
International Society of Automation

*Setting the Standard for Automation™*

# Responsible Disruption:

# What Engineers Need to Know about Digital Transformation

# Speakers

## Steve Mustard

Licensed Professional Engineer and industrial cybersecurity SME. Board Member and past president of ISA.

## Dave Lafferty

Over 40 years experience; leads Scientific Technical Services helping companies increase performance while improving safety and integrity through the application of technology and process improvement.

## Scott Sommer

Licensed Professional Engineer with 40+ years of experience in automation, instrumentation, and process control design and applications, for engineering & design firms, manufacturers, and service providers.

# Our Agenda Today

| What is Digital Transformation? | Case Studies | The Culture/ People Element | Interactive Q&A |
| --- | --- | --- | --- |
| Why is it relevant to manufacturers? | How has digital transformation been used across sectors? | What part do engineers, managers, and other stakeholders play? | Q&A will be at the end, but put questions in the Q&A section anytime |

# Dave Lafferty

What is Digital Transformation?

Why is it relevant to manufacturers?

Case Studies

How has digital transformation been used across sectors?

The Culture/ People Element

What part do engineers, managers, and other stakeholders play?

Interactive Q&A

Q&A will be at the end, but put questions in the Q&A section anytime

# Digital Transformation

## What is it?

- Digital Transformation is fundamentally changing how an organization operates by the adoption of digital technology to increase value through innovation, invention, customer experience, or efficiency

# Types of Digitalization

Implementation

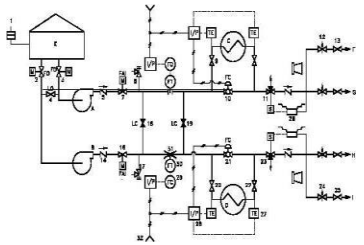
Hard

Easy

## Digital

Make Analog Digital

P&IDs to PDF



## Digitalization

Digitize Existing Workflow

Clipboard to Handhelds

## Digital Transformation

Transform the Way Business is Conducted through Digital Tools

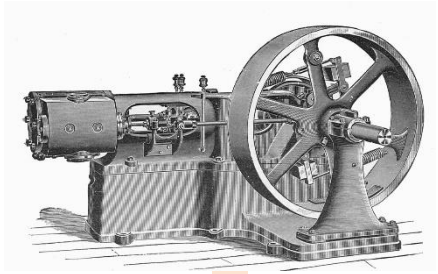
Management by Exception

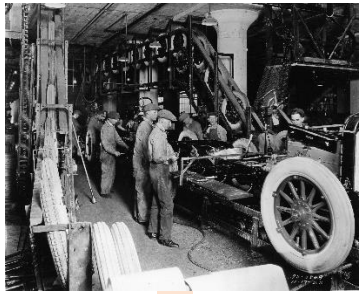
Low

Impact

High

# Industry 4.0






Industry 4.0 is about using digital to gain a competitive advantage, much like steam engines, assembly lines, and industrial robots did in previous industrial revolutions.

But it may not necessarily include changing behavior.

# Digital Transformation

## Why?

- Rate of change has accelerated — *Yellow Cab, Kodak, etc.*
- Reduced time to market — *5-10 product cycles to 18 months*
- Improve quality — *Swift, incremental increases to quality*
- Positive culture improvement — *Accept and encourage innovation*
- Enhanced customer experience

# Digital Transformation

## Benefits

- Remain competitive
- End geographic barriers
- Increase employee retention
- Improve customer experience
- Rapid, data-driven decision making

# Steve Mustard

| What is Digital Transformation? | Case Studies | The Culture/ People Element | Interactive Q&A |
| --- | --- | --- | --- |
| Why is it relevant to manufacturers? | How has digital transformation been used across sectors? | What part do engineers, managers, and other stakeholders play? | Q&A will be at the end, but put questions in the Q&A section anytime |

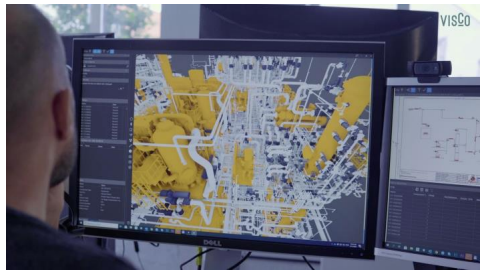
# Evolution in the Oil & Gas Industry

Implementation

Hard

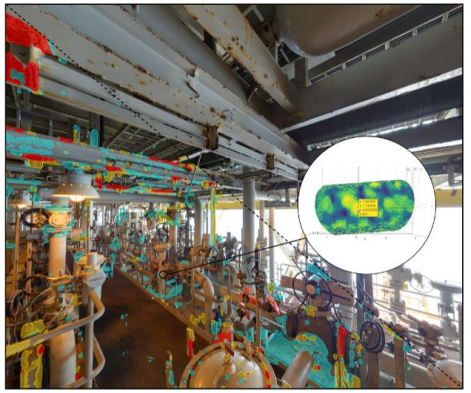
Easy

## Digital
Less paper
Better quality data



## Digitalization
Increased efficiency
Fewer mistakes


## Digital Transformation
Change business processes



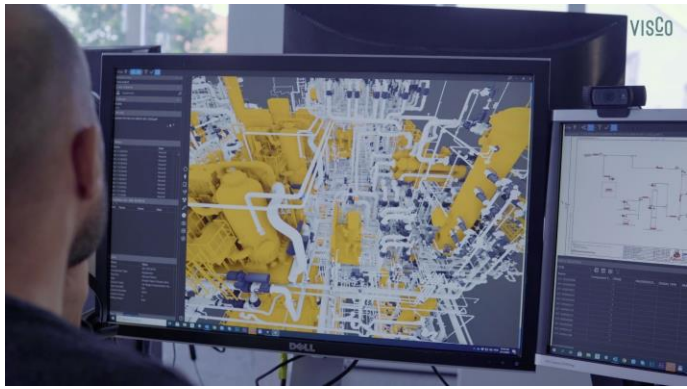
Low

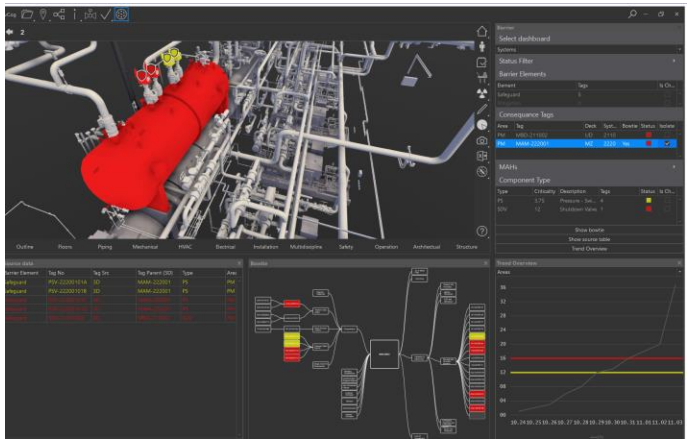
Impact

High

# Digital

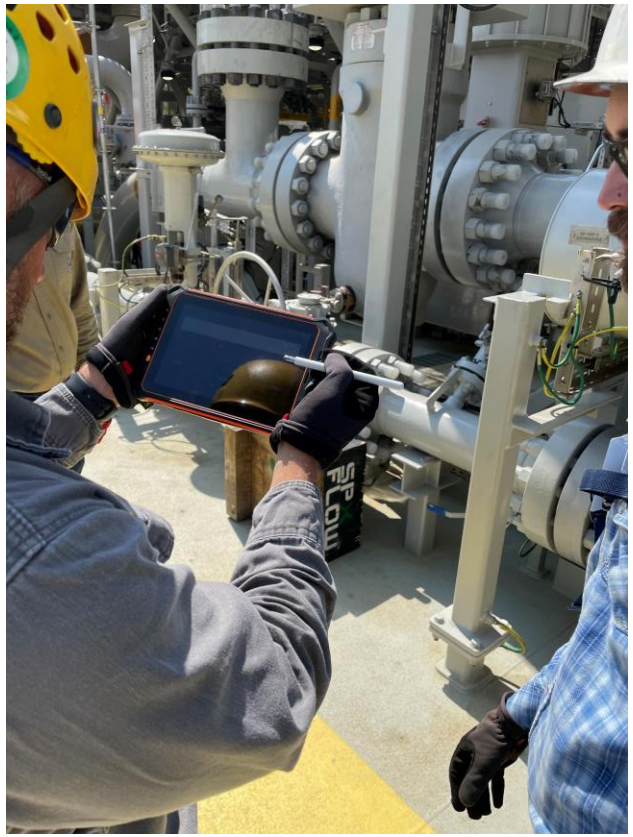
- A digital twin is an electronic replica of a real facility, built using key engineering data:
  - 3D models, 2D drawings, asset attributes
- Can integrate with other systems of record in real time to allow visualization of information in a more meaningful context
- Allows users to make decisions more quickly and reliably
- Reduces the need to be physically at the facility, improving safety and reducing travel costs



# Digitalization

- Using technology to allow users to:
  - Access documentation from central repositories
  - Allow recording of measurements, readings, etc.
  - Associate information with specific locations to make reporting easier




# Digital Transformation

- Artificial Intelligence is a field of computing that aims to design computer systems that mimic human intelligence
- Machine Learning is a key element in AI which allows the computer to learn on its own
- Significantly reduces the need for manual analysis
- Allows early identification of potential issues that might otherwise be missed
- Repeatable and without human bias

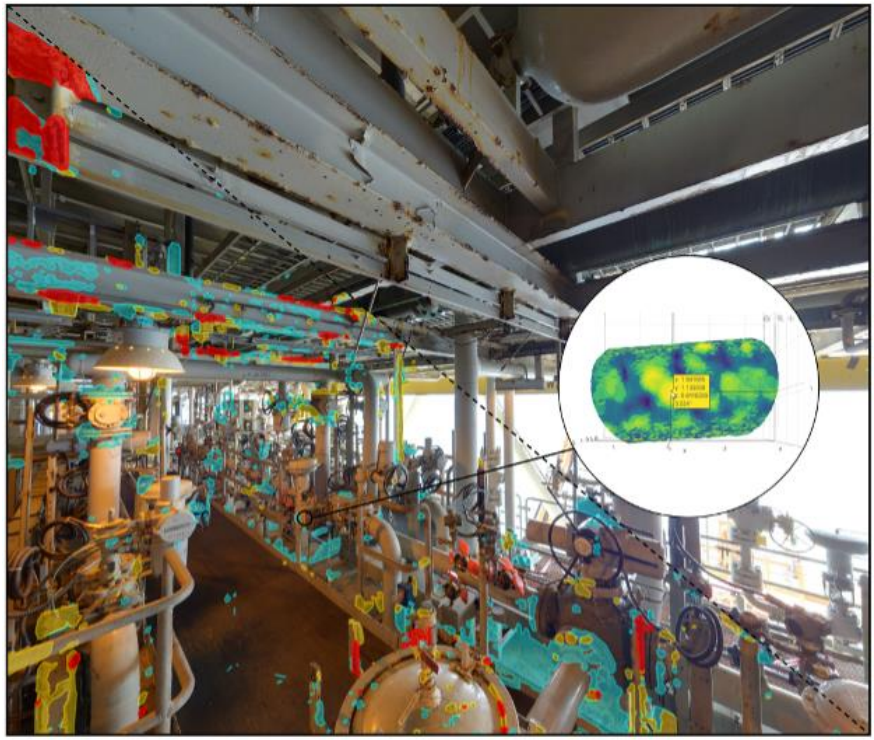


Image © Abyss Solutions

# Scott Sommer

| What is Digital Transformation? | Case Studies | The Culture/ People Element | Interactive Q&A |
| --- | --- | --- | --- |
| Why is it relevant to manufacturers? | How has digital transformation been used across sectors? | What part do engineers, managers, and other stakeholders play? | Q&A will be at the end, but put questions in the Q&A section anytime |


Digital Transformation
It’s not a project. It’s a journey.
ISA

# Culture and People

- Digital Transformation involves using digital technology to change the way (workflow) how an organization does business
- This journey involves much more than just the technology:
  - Technology
  - People & Culture
  - Business Capabilities
  - Regulatory Considerations

Resource: Biophorum Digital Plant Maturity Model, 2018, www.biophorum.com

# Roadmap

- "The Roadmap" - benchmark your progress toward digital maturity


- Define projects and initiatives to progress toward digital maturity
- Periodically reassess progress – priorities will change over time!

# Roadblocks

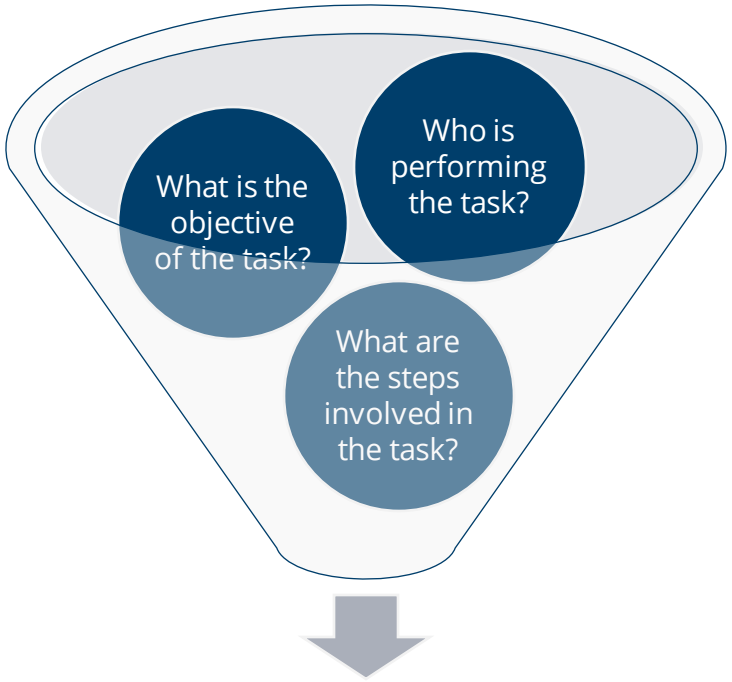
- The desire for Digital Transformation is there, but roadblocks may exist:
  - Legacy Systems
  - Lack of Funding
  - Competing Priorities
  - Regulatory Challenges
  - Organizational Structure Friction
  - Misalignment of Business IT and Manufacturing OT
  - Risk-Adverse Culture

Resource: FDA OCET Study, https://www.fda.gov/media/152568/download

# Unblock that Road! (1)

What can engineers do to help facilitate a company's digital transformation?

Develop a use case:




# Use Case Example

Vendor Equipment Package – Chiller Skid with 2 Chillers

- Currently hardwired to control system
  - Status
  - Alarm
  - Outlet temperature
- Wish to connect to Chiller package with TCP/IP interface
  - Bring in package controller data to control system
  - Use data for analysis of performance trends over time

# Use Case Example: Manufacturing Support

| Level 1<br>Pre-Digital Plant | Level 2<br>Digital Silos | Level 3<br>Connected Plant | Level 4<br>Predictive Plant | Level 5<br>Adaptive Plant |
|---|---|---|---|---|
| Plant matured past this level | Partially describes my Plant | Does not describe my plant | Does not describe my plant | Does not describe my plant |
| ● Primarily manual processing and paper-based processes. | ◑ Automated systems used for most processes listed in Level 1. | ○ Integrated global applications are used for all processes listed in Level 1, with data usage standardized across sites. | ○ Predictive analytics use real-time sensor data and machine learning to optimize utility and building operations. | ○ The plant operates largely autonomously and automatically adapts to changing conditions. |
| ● Basic PLC controls for utilities. | ◑ Limited integration and data transfer between systems. | ◑ Training records are integrated into operational systems so operators can only perform tasks for which they're trained and qualified. | ○ Virtual reality provides an immersive training experience. | ○ Equipment is plug-n-play, self-calibrating and self-diagnosing. |
| ● Paper or spreadsheet for spare parts, maintenance, and calibration. | ◔ Many systems are specific to the site, or are used differently at the site than at other sites. | ○ 3D facilities documentation is used for new design and construction. | ○ 3D facilities documentation (a "digital twin" of the plant) is integrated into maintenance, change control, training, and operational systems. | ○ Zero unplanned downtime. |
| ● Paper or spreadsheet for employee training records and safety incident tracking. | ◔ Gaps are filled with spreadsheets or similar personal productivity tools. | ○ Utilities control systems feed into an integrated cockpit for remote monitoring, alerting, and control. | ○ Human shop floor activities are guided by the digital plant model and augmented reality. | ○ Utilities, building, and energy management are self-optimizing. Remote (off-site) monitoring is the norm. |
| ● Paper or spreadsheet for environmental monitoring plans, sample tracking, and results. | | ○ Condition-based maintenance. Initial efforts at predictive maintenance. | ○ Predictive maintenance. | ○ Routine maintenance and calibration tasks are performed automatically without human intervention. |
| 100% | 38% | 10% | 0% | 0% |

# Use Case Example: People Support

| Level 1<br>Pre-Digital Plant | Level 2<br>Digital Silos | Level 3<br>Connected Plant | Level 4<br>Predictive Plant | Level 5<br>Adaptive Plant |
|---|---|---|---|---|
| Plant matured past this level | Fully describes my Plant | Partially describes my Plant | Does not describe my plant | Does not describe my plant |
| ● Culture focused on paper processes and forms. | ◕ Operators and supervisors are becoming technically knowledgable and support adoption of digital solutions. | ◔ Business personnel are thought leaders who encourage the application of digital technology and rely on technology in their operations. | ○ Business partners expect digital technology to enable achievement of their strategic goals (for example, to increase production capacity). | ○ Business partners rely on and trust technology to autonomously operate the plant. |
| ● Operators and supervisors design and execute paper processes. | ● Technology capabilities are site based, not centrally harmonized. | ○ Operators and supervisors work with a complex set of integrated systems and equipment. | ○ Personnel must understand data qualty and analytics, and evaluate when to rely on predictive analytics and when to challenge. | ○ Most site roles are performed by on-site mobile autonomous systems or remote operators and experts. |
| ● IT and Automation (OT) are viewed as support personnel who add limited value to the business. | ◔ IT and Automation (OT) are viewed as service providers. | ○ User interfaces are designed with the end use in mind (user-centric design). | ○ Systems allow for personalized user experiences; new displays can be built by users quickly. | ○ Remote experts use telepresence and work through on-site mobile autonomous systems. On-site personnel work alongside mobile robots. |
| ● IT customer service is reactive. | ● There are minimal standard reporting capabilities. Site personnel rely on IT to obtain data and information from systems. | ◔ IT and Automation (OT) cultures and processes start to converge. | ○ End users engage in self-service knowledge management. | ○ Facilities are designed to allow mobile autonomous systems to access all areas of the plant. |
| | | | | ○ Local staff are needed for complex, unexpected, urgent situations such as regulatory inspection, safety incident, natural disaster, civil unrest. |
| 100% | 75% | 13% | 0% | 0% |

# Unblock that Road! (2 and 3)

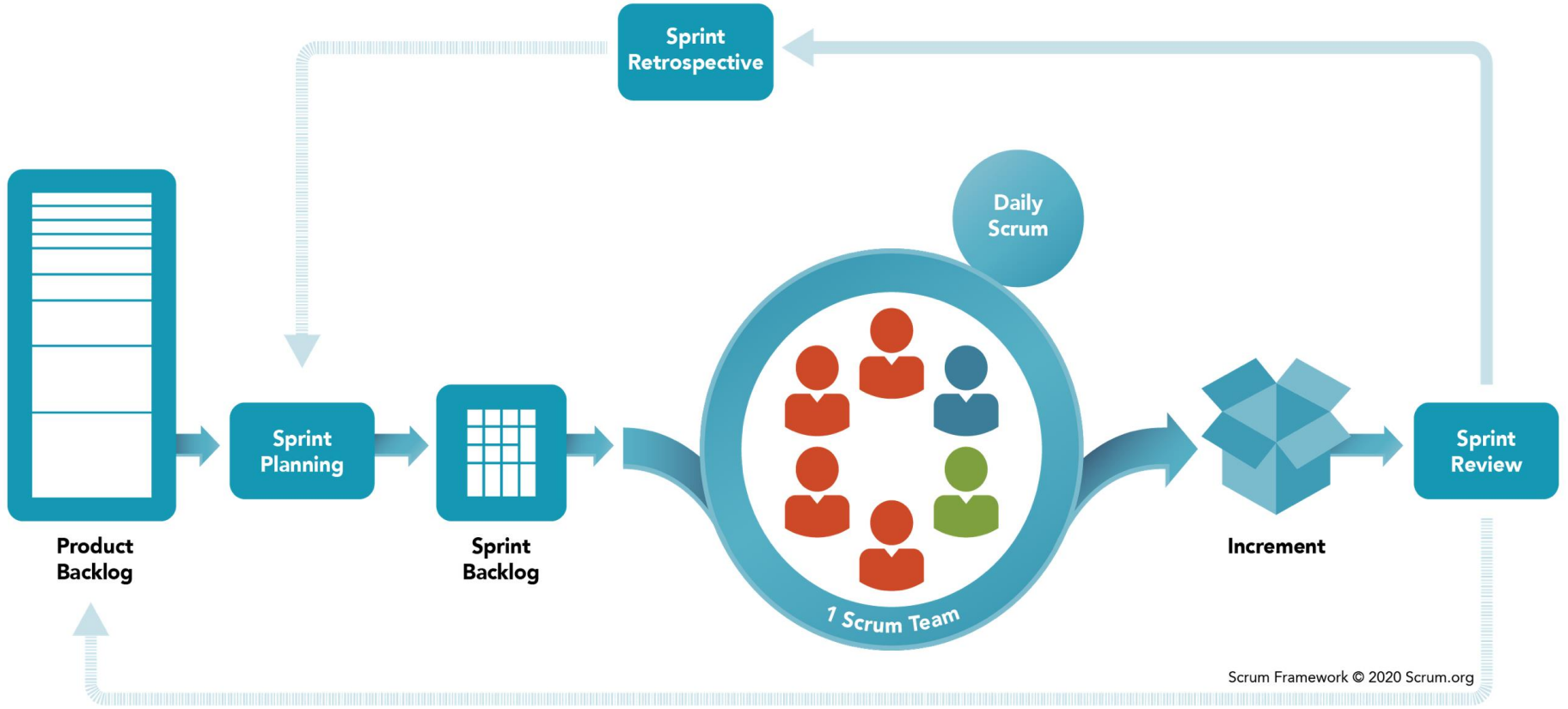
What can engineers do to help facilitate a company's digital transformation?

- Identify Stakeholders
  - Management
  - Operations
  - IT
  - Engineering
  - Regulatory Agencies
- Develop a Roadmap
  - Project Progression
  - Define Scope, Cost, Value
  - Determine Success Criteria
  - Determine Risk

# Unblock that Road! (4)

What can engineers do to help facilitate a company's digital transformation?

Execute the project:



# Unblock that Road! (5)

What can engineers do to help facilitate a company's digital transformation?

Assessment and Identify Next Steps:

- Were objectives met?
- Cost and Schedule on target?
- Value returned to company?

# Your Questions

| What is Digital Transformation? | Case Studies | The Culture/ People Element | Interactive Q&A |
| --- | --- | --- | --- |
| Why is it relevant to manufacturers? | How has digital transformation been used across sectors? | What part do engineers, managers, and other stakeholders play? | Q&A will be at the end, but put questions in the Q&A section anytime |

# More on Digital Transformation

## Other Resources from ISA

- **Digital Transformation Training Series**
  - Provides you with all the tools necessary to actively and efficiently participate in digital transformation projects at your plant site or organization
  - NOW AVAILABLE: Introduction to IIoT — The Industrial Internet of Things (DT101)
  - Self-paced modular course, sign up any time at https://www.isa.org/products/introduction-to-iiot-the-industrial-internet-of-th

# More on Digital Transformation

## Other Resources from ISA

**Upcoming Events** – join us in person or virtually – [www.isa.org/events](www.isa.org/events)

**OT Cybersecurity Summit**

Aberdeen, Scotland | 31 May – 1 June

**Automation & Leadership Conference**

Colorado Springs, USA | 4-6 October

**Digital Transformation Brazil**

Brazil | September

**Digital Transformation Asia Pacific**

Australia | November

International Society of Automation

*Setting the Standard for Automation™*

# Thank you!