WE DELIVER RESULTS THROUGH DIGITAL TRANSFORMATION

Digital Transformation
powered by the Industrial IoT and Predictive Analytics
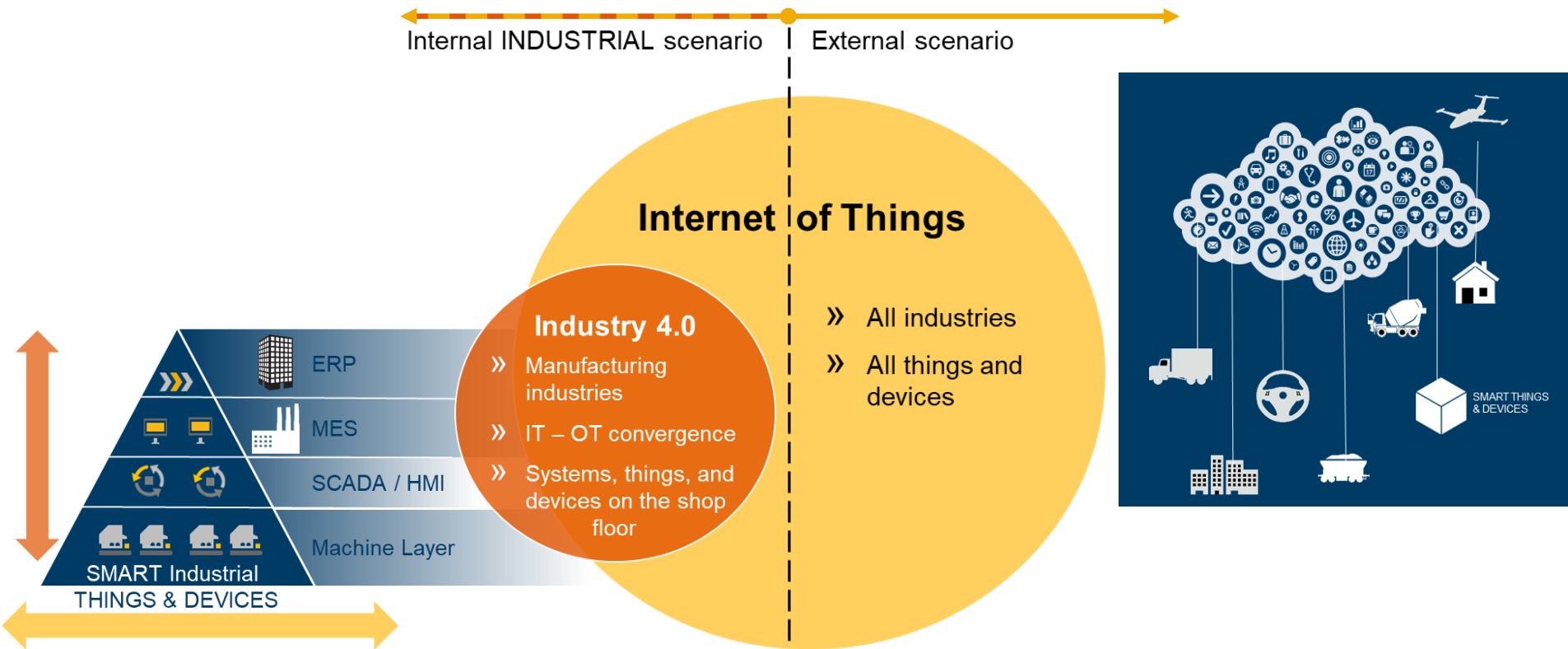
Our IoTco Offerings

Industrial IoT | Predictive Analytics | The Academy

IoTco, LLC
250 E. 5TH ST
CINCINNATI, OH 45202
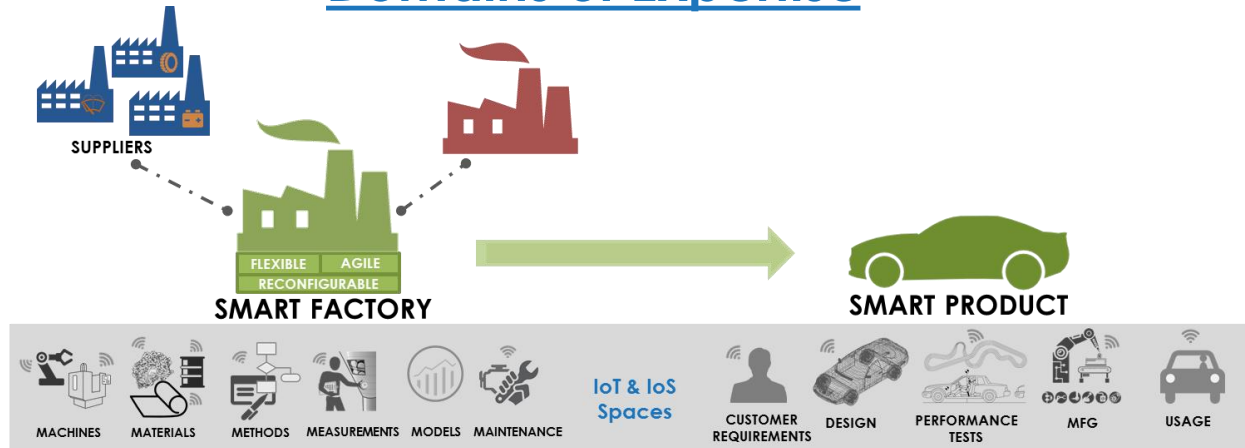www.IoTco.com

Our Expertise: IoT | Industrial IoT | Industry 4.0

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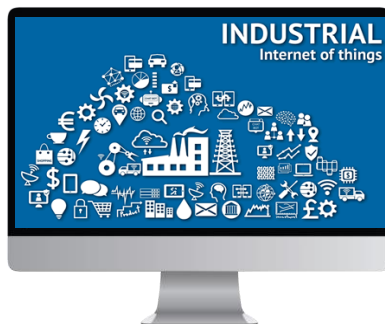Internal INDUSTRIAL scenario | External scenario

Internet of Things

Industry 4.0
- » Manufacturing industries
- » IT – OT convergence
- » Systems, things, and devices on the shop floor

- » All industries
- » All things and devices

ERP

MES

SCADA / HMI

Machine Layer

SMART Industrial
THINGS & DEVICES

SMART THINGS & DEVICES

Digital Transformation Strategy

1 TECHNOLOGY

2 ANALYTICS

3 CONNECTIVITY

4 RETURN ON INVESTMENT

2

Our Expertise

Domains of Expertise

SUPPLIERS

FLEXIBLE | AGILE
RECONFIGURABLE

SMART FACTORY

SMART PRODUCT

MACHINES | MATERIALS | METHODS | MEASUREMENTS | MODELS | MAINTENANCE

IoT & IoS Spaces

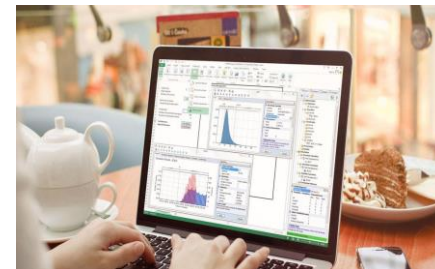CUSTOMER REQUIREMENTS | DESIGN | PERFORMANCE TESTS | MFG | USAGE

Practices

Industrial IoT
MES | OEE Software
Connectivity & Automation Services

Predictive Analytics
PDX Software
Analytics as a Service

IoT Academy
Digital Transformation
Consulting & Training Services

Our Clients

- **Automotive**

- **Manufacturing**

- **Heavy Industry**

- **OTHER**

Manufacturing Leadership Award to MAXION WHEELS

2019 ML Awards Winners

National Association of Manufacturers' Manufacturing Leadership (ML) Council recognizes these world-class manufacturing companies and individual leaders as winners of the 2019 Manufacturing Leadership Award.

Artificial Intelligence and Advanced Analytics Leadership

> Cisco Systems, Inc. (The Fully-Connected Customer Experience)

> Digital Manufacturing and Design Innovation Institute

> General Mills

> IBM (Augmented Intelligence for IBM Supply Chain)

> Maxion Wheels

> Northrop Grumman (Assembly Metadata Integration)

5

Manufacturing Leadership Award to MACLEAN-FOGG

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2021 Award Winners
Click here to view the 2021 Award Winners Announcement >

2021 ML Awards Winners

The National Association of Manufacturers' Manufacturing Leadership Council recognizes these world-class manufacturing companies and individual leaders as winners of the 2021 Manufacturing Leadership Awards. Companies with project names listed were winners of multiple awards.

Artificial Intelligence and Advanced Analytics Leadership
> Cisco Systems – Cisco's Data & Analytics Office Brings AI to Life All Across Cisco
> Cisco Systems – Component Quality Early Sensing Platform
> CNH Industrial
> HELLA
> IBM Corporation – Manufacturing Quality Inspection with AI and Edge Computing
> MacLean-Fogg
> Merck & Co., Inc. – Automated Vision Inspection Platform

Driving Zero-Downtime, Zero-Defect Manufacturing

SMART FACTORY
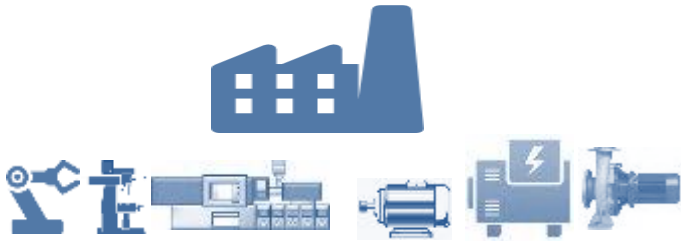
- **Real Time Data Collection and Visibility**

  - **Improve Overall Equipment Effectiveness (OEE)**
    Availability, Performance, Quality

    5 to 10 % OEE gains
    10 to 25% labor productivity

- **Predictive Maintenance**

  - **Reduced Unplanned Downtime**

    1 to 5 % uptime/utilization gains

  - **Optimize Spare Parts**

    10 to 20 % spare part reduction

  - **Optimize Maintenance Schedules and Labor Time**

    reduce MTTR and eliminate overtime maintenance

- **Predictive Quality**

  - **Detect and Eliminate Waste**

    1 to 5 % scrap reduction

We Deliver Results through Digital Transformation

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MAXION WHEELS

**N.A.M.
Artificial Intelligence
Leadership Award 2019**

USE CASE: Predictive Maintenance

VALUE
- Early Fault Detection of Machine Downtime, with Spare Part Optimization

VELOCITY
- 7 Machine Templates Deployed in less than 3 Months

SCALABILITY
- 10 Manufacturing Plants

ROI
- **Pilot ROI within 6 Months
Plant ROI within 12 Months**

BOCAR GROUP

**N.A.M.
Artificial Intelligence
Leadership Award 2020**

USE CASE: Predictive Quality

VALUE
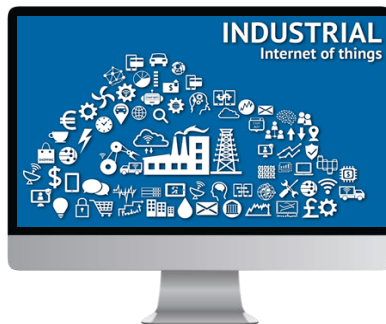- Detecting and Predicting Scrap in Die Casting (within 6 sec cycle times)

VELOCITY
- 2-Cell Template Deployment in less than 6 Months

SCALABILITY
- 100 Cells in 7 Manufacturing Plants

ROI
- **1% Scrap Reduction is $250K per Plant in Annual Savings**

Digital Transformation Services

Industrial IoT

1 • ***Connectivity & Automation***

2 • ***Performance Analytics & Metrics***
OEE - Overall Equipment Effectiveness

3 • ***MES and IIoT***
Manufacturing Execution Systems including Traceability and Quality/SPC

Predictive Analytics

4 • ***PDX Software***
Predictive Maintenance
Predictive Quality
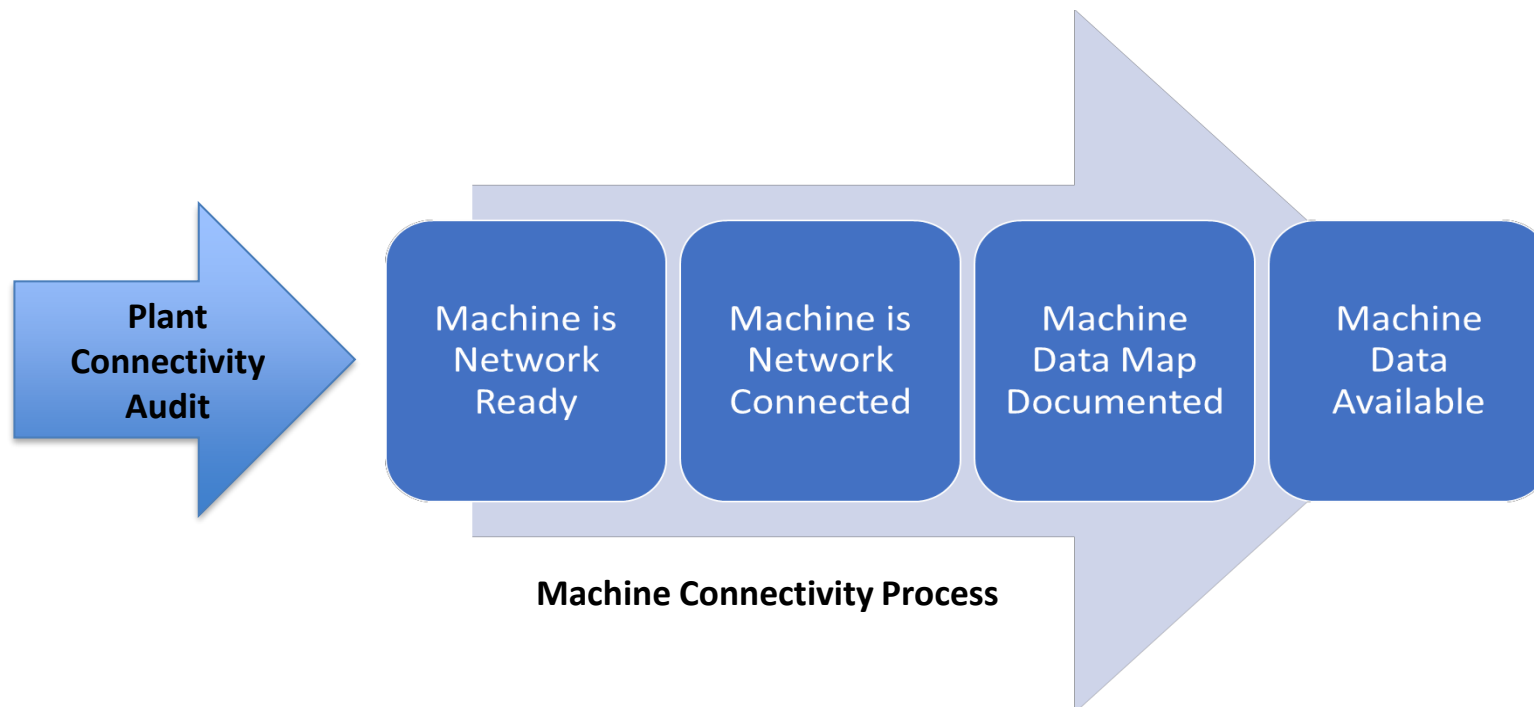
• ***Analytics as a Service***

• ***Wellness-AI***

IoT Academy

5 • ***Advisory***

• ***Digital Transformation Assessments***

• ***Industry 4.0 Training***

IoTco focuses resources on connecting both advanced and legacy machines with the highest priority and to address the following questions:

- Is the machine capable of communicating on the plant network?
- What will it cost to add network communication capability?
- How long will it take?
- How much data is available from the machine?

Plant Connectivity Audit → **Machine is Network Ready** | **Machine is Network Connected** | **Machine Data Map Documented** | **Machine Data Available**

Machine Connectivity Process

Asset Data is the Foundation

Manufacturing data is the foundation to achieve ROI from IIoT and continuous improvement programs.

- **Capturing asset data isn't always plug-and-play**

  - Machine data gaps create lag times to access, analyze, and act on core operations performance and business processes

 - Plant operators and management teams can't determine where they can impact uptime and quality

DATA SOURCES	DATA TYPES
▪ Network or Wireless Devices (OPC, IP, Bluetooth, SPP protocols) ▪ Intelligent Machines (PLC, CNC, CMM, Robots, Test Stands, Vision System, Optical Comparators) ▪ Local Serial Devices (micrometers, calipers, scales, tensile testers, hardness testers, keyboards, and other gauges via USB or RS232) ▪ Business Systems (ERP, MES, LIMS, APC, HMI, SCADA) ▪ Existing Data Sources (ODBC, Excel, Text Files)	▪ OEE and Quality Measurements (weight, dimensions, functional tests) ▪ Process Parameters (machine performance, environment) ▪ Attributes (visual inspections, defects) ▪ Traceability (tags, lot number, shift, machine)

OEE – Overall Equipment Effectiveness

IoTco technology leverages plant floor connectivity from "shop floor to top floor" and provides TRUE OEE metrics to all roles in the plant and enterprise.
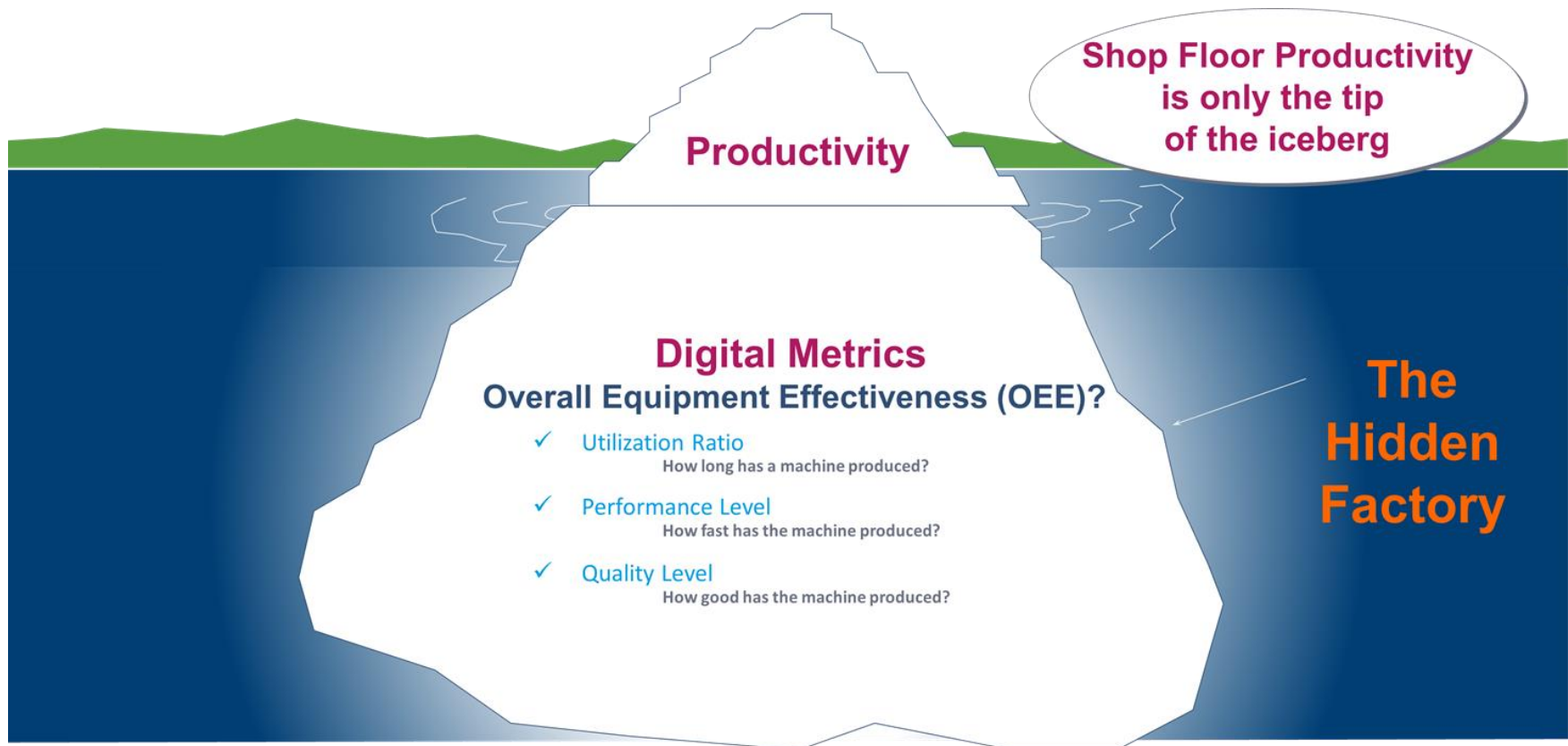
OEE – Overall Equipment Effectiveness   (contd.)

- Real-Time
- Integrated from Shop Floor (CNC/PLC) to Top Floor (ERP)
- Web-based, Mobile-capable
- Standardized and Enterprise-wide

- Modular and Phased Approach
- Think Big: Production | Quality| Inventory-Traceability| Maintenance
- Start Small: Out-of-the-box Functionality
- Scale Fast: Template-based Rollouts

Production Operations	Inventory Operations	Quality Operations	Maintenance Operations
Scheduling	Inventory	Quality Checks	Asset Register
Job Tracking		SPC	
Downtime	Label Printing	Process Monitoring	Maintenance Management
Production Counting	Traceability – Consumption	Links to Documents	Repairs
Waste		Concerns/CAPA	
Line Log Book	Build Traceability	Supplier Complaints	Tool Management
OEE			
Labour	Warehousing / Logistics	Customer Complaints	Energy

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One minute of unplanned downtime can cost tens of thousands of dollars.

Predictronics takes the guesswork out of production and maintenance planning, replacing it with accurate **predictions** that allow for a **worry-free process**.

asset reliability
process stability
worker skills
product quality

predictronics
WE KNOW **WHAT HAPPENS NEXT**

PREDICTABILITY

Predictive Maintenance
- **Asset Health**
- **Remaining Useful Life**
- **Diagnostics**

Predictive Quality
- **Part Health**
- **Quality Diagnostics**

The Data Lake → *Industrial A.I. Solution Templates* → *Use Cases*

Predictive Analytics (PDX)   *Solution Templates*

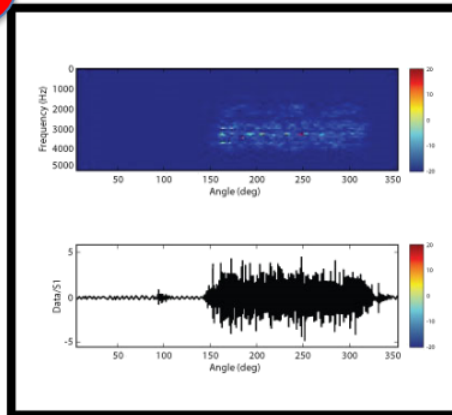| Industrial Robots	Machine Tools	Advanced Machining	Stamping Machines	Ancillary Equipment
Servo-Motor Axis Monitoring	Tool Condition Monitoring	High-Pressure Die Casting	Vibration-based Fault Detection	Compressor
Fleet-based Peer-to-Peer Analytics	Spindle Bearing Performance Monitoring	Low-Pressure Casting	Acoustic-based Analytics	Chiller
	Feed-Axis (Ball Screw) Health and Life Prediction	Injection Molding		Pump
	Coolant Analysis and Diagnosis	Welding		Motor
	Alarm and Fault Mining			Gearbox
				Valve

PDX offers 25+ Pre-Built Solution Templates

- Artificial Intelligence A.I. "out of the box"
- Quick Deployment in Weeks
- ROI-based Analytics as a Service

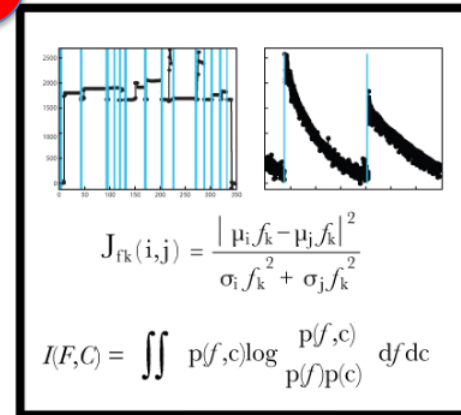# Predictive Solution Templates – *Systematic Process*

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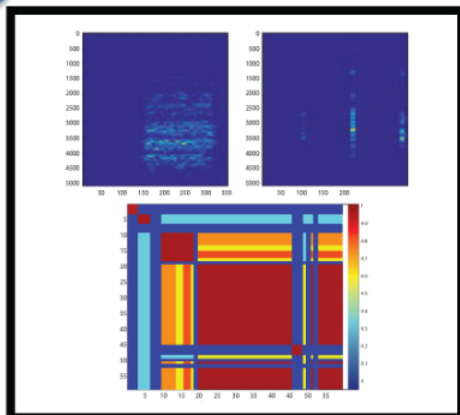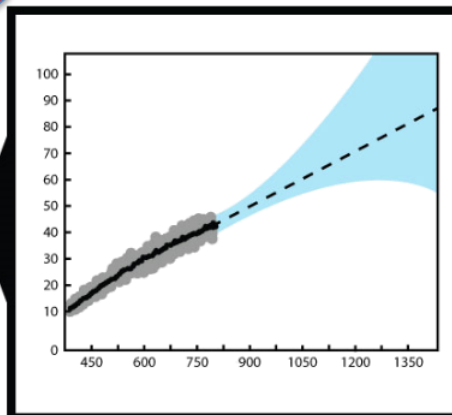**1 Data Collection**
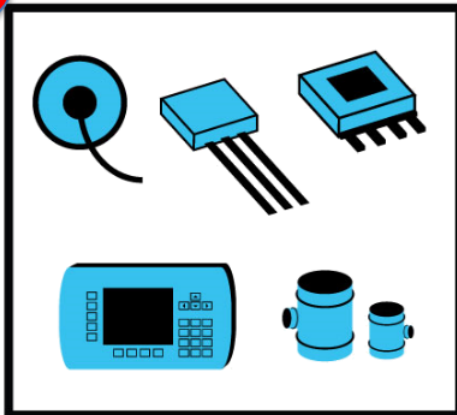
2 Signal Processing

3 Feature Extraction

$$J_{fk}(i,j) = \frac{\left| \mu_i f_k - \mu_j f_k \right|^2}{\sigma_i f_k^2 + \sigma_j f_k^2}$$

$$I(F,C) = \iint p(f,c)\log \frac{p(f,c)}{p(f)p(c)} \, df \, dc$$
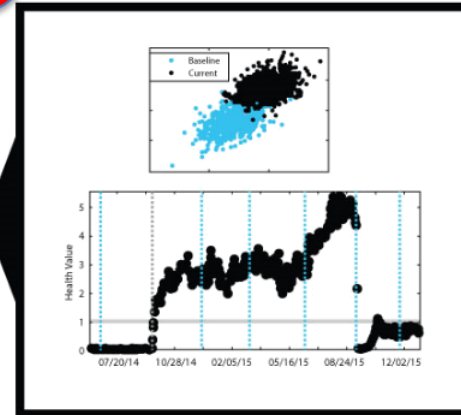
6

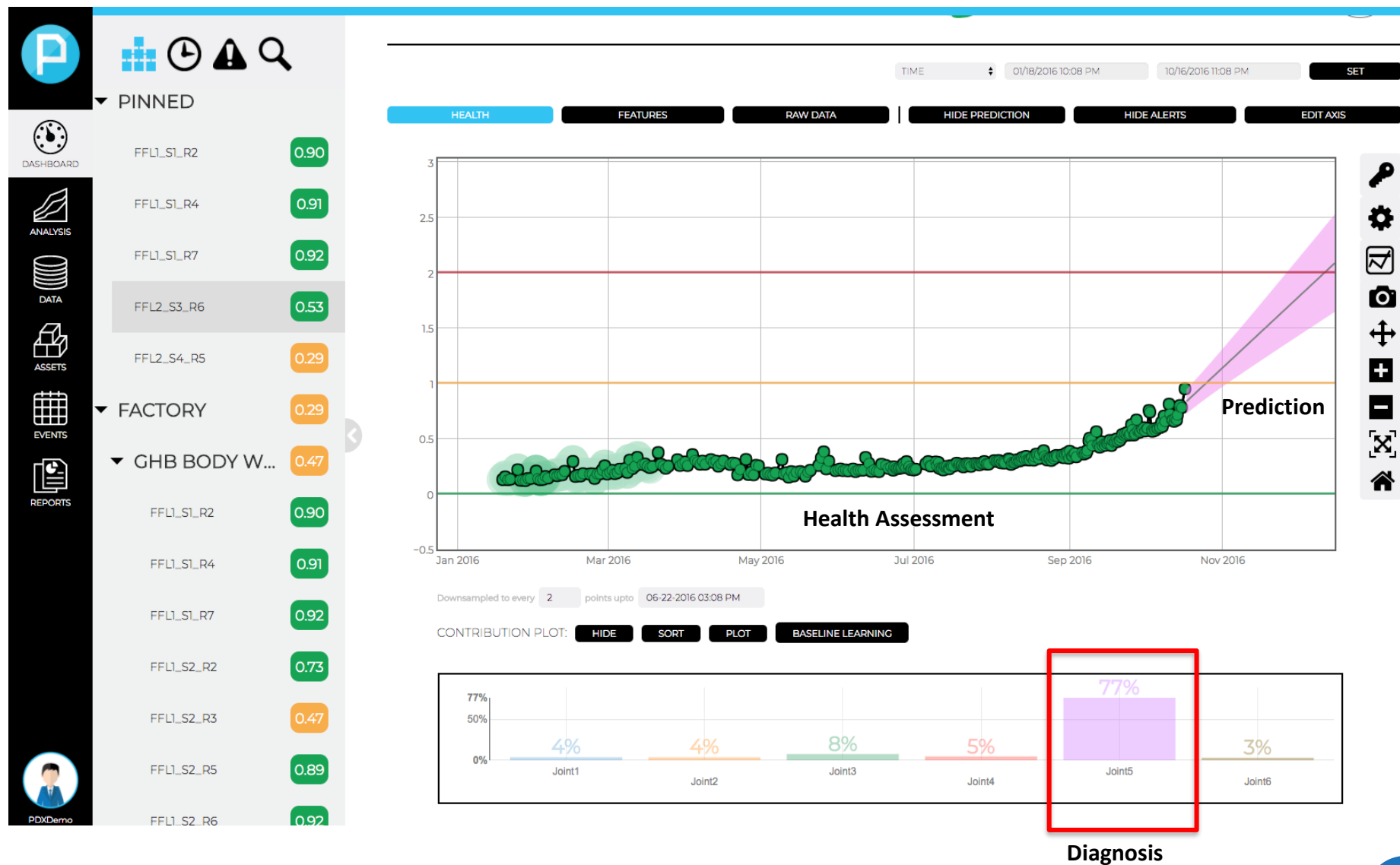**5**

4

Fault Diagnosis   **Trending / Prediction**   **Health Assessment**

Why IoTco Predictive Analytics technology?

- **Proven Clients and Experience** in Discrete Manufacturing and Automotive

- **ROI-based Predictive Analytics Use Cases** to achieve Worry-Free Productivity
  - Predictive Maintenance (Zero Downtime)
  - Predictive Quality (Zero Defects)

- **Solution Templates for Rapid Deployment** including
  - Library of 25+ out-of-the-box solutions for Robots, Stamping, Machine Tools, Casting Equipment, Compressors/Chillers, and other Critical Components

- **Interoperability** to integrate PDX into existing enterprise infrastructure, including
  - IoT Platforms, Manufacturing Execution MES, and EAM Maintenance Systems

- **Think Big, Start Small** in a 3-Step Approach

  Discovery → Proof of Value (Workshop | Pilot) → Subscribe & Scale

How We Partner With Our Clients?

Think Big → Start Small → Prove Value→ Scale Fast

Discovery and Pre-Analysis

- Assemble Team
- Identify Plant
- Discuss Preliminary Use Case and Needs
- Data Pre-Analysis

IoT Innovation Workshop

- Plant Visit
- Detailed Review of Current Systems and Processes
- Review of Technologies and Relevant Case Studies
- Confirm Critical Workplaces and Data Collection Strategy
- Discuss Business Case (ROI)

GAP Analysis

- Systems
- Infrastructure
- Process

- Identify the ideal end state, but focus on those areas which will achieve a ROI

Statement of Work SOW

- Requirements Blueprint Spec.
- Project Plan (Time/Resources)
- Cost Proposal

- Assemble proposal, highlighting required components, including infrastructure, hardware, software and services..

Proof of Value (PoV) Pilot

- Technical Deployment
- Training (Center of Excellence)
- Business Case and ROI
- Template for Global Scalability

Rollout Wave(s)

- Subscription Analytics as a Service

DISCOVER	DESIGN	DELIVER

100% ROI within 6 to 12 Months, improving Uptime, Maintenance Labor Time, and P.M. Spare Part Optimization

IoTco

Are you ready for the Digital Transformation?

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