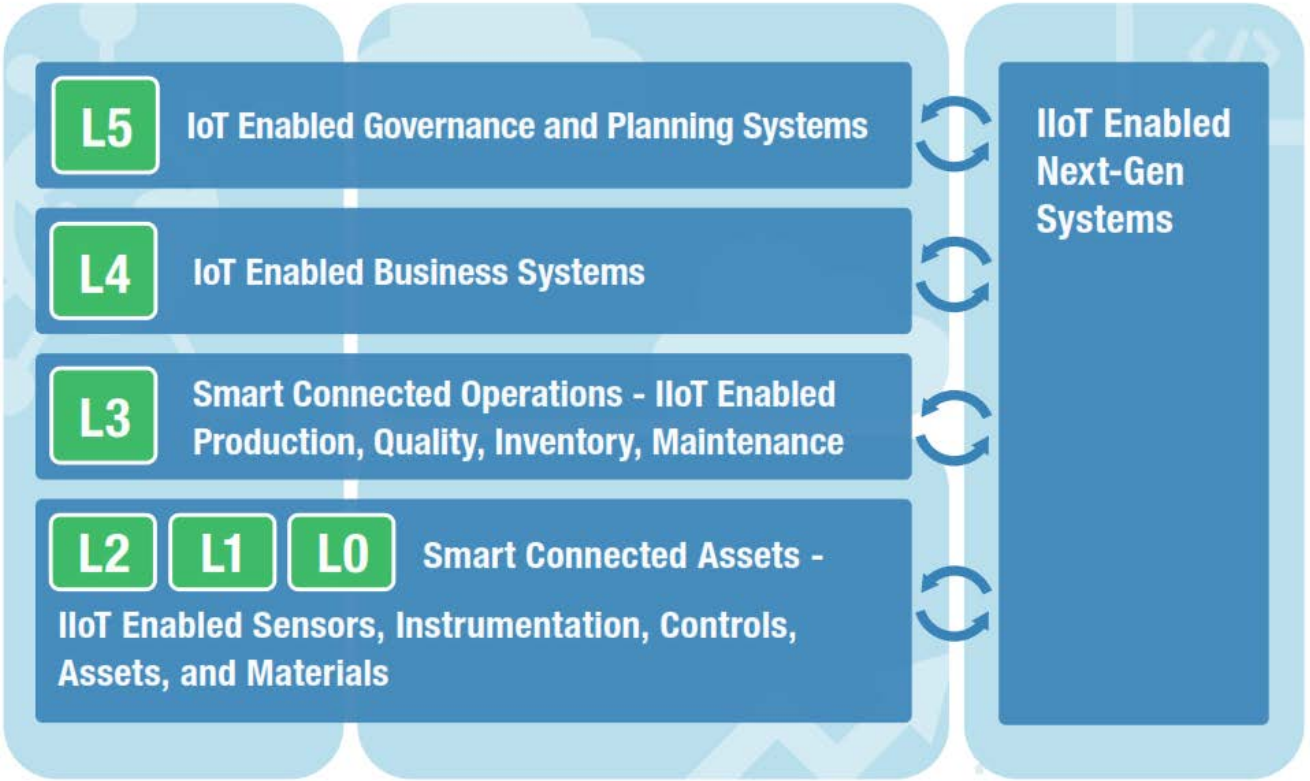
# Operational Architecture: Managing IT/OT Convergence




**Operational Architecture broadens scope for IT-OT Convergence**

**Aligns automation, engineering, business**

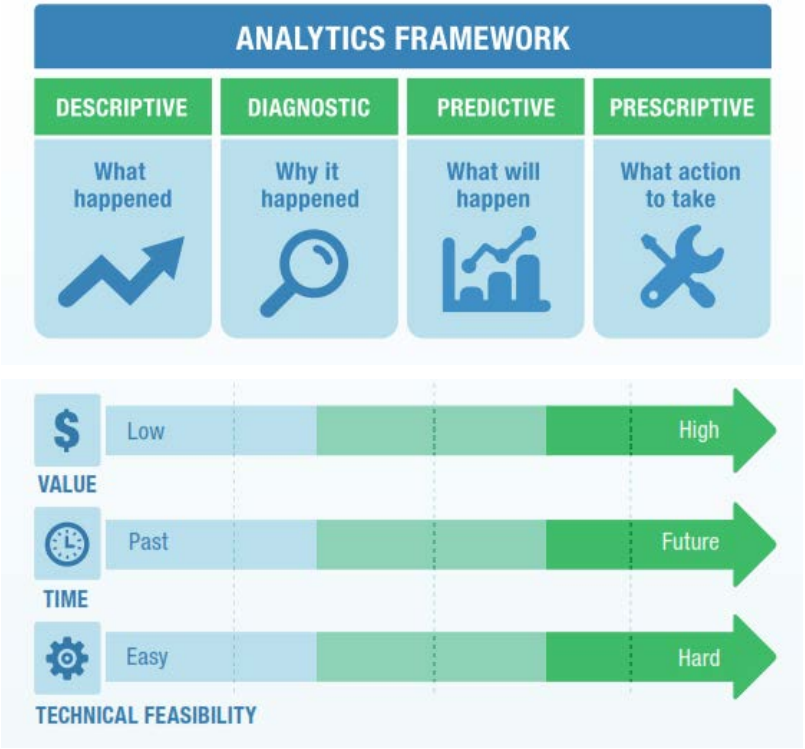
# Next-Generation Manufacturing Systems Architecture




- No Value Chain View
- Limited integration and adoption across architecture

# Trends in Big Data and Analytics

# The Data Science Divide: Engineers and Data Scientists




- Analytics are understood in terms questions answered
- Predictive and prescriptive analytics traditionally delivered as physics based by engineers with PLM.
- Big Data and Machine Learning is delivered by Data Scientists and driving technical feasibility shifts

# Understanding Big Data and Machine Learning

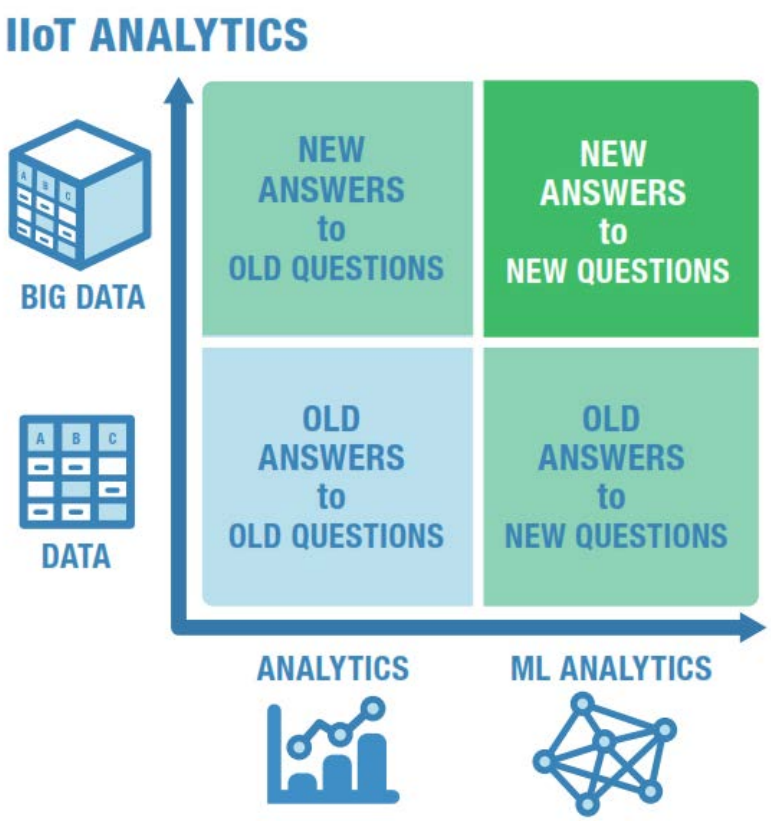


**BIG DATA** is most simply understood not just in terms of size, but in terms of the ability to manage volume, velocity, and variety of data, including structured, semi-structured, and unstructured.



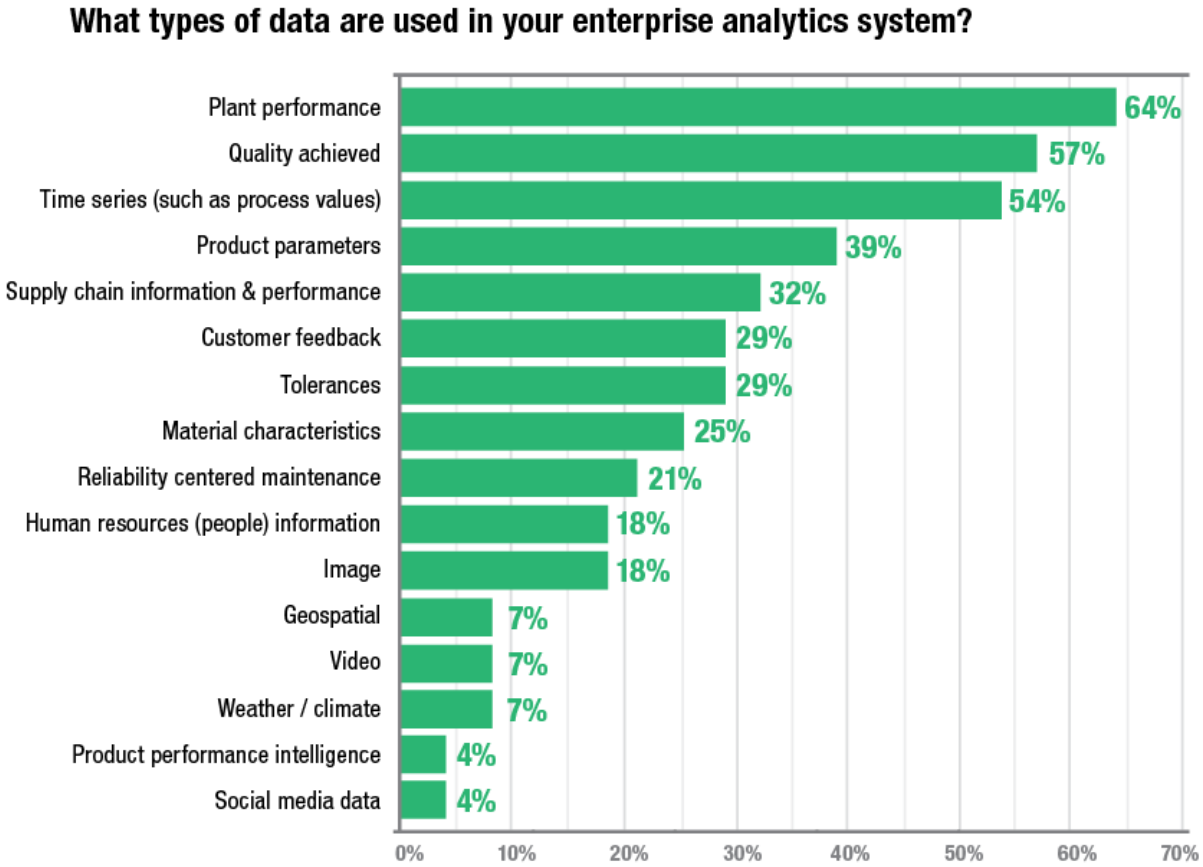
**MACHINE LEARNING** is most simply understood as the set of models and algorithms that don't rely on the analyst to presuppose relationships between variables and different data elements.

# A Different View of the Questions to be Answered



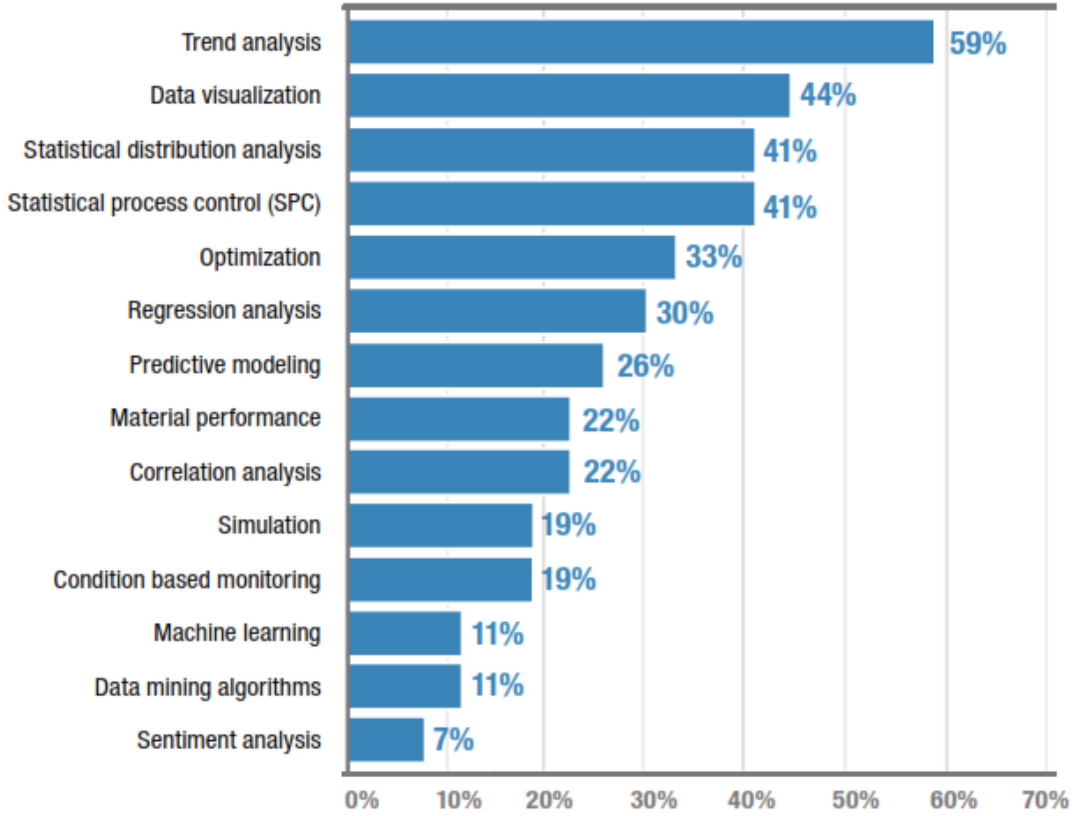

- Crossing the Data Science divide is about being open to new tools and methodologies
- Think about traditional FMEA for a product and how this will change with IIoT?
- But is it happening today?

# Data Used in Corporate Analytics



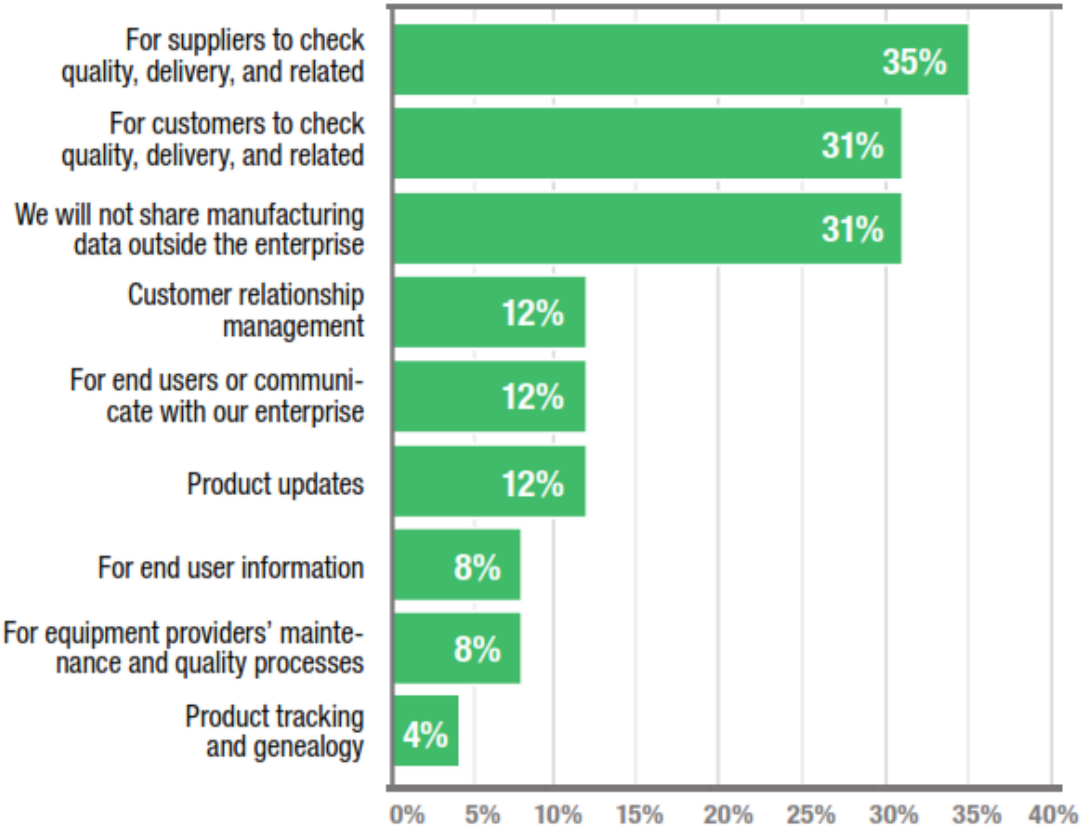

- **Companies include very little unstructured data in corporate analytics programs.**

# Algorithms Used in Manufacturing



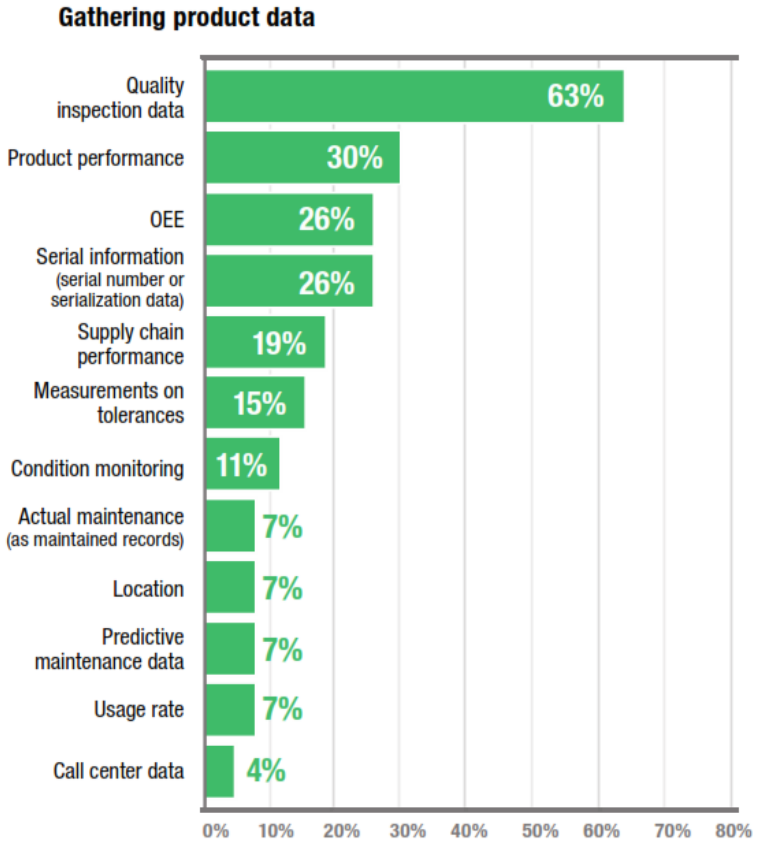

- **Most adoption is for structured data and Descriptive or Diagnostic analytics**
- **Adoption of Big Data analytics is still woefully low**

# Sharing Data Outside the Enterprise



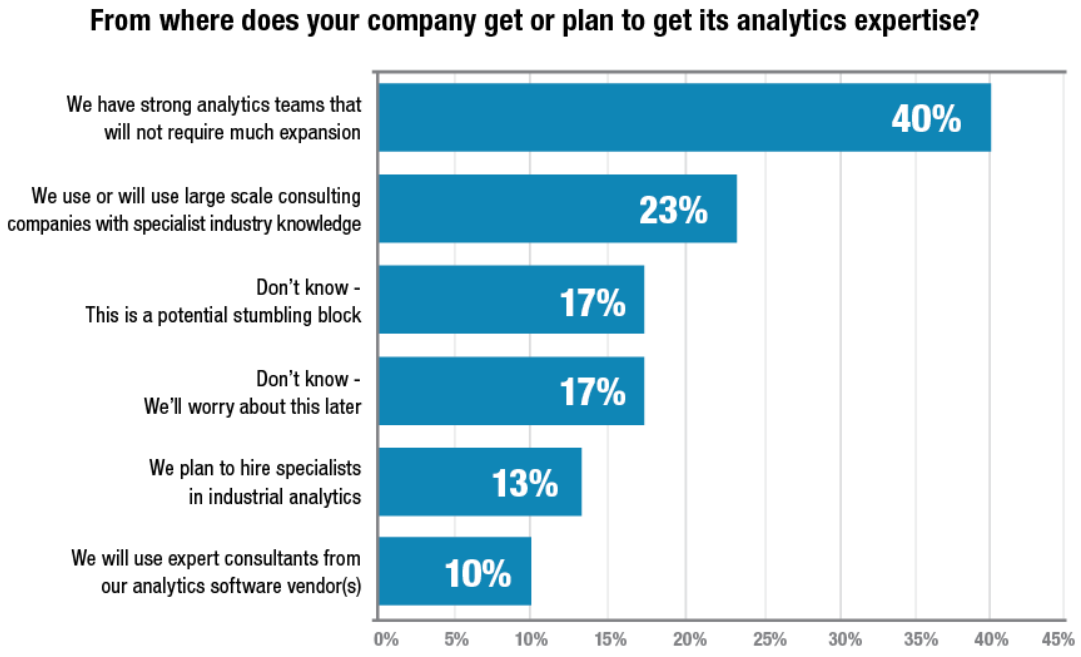

- **Data is largely shared outside the enterprise for supply chain collaboration.**
- **Business model transformation and enabling new strategic objectives is still a long way off.**

# Connected Product Data




- Quality is by far the number one use of collected product data
- Analytics and closing the loop on quality for new experiences will drive success

# Analytics Expertise




- Many Companies already feel mature with current analytics capabilities.
- Limited scope and definition of analytics
- Engineering and Data Scientists collaboration still coming

# Recommended Actions

# Actionable Recommendations

- **Institute a formal Digital Transformation framework that ties together all levels of the organization with a strategic vision.**
- **Deployed an IoT enabled Big Data architecture that shares data outside of the enterprise and breaks down internal hierarchy and silo's**
- **Enable Digital Transformation by bringing together engineers and data scientists for prescriptive and predictive PLM analytics**
- **View the business case as a journey that delivers value across the product lifecycle.**


# Thank You!!