Digital Transformation and Smart Manufacturing in Food & Beverages Industry

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ARC
Advisory Group

Agenda

Introduction

- Drivers, Challenges, Trends and Benefits

Data & Use Cases

- Digital Transformation in Food & Beverages
- User Survey Results
- Use Case
- Where are you?

Panel Session

- Q & A

About ARC: Global Advisors to Industry

- Leading analyst team focused on manufacturing ecosystem

- 31 years of thought leadership and market analysis

- 1,500 clients - include end users, suppliers, and financial

- Global advisory, consulting, supplier selection, services, Industry insights in 19 industrial verticals

- Market research, conferences, forums, white papers, newsletters, blogs, and other publications

Delivering value and influence to emerging vendors

www.arcweb.com

Digital Transformation

Digital Transformation is the transformation of business, industrial products, operations, value chains, and services that are enabled through the augmentation of people and knowledge through the expanded use of digital technologies.

Remote Services/ Mobility/ 4G/5G anywhere

Cloud Computing / New IoT Platforms

Simplify User Experience

Digital Twins/ VR/AR
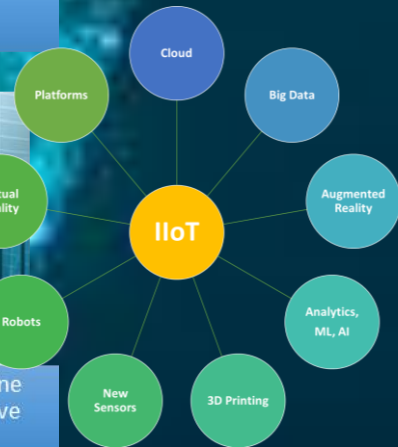
Robotics & Drones/ New Sensors

Additive Manufacturing

Connectivity & Interoperability

Artificial Intelligence / Machine Learning / Big Data / Predictive Analytics

Cloud

Platforms

Big Data

Virtual Reality

Augmented Reality

IIoT

Robots

Analytics, ML, AI

New Sensors

3D Printing

Digital Transformation Challenges

Many Food & Beverage Industry Challenges

Changing consumer preferences

- More sustainable
- Product innovation, differentiation

Food quality concerns

- Unsafe handling, food-borne illnesses
- Recalls & outbreaks of illnesses
- Regulations

New worker generation and retiring worker generation

- Mentoring, training, new technologies
- Retirees knowledge

Integrated new technologies

- From raw materials to supply chain
- Secure & customizable digital infrastructure

Reducing costs – remaining competitive

- Omni-channels
- More competition

Which kind are you?

Cultural alignment is Important!

Can Technology Align Culture?
What Cultural Barriers do you have?

People/Culture
Buy-in
Collaboration

Technology
Data/Information Challenges
Integration Challenges
IT/OT Challenges

Business
Perceived Benefits & Visibility
Executive buy-in
Financials

Processes/Things
Real-time complex processes
New equipment/sensors
New ways of doing things

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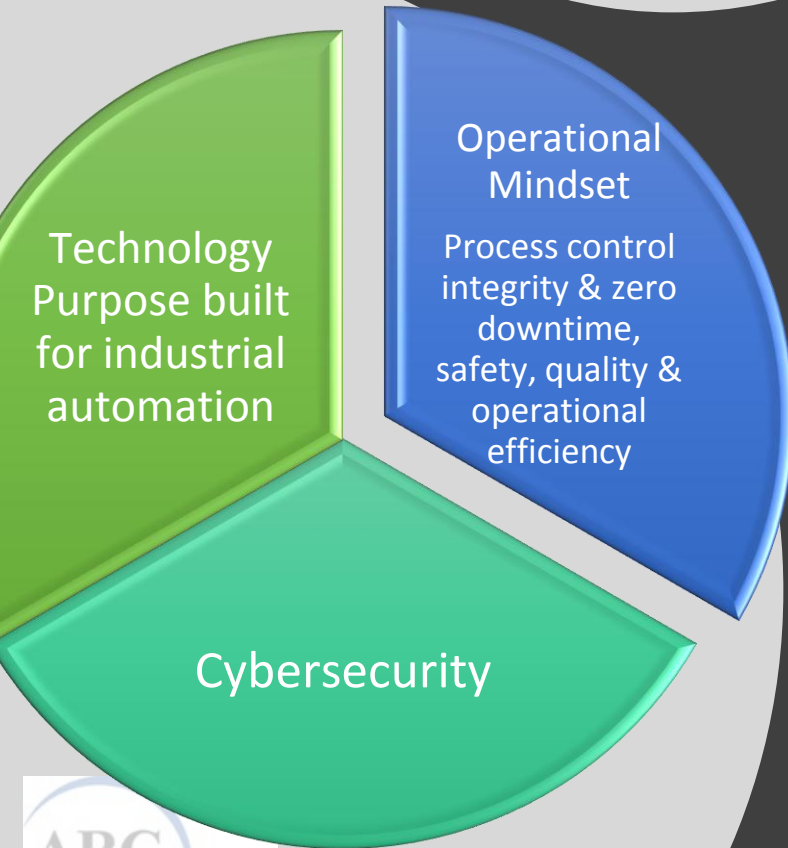Advisory Group

Requires Working Together!

People/Culture
Buy-in
Collaboration

Technology
Data/Information Challenges
Integration Challenges
IT/OT Challenges

Business
Perceived Benefits & Visibility
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IT/ OT Challenges
Different Mindsets....Different Issues

Challenges
IT/OT Priorities/Cultures Can Differ

| Option1	Option 2	Option 3	Option 4
Separate Manufacturing IT from OT; Wall of Mistrust	Train/Embed IT Skills in Automation/ Engineering	Put Engineering resource under IT Services	Put OT resource in engineering

Cultural Challenges

"IT is on their own. Manufacturing may have IT experts, but they are manufacturing people. Manufacturing IT people and IT people don't see eye to eye."
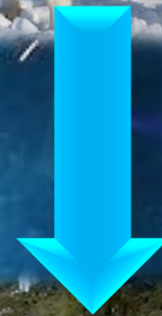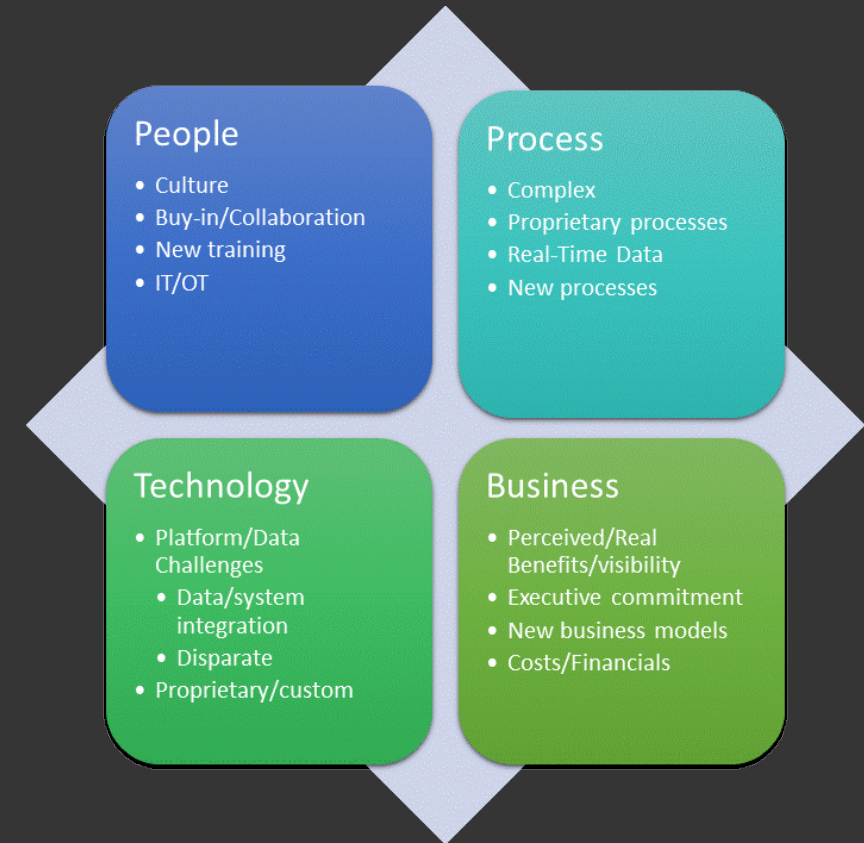
Cultural Evolution

New technologies are both disrupters & catalysts for industry change.

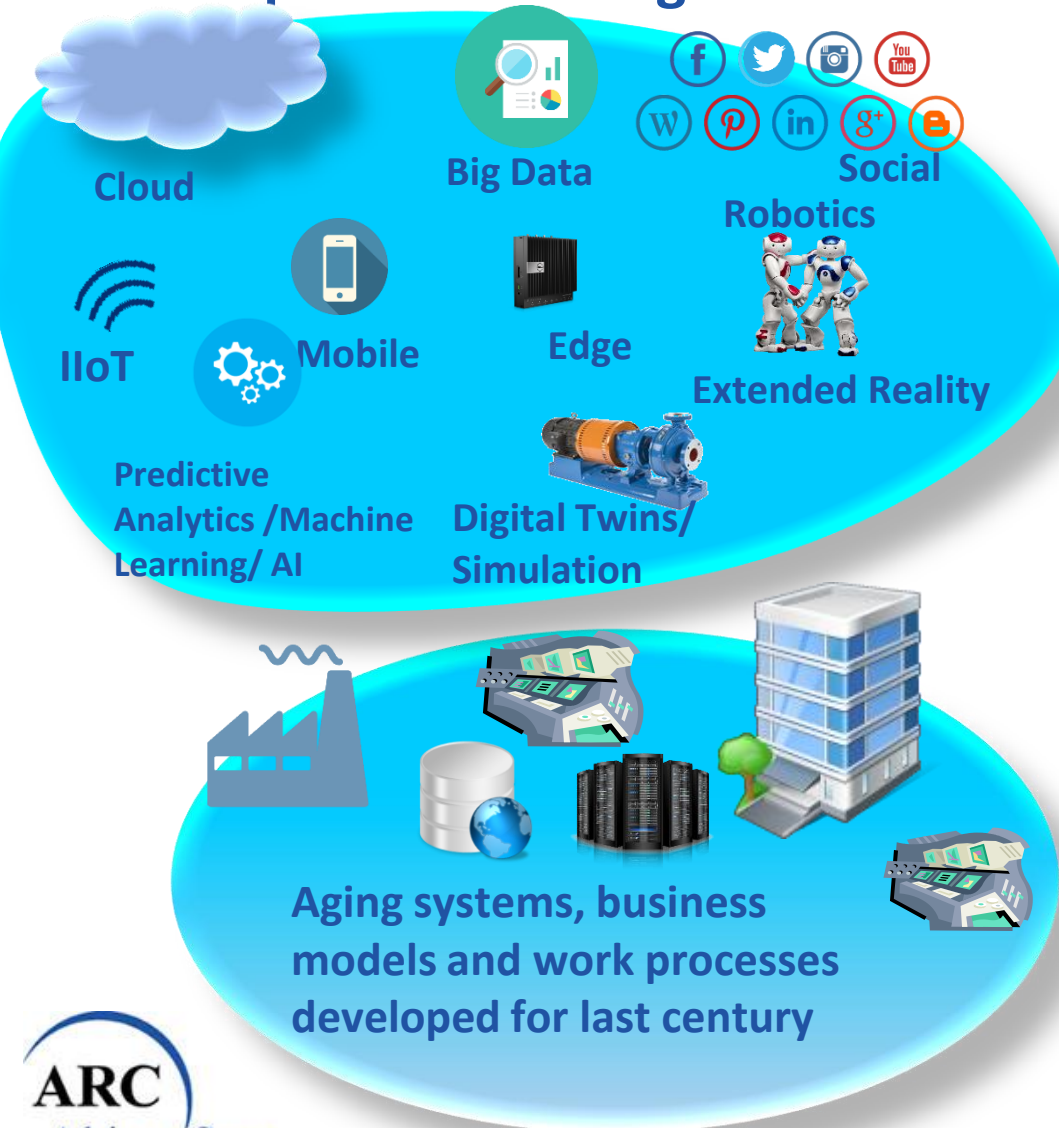## What are you doing for the digital transformation?

- Digital culture readiness
  - Without a digital culture it's not a digital transformation
  - Nearly 78% of companies that focus on culture sustain performance.
  - By ignoring culture, you risk transformation failure
  - Better financial performance
  - Worker & process enablement is important
    - Job losses - should be addressed

People
- Culture
- Buy-in/Collaboration
- New training
- IT/OT

Process
- Complex
- Proprietary processes
- Real-Time Data
- New processes

Technology
- Platform/Data Challenges
  - Data/system integration
  - Disparate
- Proprietary/custom

Business
- Perceived/Real Benefits/visibility
- Executive commitment
- New business models
- Costs/Financials

"Culture determines how things get done"
But technology can help drive culture"

Technologies and Business Practices
Enables the Digital Transformation of industry

Disruptive Technologies

Cloud

Big Data

Social

Robotics

IIoT

Mobile

Edge

Extended Reality

Predictive Analytics /Machine Learning/ AI

Digital Twins/ Simulation

Aging systems, business models and work processes developed for last century
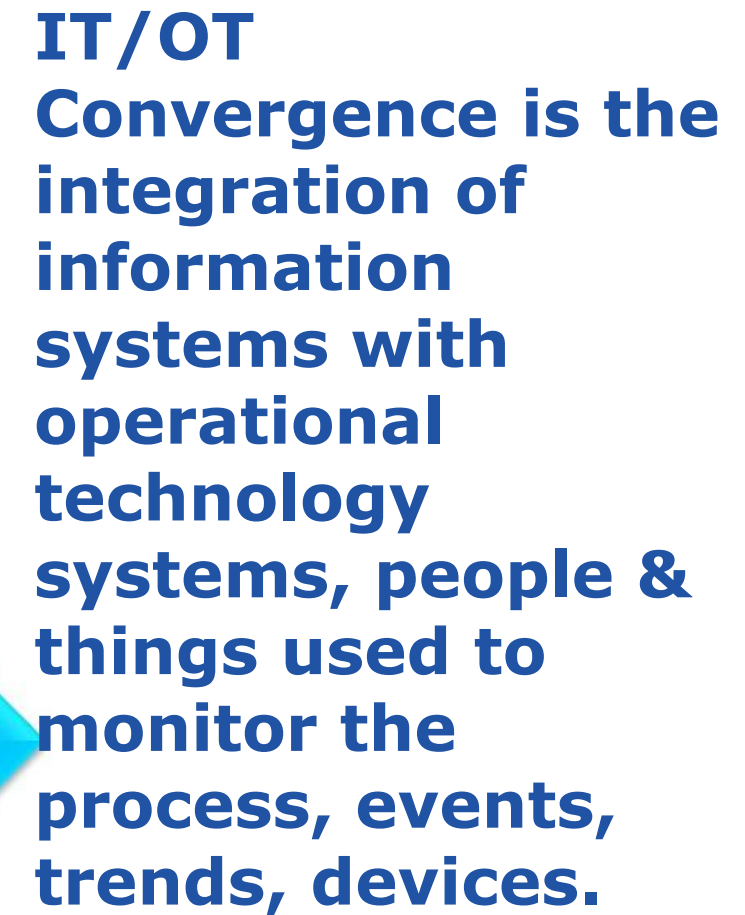
From Farm to Fork

- Connected Supply Chain
- Connected Enterprise
- Connected Operations
- Connected Products
- Connected Services
- Connected Workers
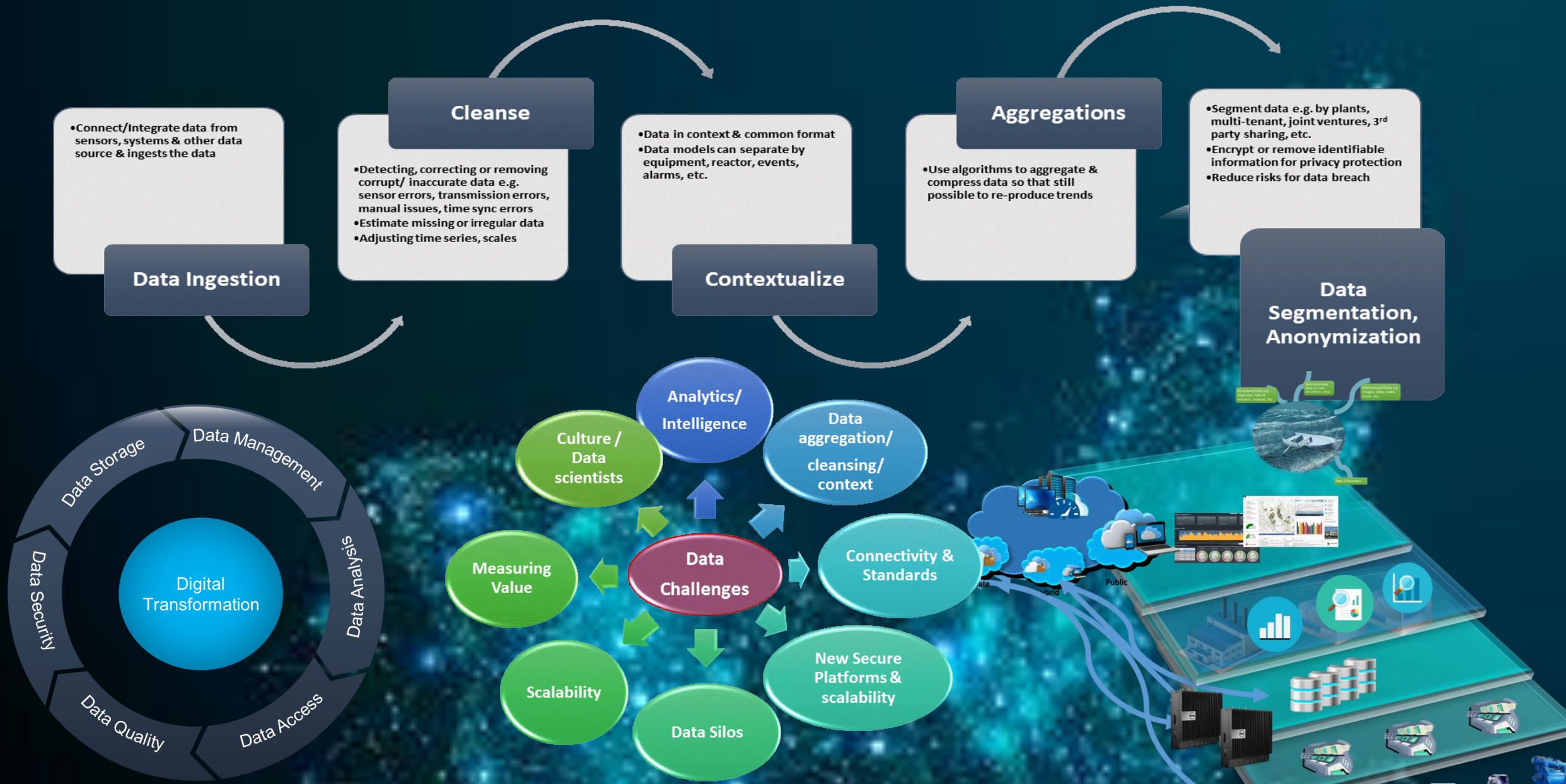- Empowered
- Synchronized, Collaborative & Autonomous

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More Challenges - Technology

IT/OT Convergence is the integration of information systems with operational technology systems, people & things used to monitor the process, events, trends, devices.

Digital Transformation Challenges
Data Challenges

Data Ingestion
- Connect/Integrate data from sensors, systems & other data source & ingests the data

Cleanse
- Detecting, correcting or removing corrupt/ inaccurate data e.g. sensor errors, transmission errors, manual issues, time sync errors
- Estimate missing or irregular data
- Adjusting time series, scales

Contextualize
- Data in context & common format
- Data models can separate by equipment, reactor, events, alarms, etc.

Aggregations
- Use algorithms to aggregate & compress data so that still possible to re-produce trends

Data Segmentation, Anonymization
- Segment data e.g. by plants, multi-tenant, joint ventures, 3rd party sharing, etc.
- Encrypt or remove identifiable information for privacy protection
- Reduce risks for data breach

Digital Transformation
- Data Storage
- Data Management
- Data Analysis
- Data Access
- Data Quality
- Data Security

Data Challenges
- Analytics/ Intelligence
- Data aggregation/ cleansing/ context
- Culture / Data scientists
- Measuring Value
- Connectivity & Standards
- Scalability
- Data Silos
- New Secure Platforms & scalability

What are some of the Technologies for the Digital Transformation?

What are you doing for the Digital Transformation? (survey)

- Executive team and support for digitization initiatives
- IT/OT teams
- Using technology to enable collaboration

Cultural Evolution

- Data visibility & accessibility
- Contextualizing and combining data
- Connecting/integrating data

Data management

- ML, AI – some roll outs(E.G. shortening batch times, filling lines, custody transfers, etc.)
- Predictive analytics

Advanced analytics

- Replacing legacy systems
- Cloud and edge
- MES
- Historian

New platforms

- Moving data to the cloud, edge, etc.
- Moving historical, reports, regulatory documentation to cloud
- Structured and unstructured

Data lakes, Cloud, Edge

- Replacing repetitive tasks, material movement, filling lines

Robots, chatbots, AGVs, etc.

- AR/VR – mostly discrete, maintenance
- CAMERAS/Video EVERYWHERE

Visualization

- Enhancing cybersecurity technologies and computer access
- Other

Security

About the value!

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What are you doing for the Digital Transformation?

Mobile everything

New IoT sensors
• New audio sensors

Digital twin & simulation

Track and trace/blockchain

About solving the problem and getting value!

Additive manufacturing

Integrated technologies
• End-to End

New processes

SERVICES/Ecosystems of partnerships/services

Lots of Data in Manufacturing

- Service providers
- Analytics
- Geographically diverse assets
- Manufacturing & operations
- Supply chain logistics/ Transportation
- Social media
- Extended reality
- New embedded sensors & data types
- Partners
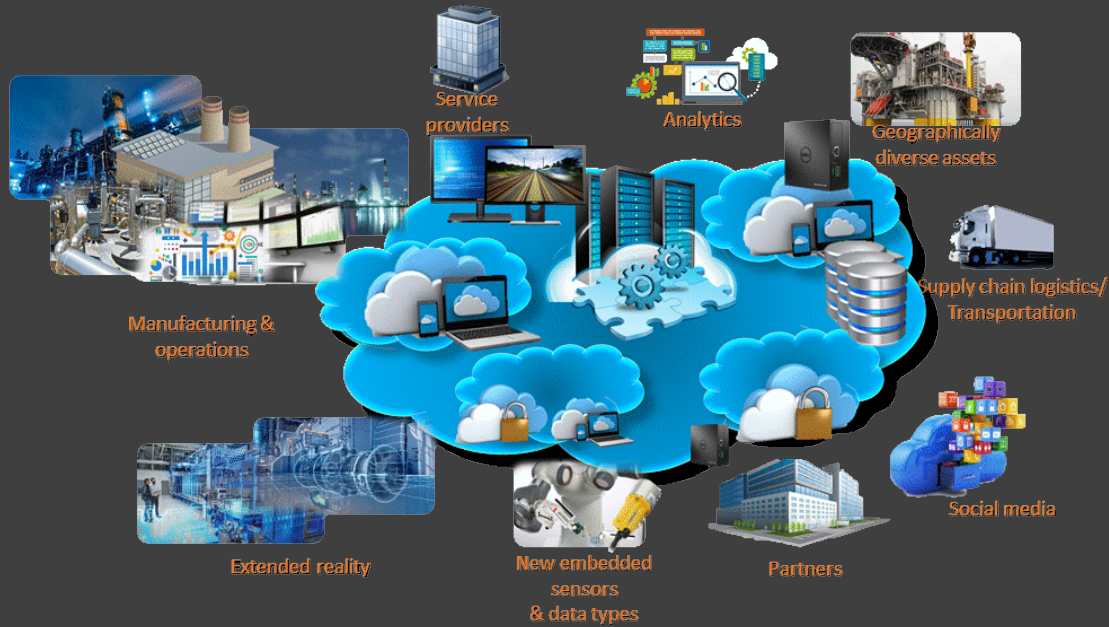
Data Lakes

Structured Data e.g. organizes, rows & columns, ordered, etc.

Semi-Structured Data e.g. text, documents, email

Unstructured Data e.g. images, video, audio, social, etc.

Data Consumers

Raw Data in One Place

Lots of New Digital Devices, Data and
Cloud, Edge, On-premise Data Platforms for DT

Data context will become even more important!

New Platforms for the Digital Transformation

- A multi-layer technology that enables the secure provisioning, management, and automation of connected devices within the Internet of Things e.g. remote devices, sensors, data, and applications.

- IoT platforms is a cloud platform that collects, configures, manages and maintains data and devices with different layers (including cloud), protocols and network topologies.

'IoT' Platforms

Cloud Application Platform

Analytics Platforms

Operations Platforms

Data Platforms

Device Connectivity Platform

Network Communications Platform

Embedded Compute/Comms Platform

Mobile Device Platform

Control Platform

Interoperable

Digital Platform
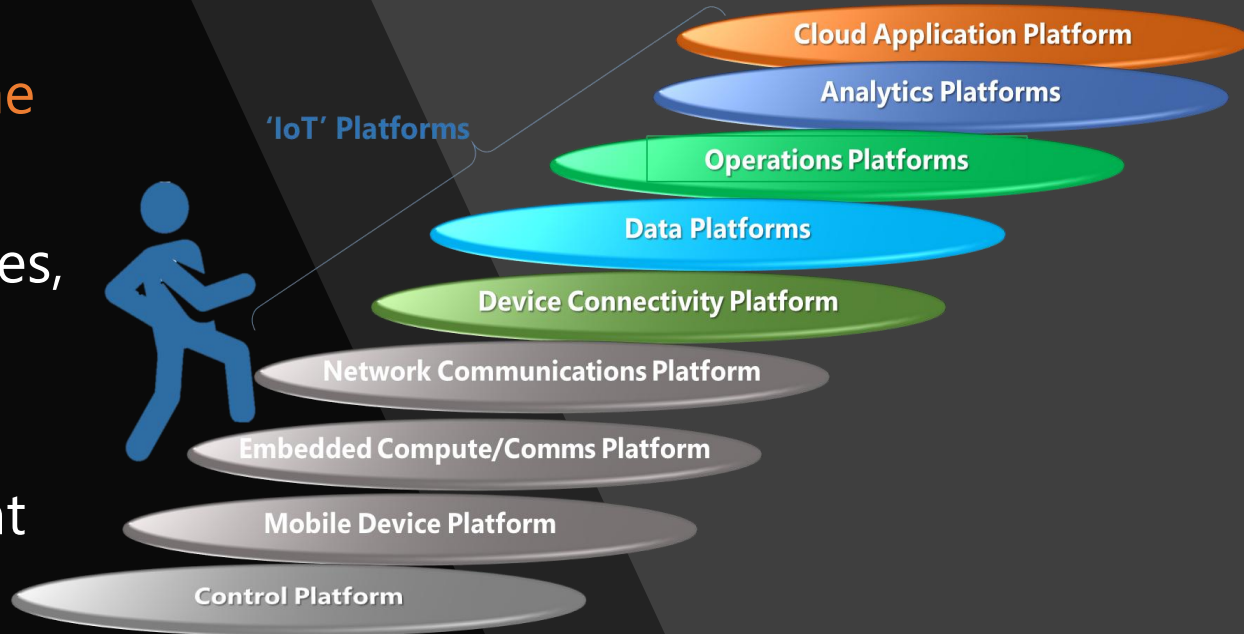
All types of Analytics
What's essential?
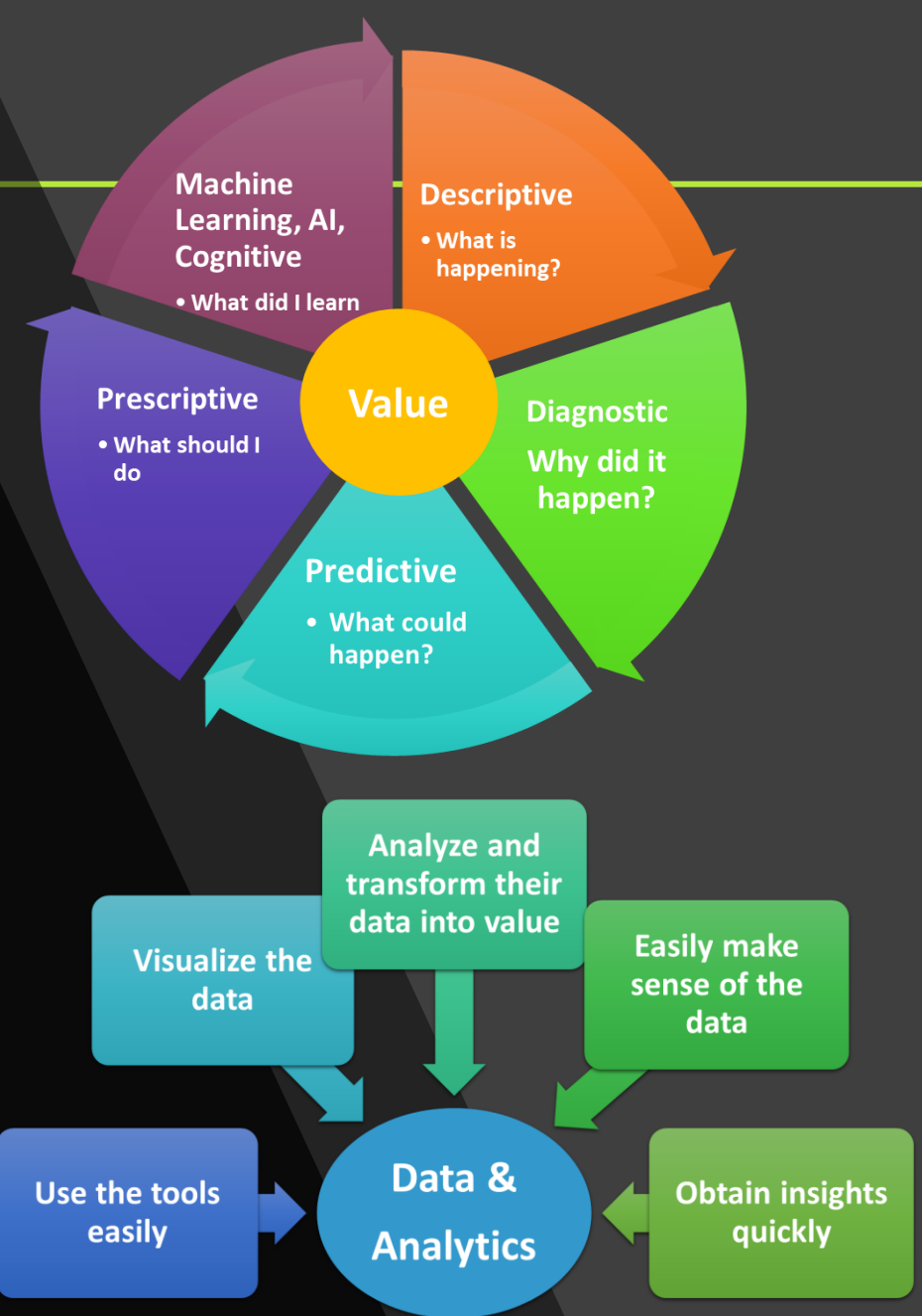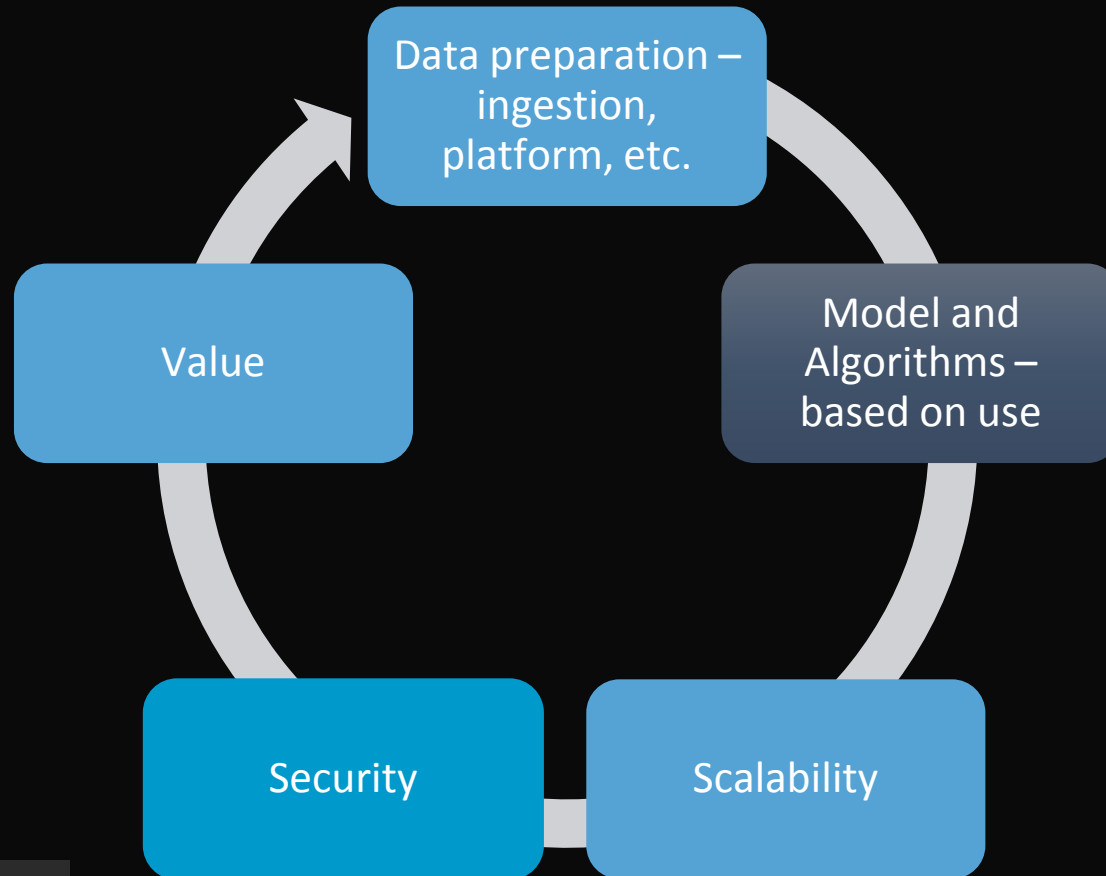
WHAT IS A.I.?

> AI – models and applies or imitates intelligence of human minds

- Chatbots - <mark>Google assistant, home, mini ,</mark> AWS Alexa, Dot, Apple's Siri, Microsoft Cortana rely on DeepMind – AI

- Moving personal profiles or apps from one platform to another?

- 8 million people use voice recognition today

Artificial Intelligence
Enables computers to mimic human behavior, self-learns

Machine Learning
AI app that provides the ability for machines to learn and improve from data and experience without being explicitly programmed

Deep Learning
Multi-layer neural networks

ML is a subset of AI!

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AI Example
How many bagels?

- AI Example
  - Facial recognition

How many bagels?

- 8 dogs
- 8 bagels
- Machines are faster
- The algorithm could distinguish the dogs but different breeds are more difficult.
- <mark>Tools & Algorithms are getting better and easier to deploy</mark>

About Solving Problems!

Digital Transformation
Transformation Brings Value

Data
Information
knowledge
Intelligence
Intelligence-based Action

People
- Connecting people for collaboration
- Getting everyone on the same team

Process
- Changing processes
- Delivering process intelligence to whomever, wherever, and whenever it is needed

Things
- Sensors, machinery, robots and other assets are connected
- IIoT

Data
- Connecting and leveraging data
- More autonomous – auto connect
- Connected plant, enterprise
- New data platforms – edge & Cloud

New Technologies
- Analytics & AI
- Robotics, Cobots, etc.
- Extended realities

There's a lot of value in real-time data-based decisions!

What are you doing for the Digital Transformation? Use Cases...
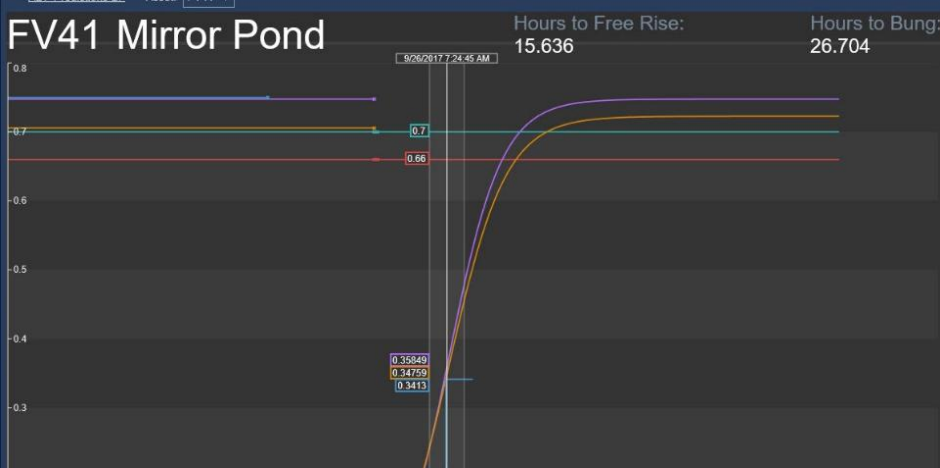
Deschutes Brewery

- PI system analytics to predict Diacetl rest
- Make better tasting beer
- Reduced production time by up to 72 hours for each batch
- Maximized capacity and postponed $8M in capital upgrades
- **BENEFITS**
  - Real-time data resulted in better brewing
  - 4% decrease in total fermentation time

Where are you in your Digital Transformation Journey?

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53% Concerned

about their ability
to achieve
business goals for
DT.

Source: RSM

81% taking steps to develop DT strategy.

Source: RSM

What are you doing?

Manufacturing and Data Maturity Model for the Digital Transformation

3. SMART MANUFACTURING

Data is recognized as a key asset. Few data silos. Data alignment. Resources are committed to extracting value from data using advanced analytics. Synchronizing. Robotics, etc. Analytics Multiple plants. Cultural Alignment.

2. CONNECTING SILOS/ANALYTICS

Connecting silos across plants, standards, practices, new sensors, new technologies.

1. COLLECTING DATA

Basic data, many silos, some reporting, spreadsheets...
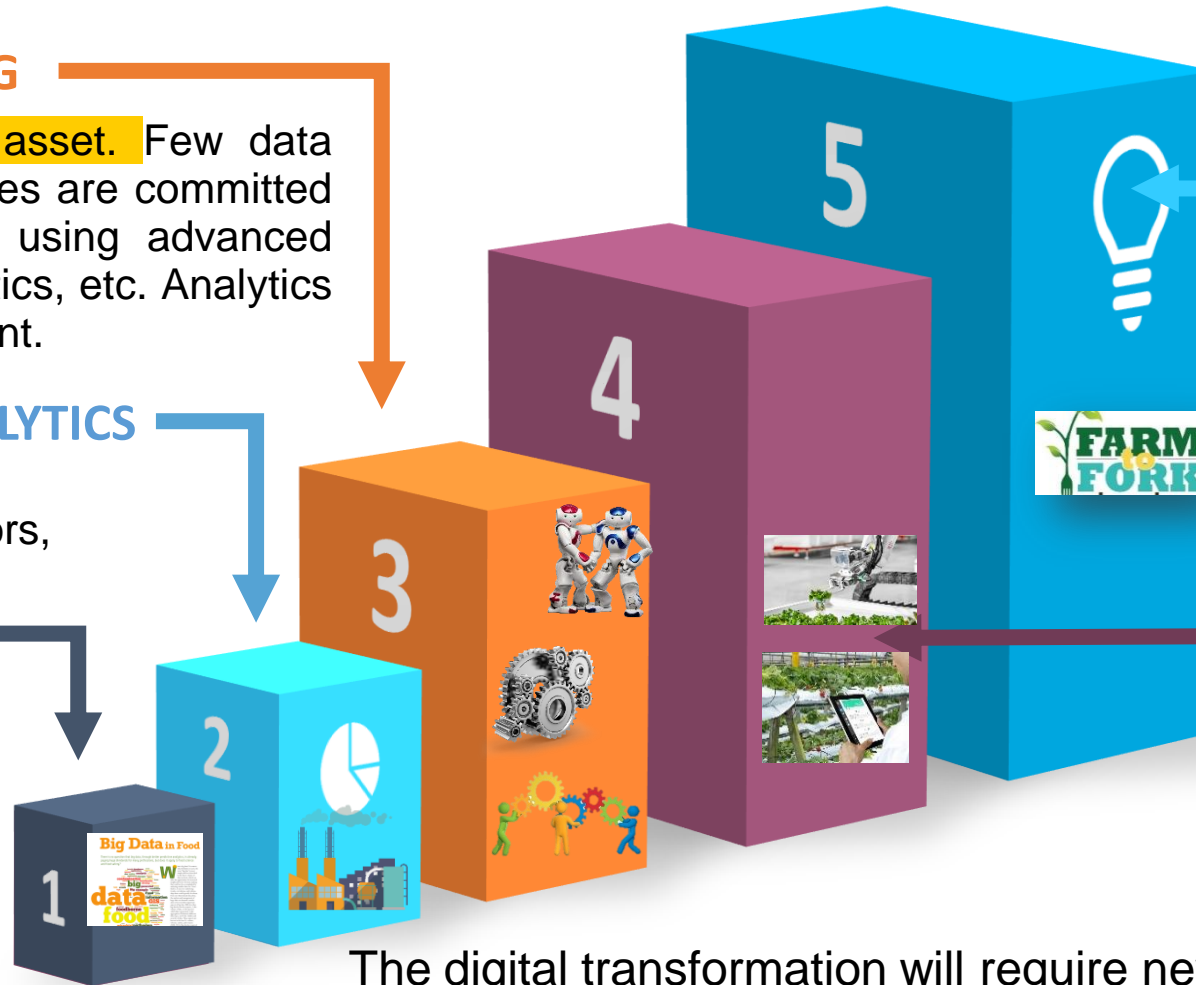
5. FARM TO FORK

End-to-end complete integration from raw materials to supply chain across plants and enterprise. Autonomous, syncronized, collaboration.

4. FACTORY OF FUTURE

Integrated/automated/ autonomous plants across the enterprise.

The digital transformation will require new processes, new technologies, new platforms, easier integration, new ways to synchronize & store data sources, new analytics, new jobs, new training, for business value.

What are you doing for the Digital Transformation?
...ARC Data in Food & Beverages
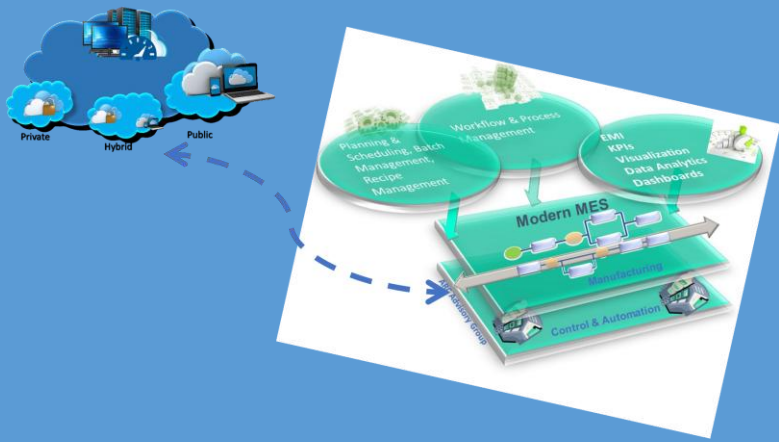
Batch Management Software & Services Revenue

Food & Beverages is 3rd largest industry in BMS Market!

Batch Management Software & Services 2018 Revenue by Industry
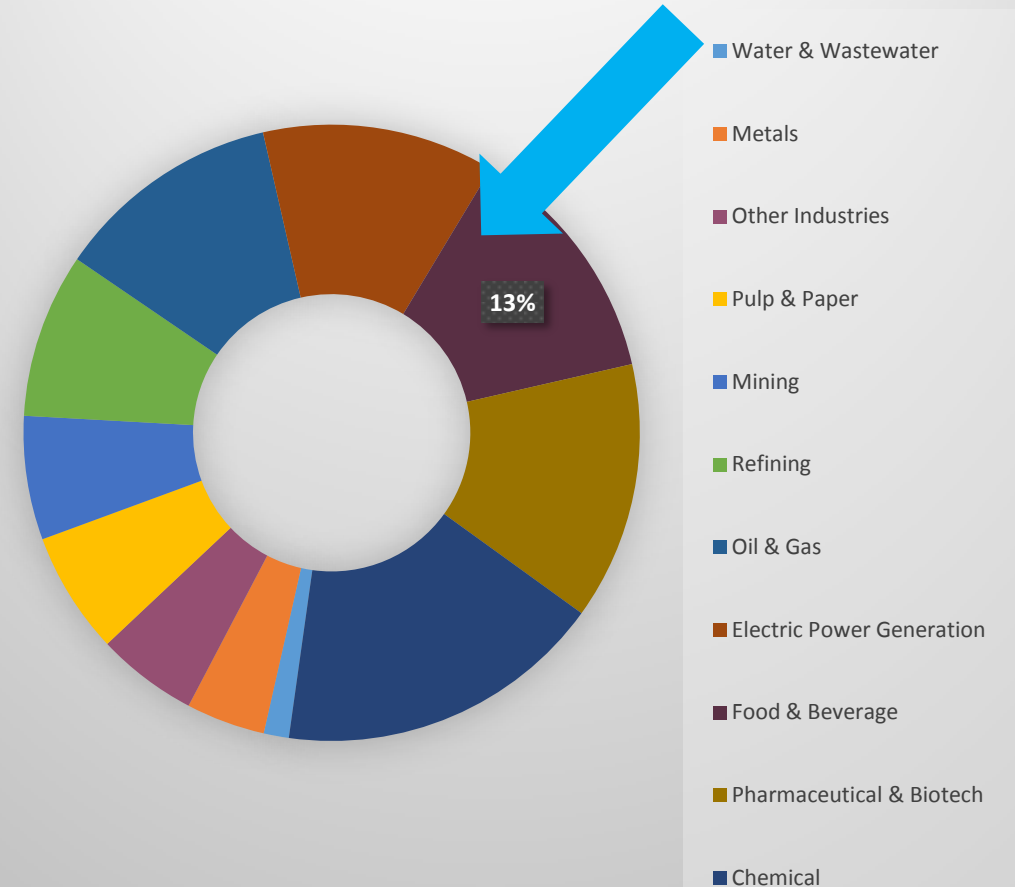
21%

Legend:
- Metals
- Pulp & Paper
- Household & Personal Care
- Other Industries
- Food & Beverage
- Chemical
- Pharmaceutical & Biotech
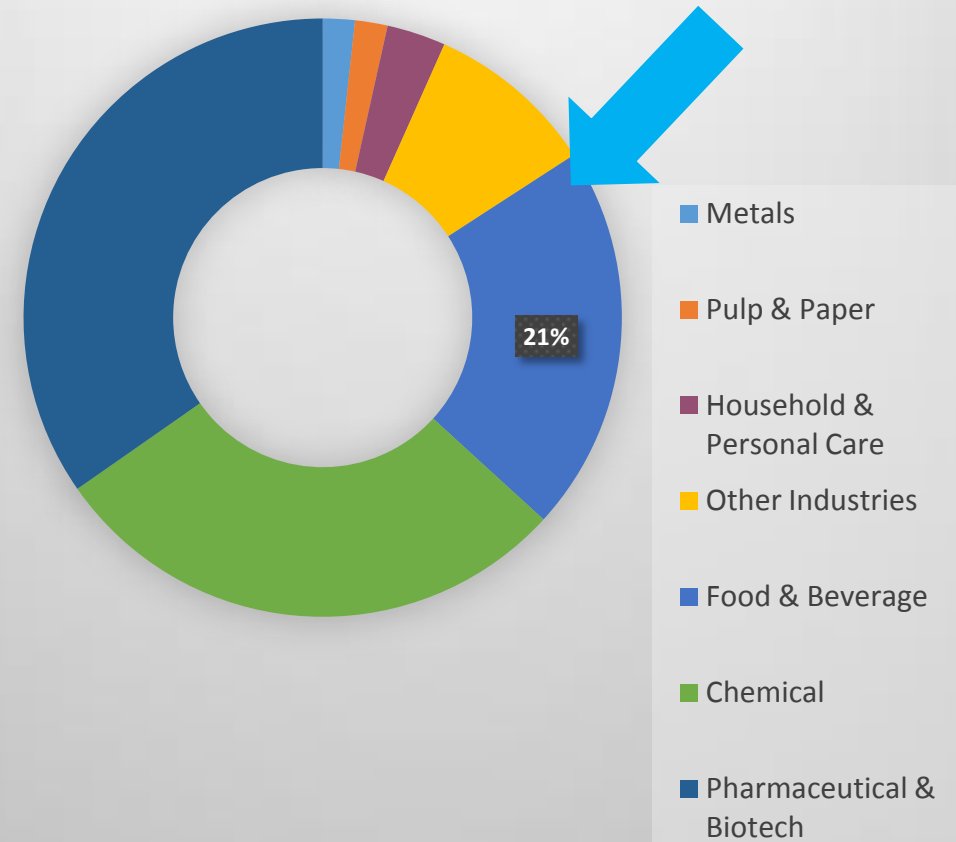
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MES/MOM by Software & Service Revenue

Food & Beverages is 3rd largest industry in MES/MOM market

MES/MOM 2017 Revenue by Industry

13%

- Water & Wastewater
- Metals
- Other Industries
- Pulp & Paper
- Mining
- Refining
- Oil & Gas
- Electric Power Generation
- Food & Beverage
- Pharmaceutical & Biotech
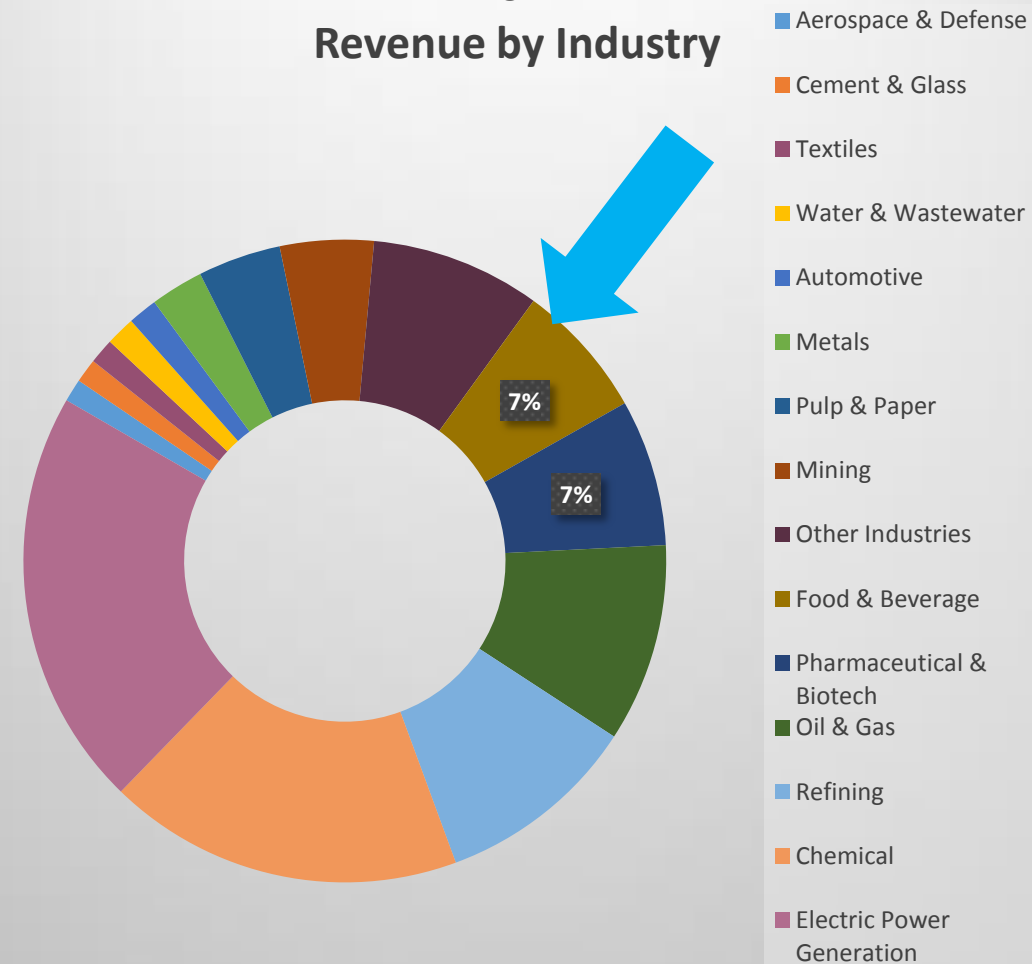- Chemical

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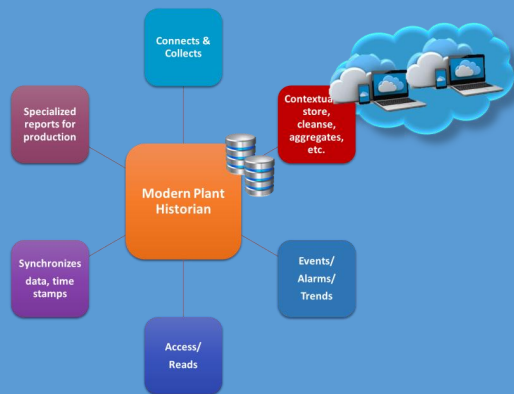
Data Platform Software & Services

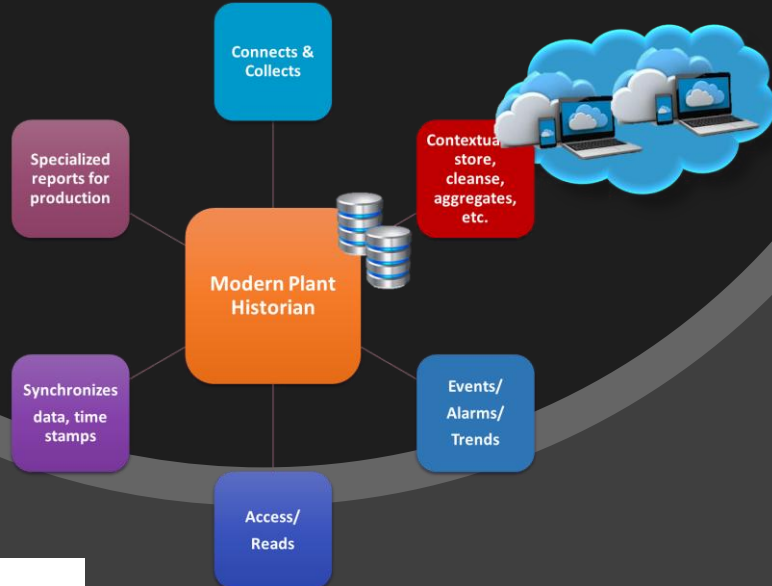*Food & Beverages is the 5th largest industry in Data Platform Market!*

Data Platform/Historian Revenue
2017
Revenue by Industry

Legend:
- Aerospace & Defense
- Cement & Glass
- Textiles
- Water & Wastewater
- Automotive
- Metals
- Pulp & Paper
- Mining
- Other Industries
- Food & Beverage
- Pharmaceutical & Biotech
- Oil & Gas
- Refining
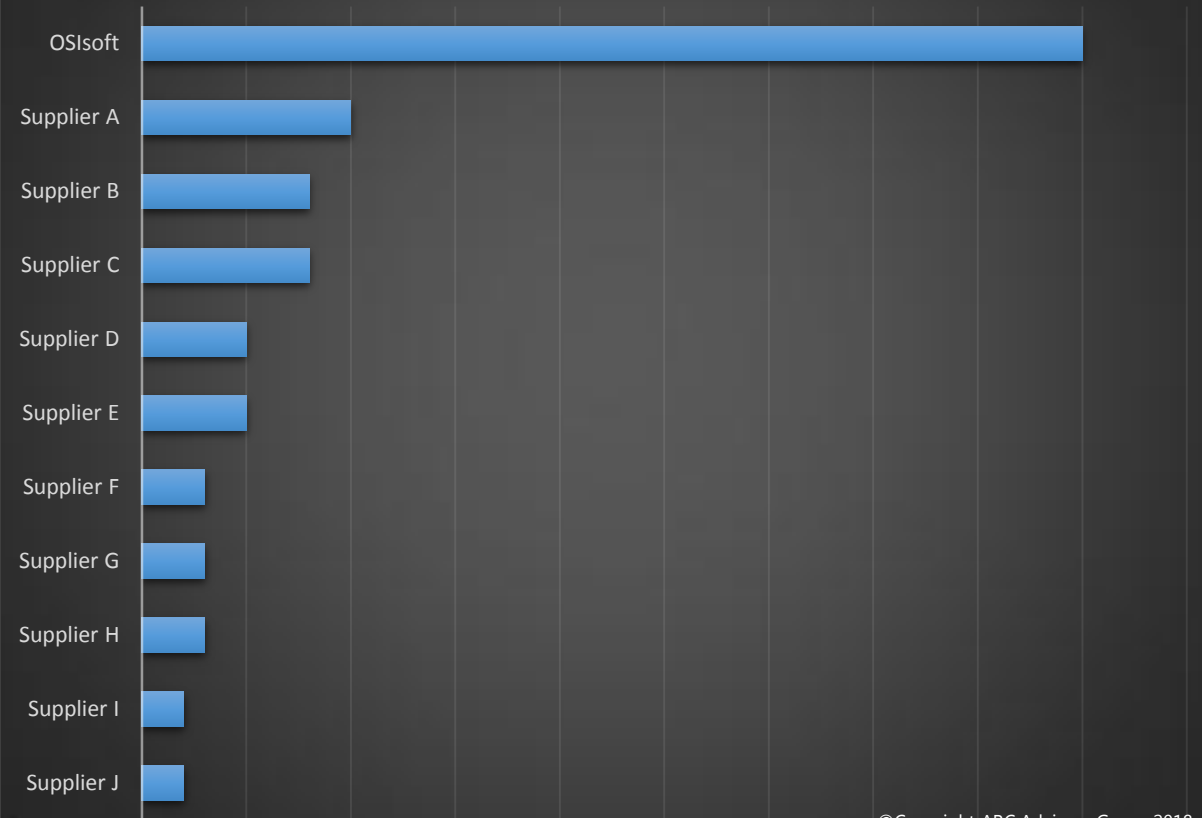- Chemical
- Electric Power Generation

7%
7%

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Data Platform/Data Historian Software by Revenue

- OSIsoft is the leading data platform

- 45% of the data platform software revenue

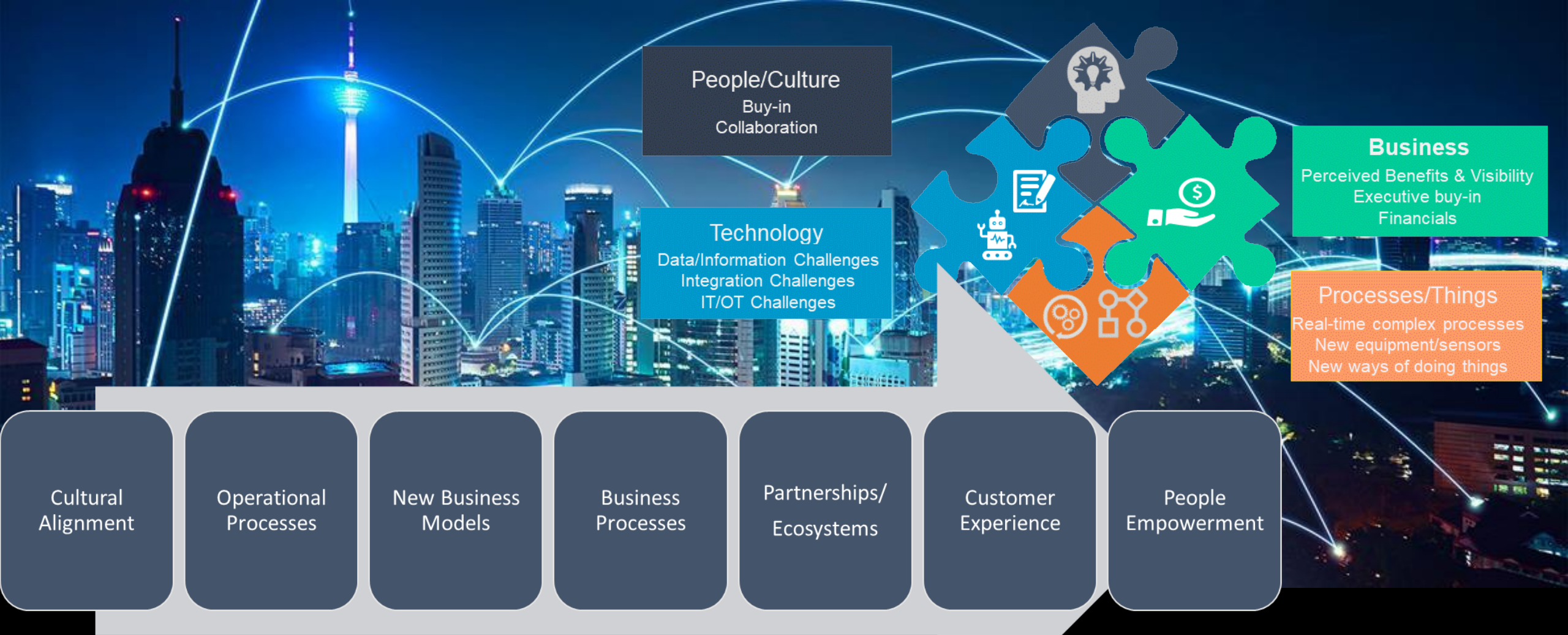- Integrate and work with other suppliers

Data Platform/Historian Software Revenue by Supplier 2017

OSIsoft
Supplier A
Supplier B
Supplier C
Supplier D
Supplier E
Supplier F
Supplier G
Supplier H
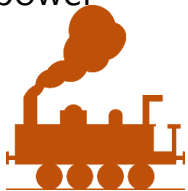Supplier I
Supplier J

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Future: Digital Transformation

Future of Industrial Revolution – What's next?
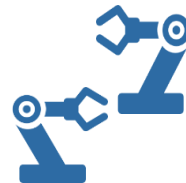

Industrie 1.0
Mechanization, Steam & water power

Industrie 2.0
Mass production & electricity

Industrie 3.0
Electronics & IT Systems, automation

Industrie 4.0
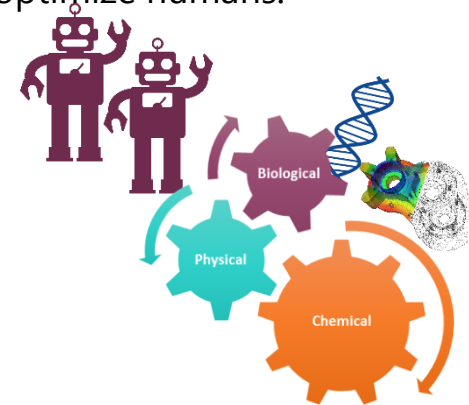Cyber-physical systems/networking

Industrie 5.0
Robots, chatbots, sensors physical, biological & chemical = autonomous/synchronized/connected end-to-end – **from farm to fork;** optimize humans.

Changing culture, services, platforms and architectures.

New methods, processes for implementing

More collaborative

More connected

More autonomous & synchronous

Connected end-to-end

Even more data!

How do you Get Started?

NEXTSTEPS

SCALE & TRANSFORM & CONTINUE
Scale up and roll out across plants, enterprise; continue process; cybersecurity is still important

05

TRANSPARENT/PROMOTE
Make your successes transparent; move from those that don't work but expect some failures

04

PILOT TECHNOLOGY/CHALLENGES
Look for challenges/evaluate for success/measurable – KPIs

03

IDENTIFY & EVALUATE CHALLENGES/BUSINESS CASE/ACTION
Evaluate challenges/Executive Buy-In/Funding

02

START WITH A VISION/TEAM/STRATEGY
Executive support helps align culture, training, etc.

01

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Digital Transformation is Transforming Business

Embrace the digital transformation

Empower people and transform your process!

All about the data and value!

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Questions?

Please remember

Please wait for
the **microphone**

State your
name & company