Digital Vortex impacting any industry

Source: Global Center for Digital Business Transformation, 2015
CHANGE
Is the New Status Quo
Industry 4.0 =
Digital Transformation of Manufacturing

The use of technology to radically improve operations.
Industry 4.0 - A New Industrial Revolution
Digitizing Manufacturing to Capture the Value of the Internet of Everything

18th Century
Steam

20th Century
Mass Production

70’s
Robots

Today
Digitization + Smart Automation

It’s all about combining technology to define new innovative solutions

Global Manufacturing Challenges Ahead...

- Increasing Complexity
- Increasing Cost Pressure
- Diverging Markets
- Production Flexibility
- Value Chain Insight
- Product Servitisation
- Changing Customer Behaviors
- Competitive Landscape
- Technology Advances
- Innovations & Insights
Digital Manufacturing Driving Business Outcomes

<table>
<thead>
<tr>
<th>Area</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Downtime</td>
<td>48%</td>
</tr>
<tr>
<td>Unplanned downtime</td>
<td></td>
</tr>
<tr>
<td>Reduction in Defects</td>
<td>49%</td>
</tr>
<tr>
<td>Defect rate down</td>
<td></td>
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<tr>
<td>New Product Introduction</td>
<td>23%</td>
</tr>
<tr>
<td>New product introduction cycle</td>
<td></td>
</tr>
<tr>
<td>time reduced</td>
<td></td>
</tr>
<tr>
<td>OEE Improvement</td>
<td>16%</td>
</tr>
<tr>
<td>Average OEE improved</td>
<td></td>
</tr>
<tr>
<td>Improved Inventory</td>
<td>35%</td>
</tr>
<tr>
<td>Inventory turns increased</td>
<td></td>
</tr>
<tr>
<td>Reduction in Energy Use</td>
<td>18%</td>
</tr>
<tr>
<td>Annual energy cost down</td>
<td></td>
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</tbody>
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Industry 4.0: The power of combination

Government plan

### Investimenti innovativi: Benefici concreti per le imprese

#### Iperammortamento

**Esempio:**
- **OGGI**
  - Superammortamento: 140% del valore ammortizzabile
  - Riduzione tasse pagate in 5 anni pari a 96.000€

**DOMANI**
- Iperammortamento: 250% del valore ammortizzabile beni I4.0
- Riduzione delle tasse pagate in 5 anni pari a 360.000€

#### Credito d’imposta alla ricerca

**Esempio:**
- **OGGI**
  - Credito d’Imposta 300.000€ (in caso di spesa maggiore limite massimo a 5.000.000€)

**DOMANI**
- Credito d’Imposta 500.000€ (in caso di spesa maggiore limite massimo a 20.000.000€)

#### Finanza a supporto di I4.0, VC e start-up

**Esempio:**
- **OGGI**
  - Detrazione fiscale: 19%
  - Investimento massimo per contribuente: 0,5 €M

**DOMANI**
- Detrazione fiscale: 30%
- Investimento massimo per contribuente: 1,0 €M

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*Fonte: MISE*
Digital Manufacturing Journey
Along a Digital Roadmap

Plant partially connected:
- Single layer LAN
- Low segmentation
- Low security
- Low Security
- Proprietary silos

1. Factory Network:
   - Open standard-based
   - Integrated
   - Secure
   - Centrally managed

Advanced services:
- Collaboration
- Asset tracking
- Safety
- Analytics

2. Digital Supply Chain
   - Production
   - Logistic
   - Suppliers
   - Sales
   - Customers

3. Todays
   - Off-Line
   - Connected Enterprise
   - Connected Factory
   - Connected Machines
   - Factory Collaboration
   - Location Services
   - Analytics & Big Data
   - Virtualization & Compute
   - Design Collaboration
   - Supply Chain Collaboration (SSP)

Supply Chain Orchestration
Manufacturing Digitization Across The Value Chain

**Connected R&D**
- Connected products providing innovate insights
  - Global, Virtual, 3D, Collaborative
  - Enable Workforce Innovation
  - Personalize Customer Experiences

**Connected Factory**
- Plant-floor platform providing converged connectivity
  - Advanced capabilities to streamline process
  - Optimize Business Operations
  - Manage Risk

**Supply Chain Security & Visibility**
- Visibility enabling informed and fast decision making
  - Security to enable traceability and confidence
  - Optimize Business Operations
  - Manage Risk

**Connected Customer**
- Intelligent customer care through connected products
  - Empowered sales to reach the right customer at right time
  - Optimize Business Operations
  - Manage Risk
  - Personalize Customer Experiences
  - Enable Workforce Innovation

**Connected Assets**
- Insights into asset performance, usage patterns, and utilization
  - Improve response times by knowing the location / condition of critical assets
  - Optimize Business Operations
  - Manage Risk
  - Personalize Customer Experiences
Cisco to create the ecosystem to drive the roadmap

Customer way to Digital

Roadmap

Best Practises

System Integrator

POC

Consultant

Ecosystem/Startup
Converged Plantwide Ethernet Architecture

Enterprise Network reference model

- Access Switch
- Distribution Switch
- Core Switch
- Firewall
- Enterprise Network

IACS (Industrial Automation and Control Systems) reference model

- Enterprise Network
- Site Business Planning and Logistics Network
- Site Manufacturing Operations and Control
- Area Supervisory Control
- Basic Control
- Process
- Safety-Critical

Levels:
- Level 0
- Level 1
- Level 2
- Level 3
- Level 4
- Level 5
Converged Plantwide Ethernet Architecture (CPwE)

**Wide Area Network (WAN)**

- Physical or Virtualized Servers
  - ERP - Business Systems
  - Email, Web Services
  - Security Services - Active Directory (AD), Identity Services (AAA)
  - Network Services - DNS, DHCP
  - Call Manager

**Enterprise Zone
Levels 4 and 5**

- Plant Firewalls
  - Active/Standby
  - Inter-zone traffic segmentation
  - ACLs, IPS and IDS
  - VPN Services
  - Portal and Remote Desktop Services proxy

**Industrial Demilitarized Zone (IDMZ)**

**Manufacturing Zone
Levels 0–3**
(Plant-wide Network)

**Level 3 - Site Operations**
(Control Room)

- Physical or Virtualized Servers
  - Patch Management
  - AV Server
  - Application Mirror
  - Remote Desktop Gateway Server

**Cell/Area Zone - Levels 0–2**

- Redundant Star Topology
- Unified Wireless LAN
- Location Based Services - Tags, Cell phones, Tablets

**Cell/Area Zone - Levels 0–2**

- Ring Topology - Resilient Ethernet Protocol (REP)
- Unified Wireless LAN
- (Lines, Machines, Skids, Equipment)

**Cell/Area Zone - Levels 0–2**

- Linear/Bus/Star Topology
- Autonomous Wireless LAN
- (Lines, Machines, Skids, Equipment)
Industry 4.0 Solutions
Industry 4.0 Infrastructure and Solutions

**FOUNDATION: Architecture 4.0**

- Factory Network
- Factory Wireless
- Factory Security

**Analytics**
- Business Intelligence

**Plant/Machines/Robots**

- Mobility
- Smart Logistic
- Factory Collaboration
- Physical Safety and Security
- Fog Computing & Data Virtualization
- Connected Machine/Products
Factory 4.0

Security 4.0

Mobility & Collaboration 4.0

Assett 4.0

People 4.0

Virtualization 4.0

Safety & Security

Connected Machines

Connected Products
Architecture 4.0 – Factory Network
Foundation between Automation Layer and Enterprise Network

- 1 Network
  - Open, Standard-based, Secure, Scalable
- Integrates Manufacturing Systems + Business networks
- Enables real time visibility to business applications
- Reduce downtime
- Improved OEE and productivity
- Increase safety
Security 4.0 / Factory Security

- Plant safety, availability, integrity, intellectual property defense
- Business continuity
- Quick crisis management and response
- Reduce risk of inadvertent plant downtime
- Implement new business models such as remote maintenance and remote collaboration
- Improved productivity with Any-time secure and encrypted access to the Industrial Zone for Employees, Contractors and Vendors
- Zone based and Granular security policies based on plant roles, device, location, and time
Mobility 4.0

- Faster Assembly Line, Material Flow Efficiency
- Enable BYOD/Mobile workforce productivity
- One network for Barcode readers, VoIP and VoIP picking, Data, Video, Collaboration
- Locate people in case of emergency to Improve Safety, Avoided incident management costs and penalties
- Physical Access Security, Movement of contractors and visitors
- Locate technicians based on skills
- Integrated Maintenance and Improved

Case history

SUB-ZERO
Safety & Security 4.0
Asset 4.0

- Real time Equipment and Asset visibility, location, condition
- Track supplies in transit
- Inventory accuracy
- AGV control
- Improved equipment utilization
- Real time push notification
- Correlate location of asset and operator to minimize down time

Case history
Collaboration 4.0
Real-time location-based profile-based Communication

- Workforce Management to Improve Safety and Physical Access Security
- Locate and contact nearest people with specific skills
- Voice commands for pickup
- Real-time push notification
- Real-time dialogue with the machine or Remote expert for Maintenance

Case history

Coca-Cola
Fog Computing & Data Virtualization 4.0 to enable Edge Analytics

- Enables monitoring, analyzing and reporting, all on a single platform
- Support analytics for IoT environments, handles massive volumes and high velocity of data, enabling analytics at the edge
Connected Machine / Connected Products
Business model shift from Product to Services

- New revenue stream thanks to new services
  (predictive maintenance, zero downtime, machine running, Data Analytics, remote support)
- Machine-As-A-Service
- Time to market, Innovation, quality assurance
- Real-time inventory
Retrofit
Creating Value for Zero Defects Factories

- Small Form Factor WiFi based End Node with a low cost of installation and easy to manage
- Connect securely to the network every industrial machines and sensors via physical ports (RS485, RS 232) and standard industrial protocols, such as ModBus, CANBus, OPC-UA
- Pre built configuration for a faster and easier integration to the Analytics Platform

- Factory Network is the Foundation, the essential first step of the digital journey, between automation layer and the Enterprise a connectivity
- Connects manufacturing systems and integrates factory floor with business networks
- Enables real time visibility to business applications
- Reduce risk of inadvertent plant downtime and risk intellectual property loss

- Advanced Machine Learning Platform able to self-learn the behaviors of the machines to anticipate increasingly earlier possible losses of processes and quality
- Specific pre-built algorithms and data models to address faster the 6 big losses of the Overall Equipment Effectives (OEE)
- Deployed in different operational models: Cloud, On Premise, Hybrid
Cisco Spark automatically generates a support chat ‘room’ interfacing with the machine.

We have noticed the machine has been off for 5 minutes.

The Last Values we have seen were:
- Boiler 1: 94.56
- Boiler 2: 95.78
- Boiler 3: 98.56

Is everything OK on site with the machine?
Predictive Maintenance at work

Component changed during weekend

Data analysis detects failing component from historical data and notifies customer.

- Action Required -

❖ Replacement component automatically sent to the customer

Alert message sent to the customer and machine producer

Data Collector

Data Storage

Analytics
Predictive Maintenance at work

**Key Functions**
- Robot Switch – Managed
- Open Cell Architecture – Non blocking
- Connected routing – Analytics Access
- Security
- Identity - Enforcement through the robot and Zone switch
- Robot participates in customer IT security framework

**Key Functions**
- Data Collection
- Data Buffering
- Application Host
- Virtual Compute
- Monitoring
- Data Integrity
- Authorization
- Deep Packet Inspect.

**Key Functions**
- Confidentiality
- Encryption
- VPN
- Connectivity to Cloud
- Secure Internet Connectivity

**Key Functions**
- Business Intelligence
- Analytics
- Reporting
- Monitoring
- Security
- Data Integrity
Why Cisco?

Strong Ecosystem
Technology Partners
System Integrators
Startup

One Unified Converged IP Network
Open standards vs. proprietary
Reduced TCO, simplified management

Validated Designs
Proven and tested architectures to reduce deployment risk, speed time to market and reduce time for PoC

End-to-end network that enables more than Just connectivity
Computing from Edge to Cloud
Supports Big Data and Analytics
Centralized management of everything
Security across entire platform
Built for the future and flexible growth