Harnessing the power of digitalization to address the evolution of Oil, Gas & Chemical Industry

Mauro Martis, Head of Industrial Automation Division, Italy
Agenda

The perfect storm
Threats and opportunities of digital technologies
Enabling digitalization with an IoT platform
Upstream to downstream—digital solutions for yield, cost, & safety
Customer examples
Conclusion
The digital opportunity
A perfect storm

Inaction is not an option…

Revenues -40%, but OPEX only -9%

Aging workforce: 50% retiring in 10 years

Aging infrastructure: 55% US pipelines, > 50 years

Cybercrime

- Financial services: $13.50
- Utilities & energy: $12.80
- Technology: $8.09
- Services: $7.93
- Industrial: $7.66
- Defense: $6.61
- Public sector: $6.01
- Transportation: $5.65
- Communications: $5.35
- Consumer products: $4.90
- Retail: $4.88
- Education & research: $3.89
- Hospitality: $3.34
- Media: $3.15
- Pharmaceutical: $2.75
- Healthcare: $2.35
- Automotive: $2.28
- Agriculture: $1.97

Revenue and OpEx decline since Q3-2014

Source: Strategy & part of the PwC network

Source: Ponemon Institute, September 2016
### Digital trends affecting the value chain

#### Threats and opportunities

<table>
<thead>
<tr>
<th>Digital technologies</th>
<th>Sourcing</th>
<th>R&amp;D</th>
<th>Production</th>
<th>Sales and service</th>
<th>Distribution</th>
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<td>Internet of Things</td>
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<td>Big Data</td>
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<td>Advanced Robotics</td>
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<td>Smart plants</td>
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<td>Digital engineering</td>
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<td>3-D printing</td>
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<td>Mobile apps</td>
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<td>Omnichannel</td>
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- Significant impact
- Moderate impact

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Source: Bain & Co, August 2016
Digital technologies are driving new innovation

Media is focused on B2C but the “killer app” is in B2B

- Virtual/ augmented reality
- Software-defined machines
- Machine learning
- Time-sensitive networking
- Big data

- Inexpensive computing
- Cloud computing
- Cybersecurity
- Connectivity
- Blockchain

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IT & OT integration
The undiscovered country...

Enterprise Resource Planning (ERP)
Human Resource Management System (HRMS)

Internet of Things (IoT)

Distributed Control System (DCS)
Enterprise Asset Monitoring (EAM)

Data fusion, contextual awareness, alerts, insights
How we can help deliver value

ABB Ability™ - Digitally connected products and services providing expertise
There are two loops: Control loop & asset loop
# Solution types and relevant use cases

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<tr>
<th>Ability Hierarchy</th>
<th>Solution types</th>
<th>Use cases</th>
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<tbody>
<tr>
<td>Together</td>
<td>1. Collaborative operations</td>
<td>Connect customer operations, engineering and business management with ABB Ability solutions and expertise; Improve asset availability and operational efficiency through integrated digitalization.</td>
</tr>
<tr>
<td><strong>DO better</strong></td>
<td>2. Simulation / Virtual commissioning</td>
<td>Support design, engineering, installation and commissioning activities through simulation of installed mechanical and electrical functionalities.</td>
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<tr>
<td>Optimization</td>
<td>3. Performance optimization</td>
<td>Compare system and process performance against peak operating conditions or industry standards and develop improvement plans.</td>
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<tr>
<td><strong>DO MORE</strong></td>
<td>4. Energy optimization</td>
<td>Analyze customer energy needs and usage; Identify and prioritize thermal and electrical energy efficiency improvements across entire plants or businesses; Develop and implement a comprehensive energy efficiency program.</td>
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<td><strong>DO MORE</strong></td>
<td>5. Alarm management</td>
<td>Design, rationalize and optimize alarm responses.</td>
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<td>Security</td>
<td>6. Cyber security</td>
<td>Address gaps compared to industry standards and best practices that could endanger employees, assets or uptime.</td>
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<td><strong>DO MORE</strong></td>
<td>7. Asset health</td>
<td>Assess the condition of the equipment, monitor key parameters related to the critical aspects of the equipment; Get reliable early warnings and recommended maintenance actions, which do not provide evaluation of equipment remaining life.</td>
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<tr>
<td>Maintenance</td>
<td>8. Predictive maintenance</td>
<td>Assess the condition of equipment and evaluate its remaining life; Monitor key parameters related to the critical aspects of equipment and get reliable early warnings and recommended maintenance actions.</td>
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<tr>
<td><strong>DO MORE</strong></td>
<td>9. Lifecycle assessment</td>
<td>Evaluate condition and criticality of products/systems to better plan maintenance and future investments.</td>
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<td><strong>KNOW more</strong></td>
<td>10. Control systems</td>
<td>Monitor and control processes, production and/or delivery of products and services.</td>
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<td>Training</td>
<td>11. Virtual training</td>
<td>Train personnel on ABB products, systems, processes and technologies through digital training (e.g. virtual reality, augmented reality, mixed reality trainings).</td>
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<tr>
<td><strong>KNOW more</strong></td>
<td>12. Inspections</td>
<td>Check product health and accuracy.</td>
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<tr>
<td><strong>KNOW more</strong></td>
<td>13. Condition monitoring</td>
<td>Monitor equipment maintenance conditions and identify needs for preventive maintenance.</td>
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<tr>
<td><strong>KNOW more</strong></td>
<td>15. Data analytics</td>
<td>Collect, organize, analyze and visualize data to better diagnose product, system and process issues.</td>
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<tr>
<td>Monitoring</td>
<td>17. Backup management</td>
<td>Ensure fast (remote) restoration of system data configurations and settings in case of a critical situation or system failure.</td>
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<tr>
<td><strong>KNOW more</strong></td>
<td>18. Data collections</td>
<td>Collect data from devices and retrofit devices to make them smart.</td>
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Multiple areas where digitalization can help

Improve yield, reduce cost, & enhance safety
Upstream → Downstream

Digital opportunities

1. Safety management
2. Collaborative support
3. Subsea technologies
4. Fleet management
5. Site collaborative operations
6. Automated data collection
7. Remote operations
8. Integrated infrastructure
The power of ABB Ability to optimize resources and efficiency

Onshore & midstream

QCLNG – QGC Australia coal seam gas to LNG

Customer’s Situation: Design and deploy a safe, reliable power, communications and control infrastructure for 6000 upstream wells and 540km pipeline supporting liquefied natural gas production facility over a vast 1500sq mile area

ABB’s Solution: Digital infrastructure provided across integrated electrification, telecommunication, and automation systems. The centralised control room environment requires only 4 operators across the huge site. Combined analytics upstream & midstream

Outcome: Achieving extremely high facility efficiency and productivity. Reduced complete lifecycle costs by using remote operations. From reactive to predictive. Major time saving maintenance team would otherwise need a whole day to travel across the site.

Improved efficiencies, optimized resources
The power of ABB Ability centers to maximize uptime

Remote operations center

**Ormen Lange**

**Customer’s Situation:** Norske Shell operates two oil and gas fields on the Norwegian Continental Shelf: Draugen and Ormen Lange. Both fields operate at exceptional levels of availability and productivity, thought to be the highest in the oil and gas industry.

**ABB’s Solution:** Authorized ABB personnel have remote access to the safety and automation systems at Draugen and Ormen Lange from several remote monitoring and operations rooms at ABB locations in Norway. This enables ABB to safely implement changes, troubleshoot, provide support and carry out health checks by remote.

**Outcome:** “Ever since the start-up phase in 2007, uptime at Ormen Lange has been more than 99 percent for most months of the year. Such high availability is unusual for a plant as large and complex as this. We’ve invested significant resources in continuously fine-tuning the plant, which has benefitted us enormously. Our experience from Ormen Lange tells us that it pays to invest in optimization.” – Reider Haugsgierd, Process Control Engineer, Norske Shell
The power of ABB Ability to optimize efficiency

Chemicals: Intelligent infrastructure

**BASF 4.0, Germany, Fleet Management for Industrial Equipment**

**Customer’s Situation:** Customer is experiencing **production loss** due to breakdown of standard assets like LV motors, gearboxes, pumps, fans, compressors. Utilization of timely information about the equipment’s health state can change this by enabling the plant operator to a **proactive maintenance process** which minimizes the risk of unplanned production shut downs, provides the possibility of gentle operation or minimize the downtime and additional damage due to better preparation.

**ABB’s Solution:** **Low-cost sensor** for plant wide data collection that makes the health status of assets transparent and thus enables the offering of predictive maintenance using fleet **analytics algorithms** running on the distributed ABB Ability infrastructure.

**Outcome:** Digital technologies and applications will increase the effectiveness of BASF’s assets as well as efficiency of manufacturing and engineering processes. Critical assets like rotating equipment are now empowered with ABB Ability infrastructure comprising of smart sensors and analytics algorithm which enables transparency of asset fleet conditions thereby **reducing unplanned downtimes** through predictive maintenance and enabling improvement services which **minimizes operational costs**

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**Improved operational efficiency**
The power of ABB Ability to cut costs and reduces risk
Chemicals: Intelligent engineering

Sadara, Saudi Arabia, Site collaborative operations

Customer’s Situation: A number of integrated systems to power, automate and manage world’s largest petrochemical complex that contains more than 26 manufacturing facilities – over 3 million metric tons of capacity per year

ABB’s Solution: Capability to act as power & automation partner from concept through long lifecycle. Digital infrastructure provided across integrated power and automation systems. Integrated software package to ensure safe, efficient and reliable operation of the facilities’ various assets. World’s biggest fieldbus foundation enables seamless integration of different plant assets.

Outcome: Enabling world’s largest petrochemical complex to secure connectivity and data management, scalability to accommodate future needs, advanced analytics capabilities for domain specific applications, seamless cooperation between domain and product experts remotely and in the field for quick resolution of technical issues. A single distributed control system will run its more than 50 fully automated production lines

Improved efficiency, reduced cost and risk
**Customer example**
Midstream: Trans-Anatolian natural gas pipeline—TANAP

**Benefits**

- Leak detection via distributed acoustic sensing
- Physical security via laser pulses on fiber-optics on fencing
- Cybersecurity integrated into SCADA
- Point of Control (PoC) allows transfer of control to be passed from local to central operations centers
Customers asking for Collaborative Operations
Continued access to expertise via digital services

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<th>Predictive maintenance</th>
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<td>Simulation</td>
<td>Operations and Technical Support</td>
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<th>Cyber and safety</th>
<th>Control</th>
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<td>Cyber Security</td>
<td>Control Centers</td>
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<td>Energy Optimization</td>
<td>Safety Management</td>
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<td>Performance Optimization</td>
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Customer assets e.g. rigs, mills, vessels

ABB Collaborative Operations Center

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Partnerships

Leverage IT innovations + complementary OT expertise

- Connectivity
  - Local and wide-area networking, Internet, software-defined and time-sensitive networking

- IoT Edge
  - Capturing and processing data securely and cost effectively at the “edge” of the network

- Platforms & Cloud
  - Secure public and private cloud, and inter-cloud interoperability

- Security
  - Protecting digital and physical assets from the device to the cloud

- Analytics
  - Advanced analytics, algorithm-based insights, AI and Machine Learning

- ISVs
  - Software leaders in categories critical to ABB customers

- Systems Integrators
  - System integrators and thought leaders affecting customer/market perception

ABB Customers & ABB Ability™

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Summary
Conclusion

- Digital opportunity is here
- Digital is transforming every aspect of industry
- Need to combine IT innovations with OT expertise
- ABB has a wide range of industry-leading solutions
- Industry-standard platform components leverage an ecosystem of innovation
- ABB has unparalleled expertise in technology, information, and domain know-how
- 210+ ABB Ability™ solutions are ready now
The time to embrace digital is now. Close the loop.