NIRUPA CHANDER, DIGITAL LEAD, ABB SINGAPORE   JULY 2018

ABB Ability™
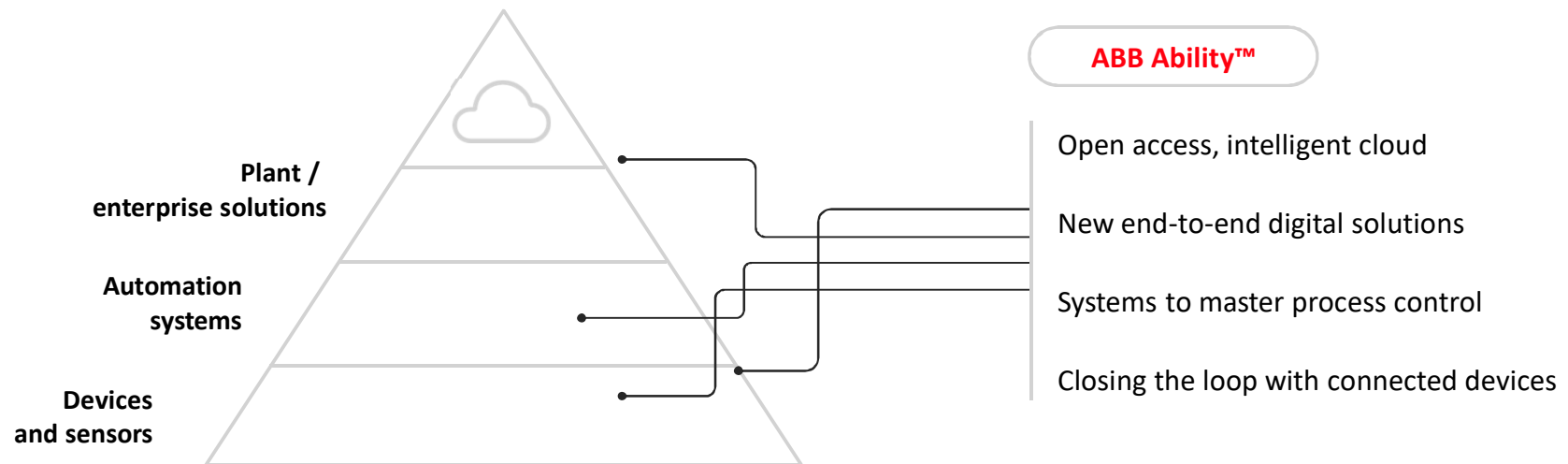
Leveraging Digital and Industry 4.0 for Tangible Returns

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ABB Ability™

Unlocking the ABB potential in digital

ABB Ability™: industry-leading digital solutions built on a common set of standard technologies
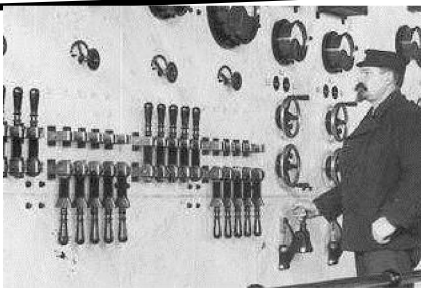
Plant / enterprise solutions

Automation systems

Devices and sensors

ABB Ability™

Open access, intelligent cloud

New end-to-end digital solutions

Systems to master process control

Closing the loop with connected devices

The 4th Industrial Revolution

The impact of digitalization

Revolution	Year	Impact
1	1784	Steam, water, mechanical production equipment
2	1870	Division of labour, electricity, mass production
3	1969	Electronics, IT, automated production
4	now	Digital Data Cyber-physical systems

Computing and connectivity over time

Industrial technology and connectivity has become more prevalent

Future

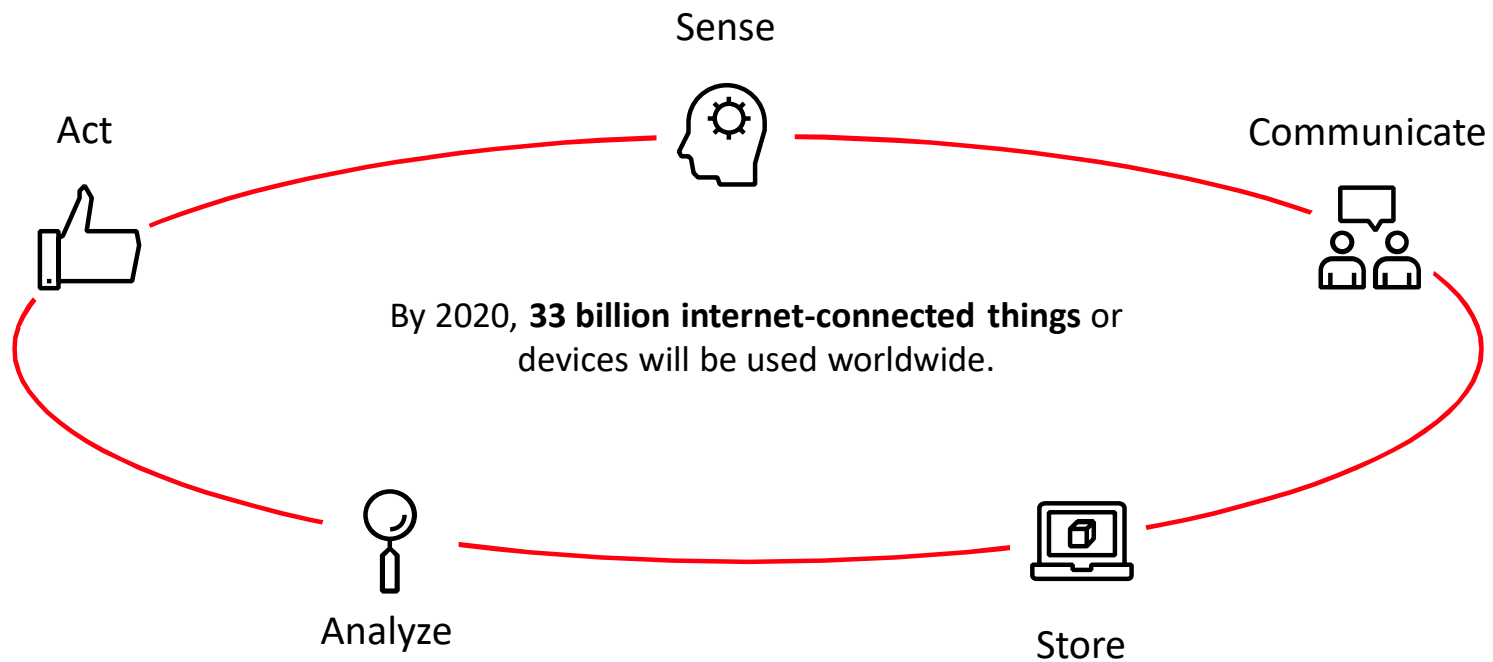**Today**

~ 1990

~ 1910

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The 4ᵗʰ Industrial Revolution

The impact of digitalization

Sense

Act

Communicate

By 2020, **33 billion internet-connected things** or devices will be used worldwide.

Analyze

Store

Lessons of digital transformation from the early adopters…

Computing + connectivity + cloud + analytics set to unlock value

Digital S-Curve
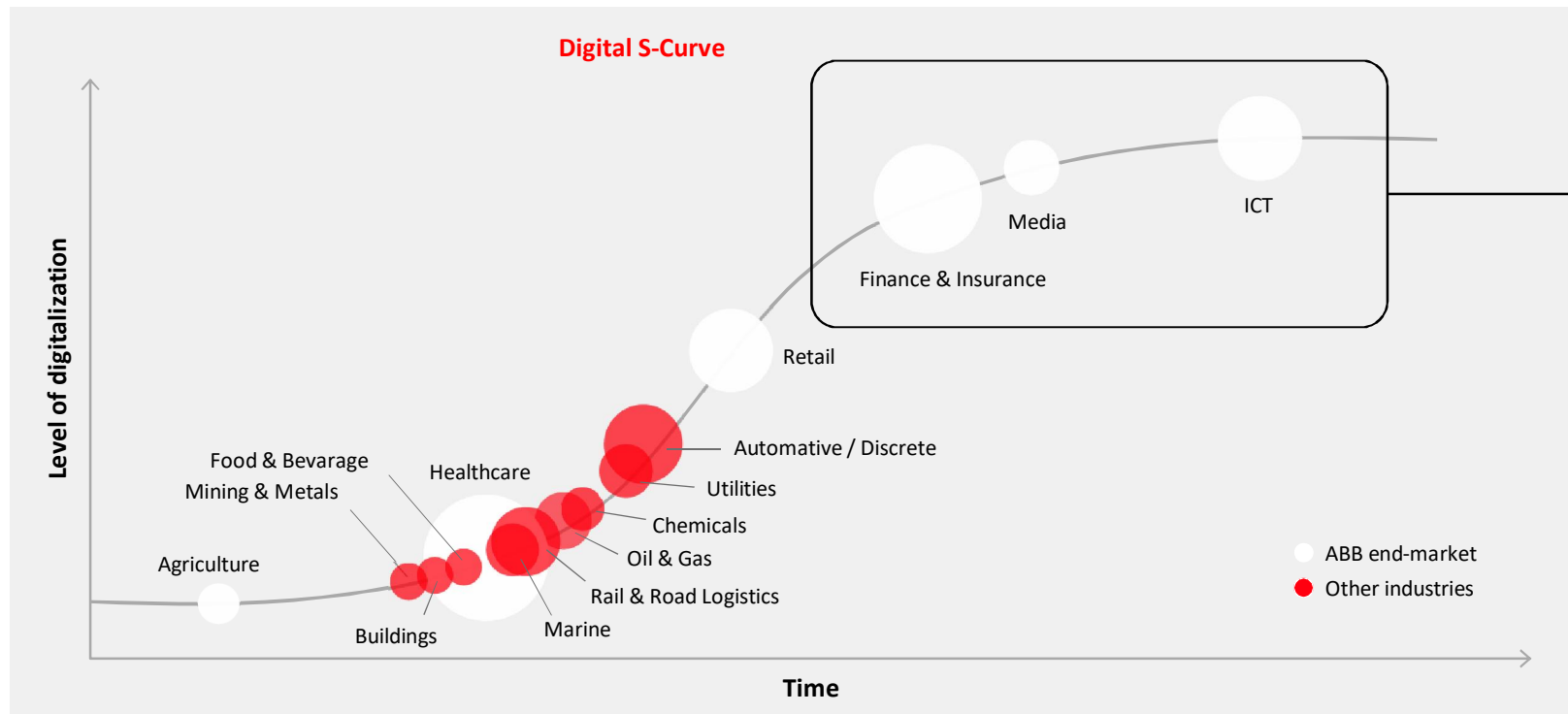
What can we learn from "wave 1" digital disruptions?

Level of digitalization

Finance & Insurance

Media

ICT

Retail

Food & Bevarage
Mining & Metals

Healthcare

Agriculture

Automative / Discrete

Utilities

Chemicals

Oil & Gas

Rail & Road Logistics

Buildings

Marine

Time

○ ABB end-market
● Other industries

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ABB Ability™: industry-leading digital solutions

ABB in digital – uniquely qualified

Know-how
- Industry
- Geography
- Automation
- Process

Information
- $470 bn installed base
- 125 year history
- Context

Technology
- Electrical
- Material
- Mechanical
- Digital

ABB Ability™

Digitally connected products & services

Customers
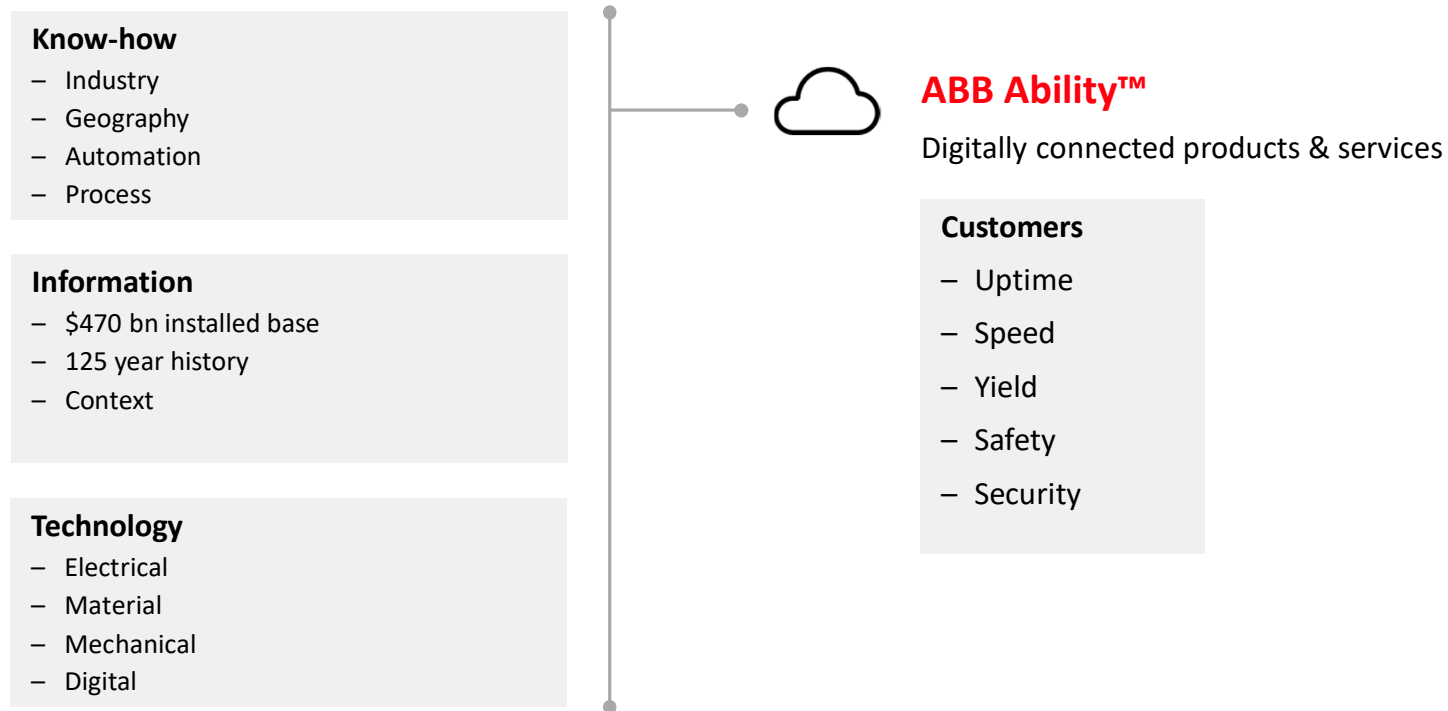- Uptime
- Speed
- Yield
- Safety
- Security

ABB Ability™ solutions & platform

210+ ABB Ability™ solutions

ABB Ability™

Utilities
solutions

Industry
solutions

Transport &
Infrastructure
solutions

What
Delivers customer value (safety,
uptime, speed, yield…)

Microsoft

Platform
(common technologies for
device, edge, and cloud)

IBM

How
Provides ABB with efficiency and
scale

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Optimizing operations and maintenance with expertise

Control loop & asset loop

Realtime

Days/weeks/months

Cloud

Hybrid Cloud

On Premise

Edge

Device

Analyze

Control

Sense

Act

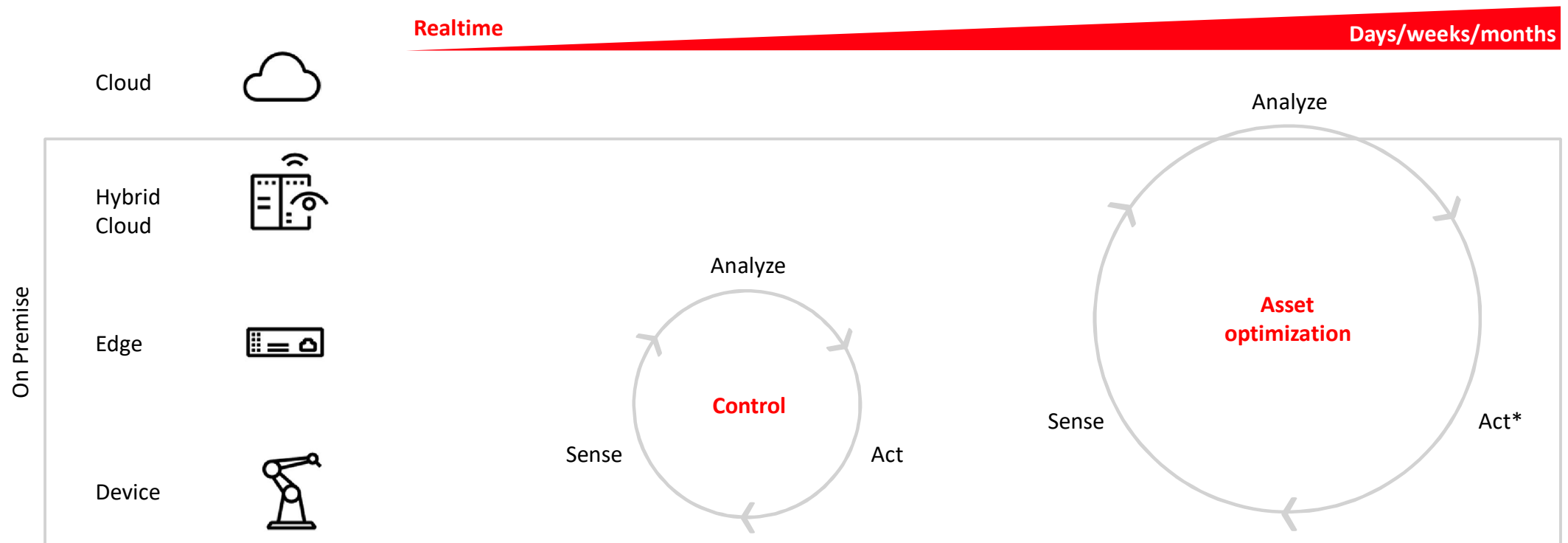Analyze

Asset optimization

Sense

Act*

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ABB Ability™ services

Enabling us to know more, do more, do better, together

Ability hierarchy		Digital service clusters	Cluster use cases
	Together Advice, transform, collaborate, re-think	**1.** Collaborative operations	Connect customer operations, engineering and business management with ABB's Internet-of-Things applications and expertise. Integrated digitalization helps customer to improve asset availability and operational efficiency
	Do better Optimize, simulate, predict, automate	**2.** Simulation / Virtual commissioning	Support design, engineering, installation and commissioning activities through simulation of installed components mechanical and electrical functionalities
		3. Performance optimization	Compare system/process performance to peak operating conditions / industry standards and get recommended improvement plans
		4. Energy optimization	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
		5. Alarm management	Design, rationalize and optimize response to alarms often not effective due to alarm flooding
		6. Cyber security	Address gaps vs. industry standards / best practices that could endanger employees, assets and uptime
		7. Predictive maintenance / Asset health	Assess the condition of the equipment and evaluate its remaining life. Monitor key parameters related to the critical aspects of the equipment and get reliable early warnings and recommended maintenance actions
		8. Life cycle assessment	Evaluate condition and criticality of products/systems to better plan maintenance and future investments
	Do more Monitor, control, secure, manage, apply	**9.** Virtual training	Train personnel on ABB products, systems, processes and technologies through digital training (e. g. virtual reality, augmented reality, mixed reality trainings)
		10. Inspections	Check product health and accuracy
		11. Condition monitoring	Monitor equipment maintenance conditions and identify needs for preventive maintenance
		12. Emission monitoring	Predict, monitor, analyze and control emissions from stacks, vessels and industrial processes
		13. Data analytics	Collect, organize and visualize data to better diagnose product, system and process issues
		14. Remote assistance	Be remotely supported in case of an equipment issue
		15. Backup management	Ensure fast (remote) restoration of system data configurations and settings in case of critical situation or system failure
	Know more		

Our future: portfolio development for enhanced customer value creation

ILLUSTRATIVE

Level of digitalization

Autonomous Operations

Collaborative Operations

Connected Operations

Isolated Operations

Artificial intelligence

IT/OT integration

Advanced analytics and visualization

Predictive maintenance

Condition monitoring

ABB products, systems

Level of solution integration

Customer value

Business optimization

Operations optimization

Process optimization
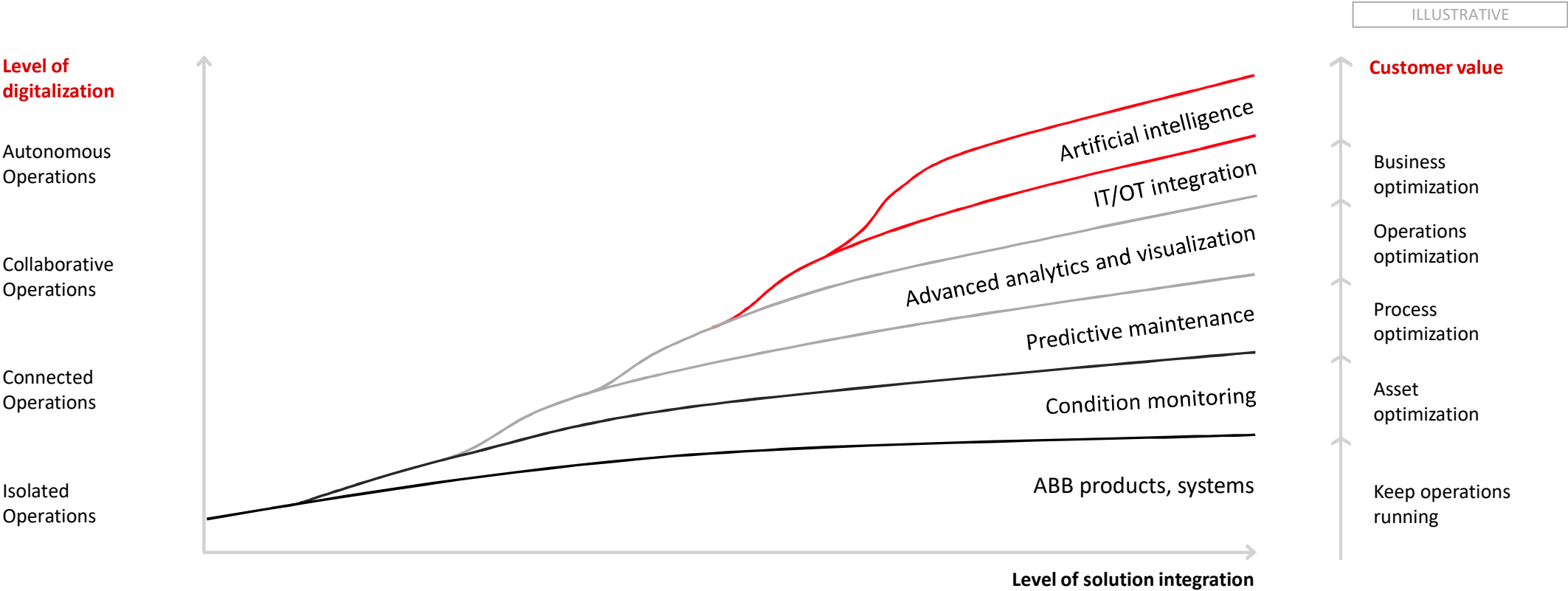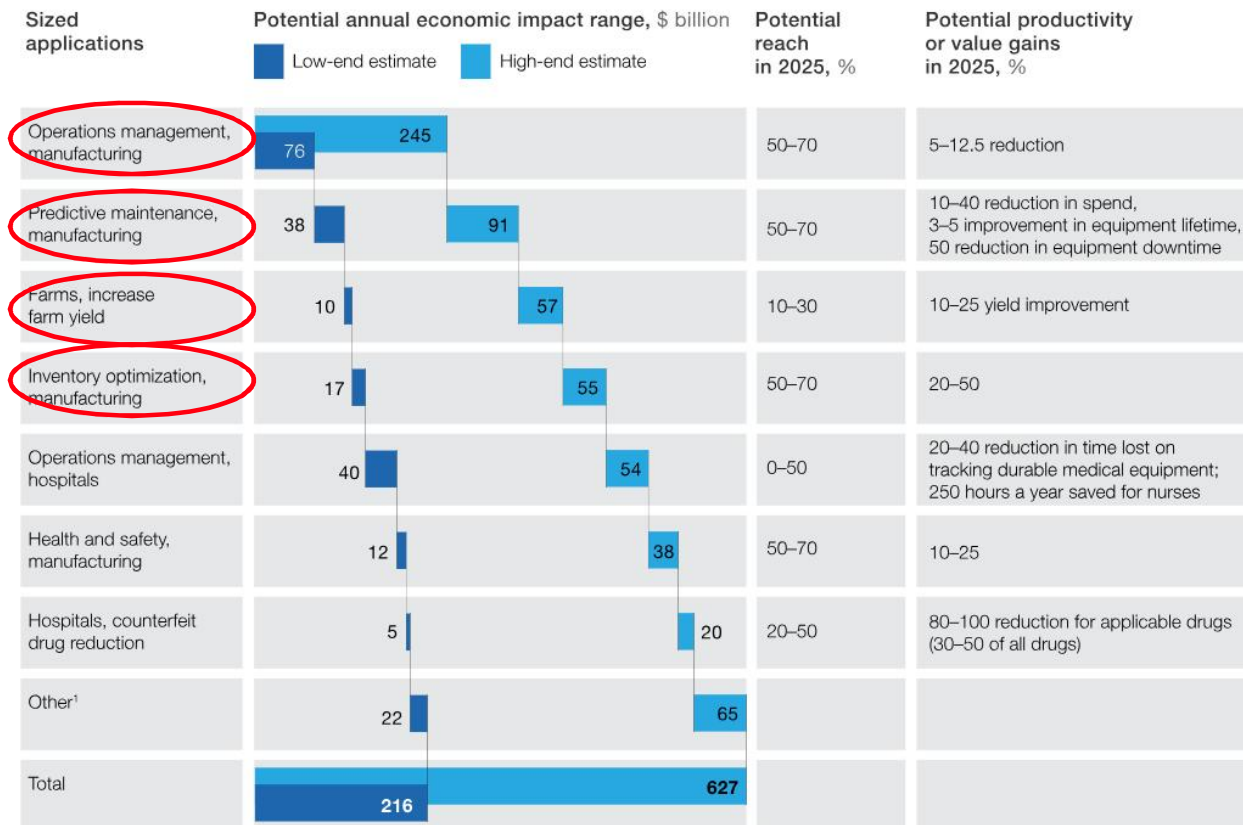
Asset optimization

Keep operations running

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Use cases

Industry 4.0 Opportunity

In ASEAN, the impact of Industry 4.0 could be between $216 billion–$637 billion a year by 2025.

Sized applications	Potential annual economic impact range, $ billion		Potential reach in 2025, %	Potential productivity or value gains in 2025, %
	Low-end estimate	High-end estimate		
Operations management, manufacturing	76	245	50–70	5–12.5 reduction
Predictive maintenance, manufacturing	38	91	50–70	10–40 reduction in spend, 3–5 improvement in equipment lifetime, 50 reduction in equipment downtime
Farms, increase farm yield	10	57	10–30	10–25 yield improvement
Inventory optimization, manufacturing	17	55	50–70	20–50
Operations management, hospitals	40	54	0–50	20–40 reduction in time lost on tracking durable medical equipment; 250 hours a year saved for nurses
Health and safety, manufacturing	12	38	50–70	10–25
Hospitals, counterfeit drug reduction	5	20	20–50	80–100 reduction for applicable drugs (30–50 of all drugs)
Other[1]	22	65		
Total	216	627		

Manufacturer's Stories in Digital

Coca-Cola
"We are very seriously trying to transform our company to make it a digital company, but it's not just to put ads in social media".

12.09.2016 – Marcos De Quinto, CEO of CCIB

DANONE
"We don't just talk digital, We act digital (...). It's no longer a question of whether you implement digital or not, but how fast and big you should go".

12.2016 – Pierre Lacour, CIO Asia Pacific

GROUPE LACTALIS
"As part of its digital transformation, Lacatalis has launched a new app aimed at its foodservice clients in Spain".

09.06.2016 – Info Retail

FrieslandCampina
"Because we have our own digital media channel, we gain more and more insights into the consumer journey, which means we constantly try to match the consumer's needs better than ever before".

04.29.2016 – Luc Wong-Lun-Hing, Digital Innovation Mgr.

Fonterra
"We're the only dairy co-operative in New Zealand offering smartphone apps to help our farmers to run their businesses and connect with the co-operative, and we're constantly enhancing our digital offering based on farmer feedback".

06.09.2016 – Evelyn Seewald, GM Operations

Nestlé
"As part of its digital transformation, Nestle has launched a new digital hub in Barcelona that will generate 70 highly qualified jobs for digital platforms that the group will use to communicate with consumers on a global scale".

02.03.2016 – La Vanguardia

Digital solutions for industry

Improved productivity (+200%), reduced energy (-30%), & longer product life (+30%)

Digital operation

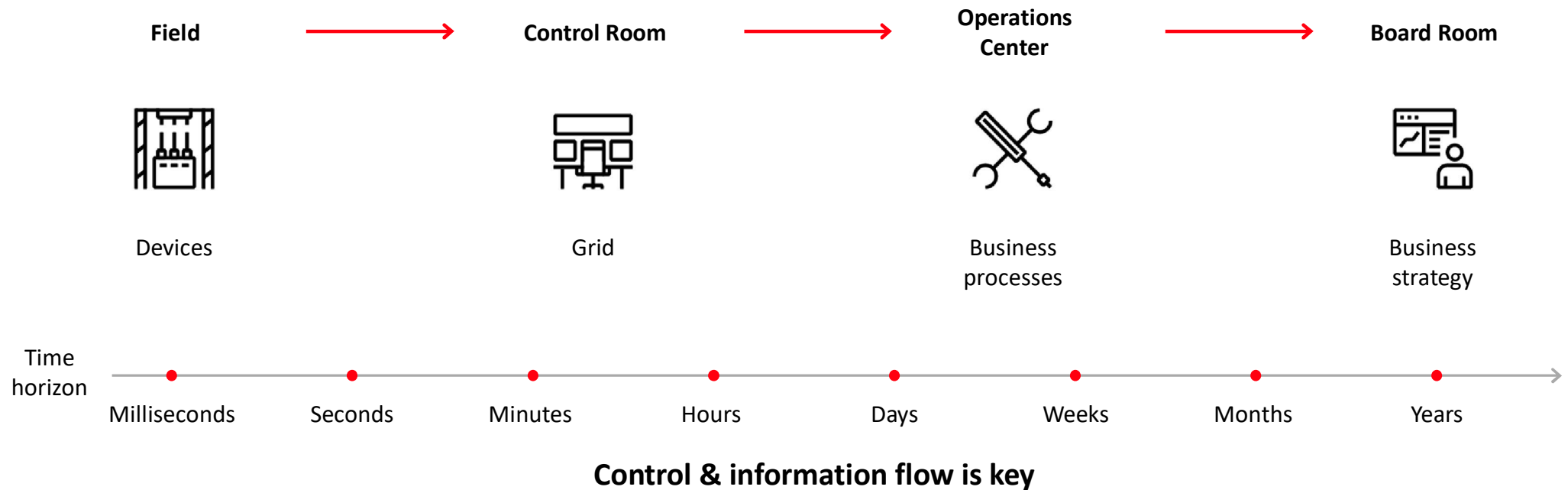|			
Digital simulation for robot deployment	**Connected robots**	**Manufacturing execution systems**	**Distributed control systems**
Energy assessment	**Cybersecurity assessment**	**Power quality monitoring & demand-response**	**Remote monitoring & optimization**

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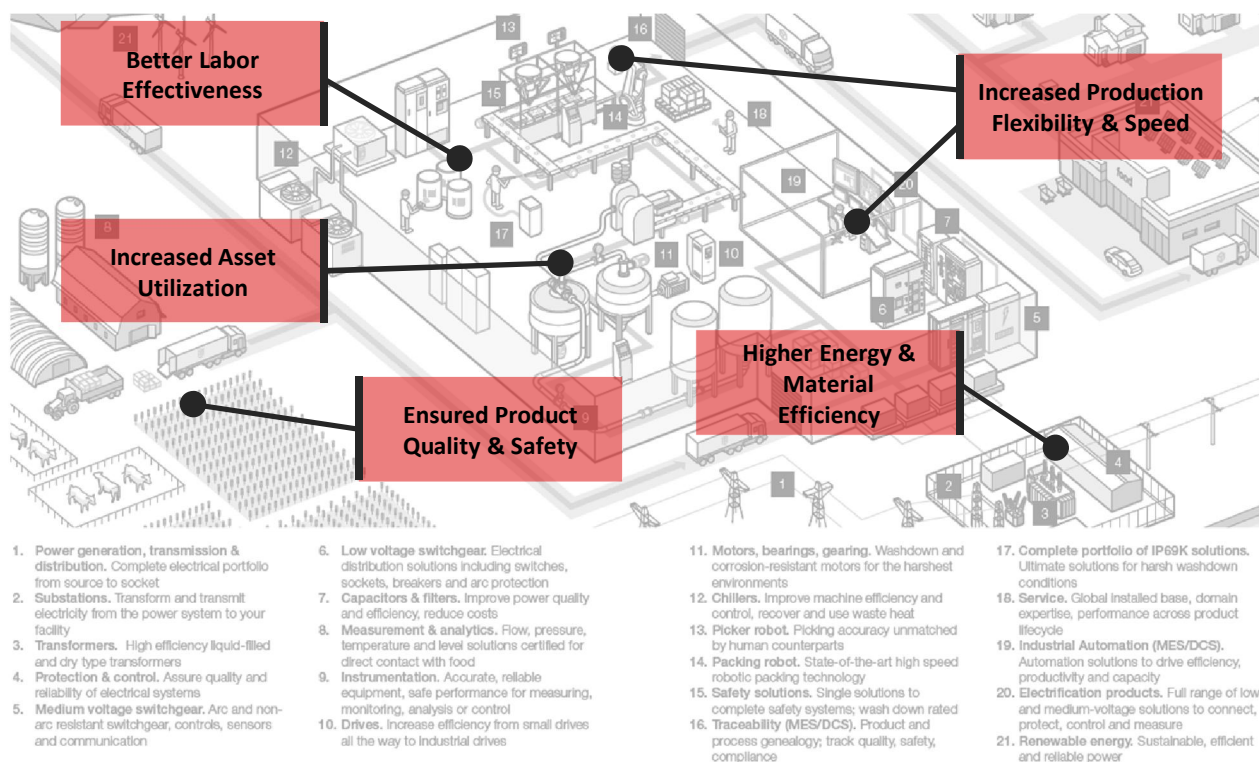# Industry will increasingly have to deal with very complex, dynamic environments

Making the right decisions requires system level visibility in real time across the business

Field	→	**Control Room**	→	**Operations Center**	→	**Board Room**
Devices		Grid		Business processes		Business strategy

Time horizon → Milliseconds — Seconds — Minutes — Hours — Days — Weeks — Months — Years

Control & information flow is key

Digitalization is the answer for the necessary Situational Awareness, Agility and Decision-Making velocity

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Digital Solutions for the Manufacturing
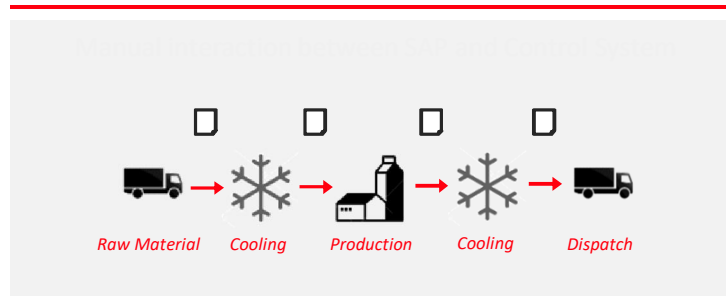
Addressing all of your pain points

Better Labor Effectiveness

Increased Production Flexibility & Speed

Increased Asset Utilization

Higher Energy & Material Efficiency

Ensured Product Quality & Safety

1. **Power generation, transmission & distribution.** Complete electrical portfolio from source to socket
2. **Substations.** Transform and transmit electricity from the power system to your facility
3. **Transformers.** High efficiency liquid-filled and dry type transformers
4. **Protection & control.** Assure quality and reliability of electrical systems
5. **Medium voltage switchgear.** Arc and non-arc resistant switchgear, controls, sensors and communication

6. **Low voltage switchgear.** Electrical distribution solutions including switches, sockets, breakers and arc protection
7. **Capacitors & filters.** Improve power quality and efficiency, reduce costs
8. **Measurement & analytics.** Flow, pressure, temperature and level solutions certified for direct contact with food
9. **Instrumentation.** Accurate, reliable equipment, safe performance for measuring, monitoring, analysis or control
10. **Drives.** Increase efficiency from small drives all the way to industrial drives

11. **Motors, bearings, gearing.** Washdown and corrosion-resistant motors for the harshest environments
12. **Chillers.** Improve machine efficiency and control, recover and use waste heat
13. **Picker robot.** Picking accuracy unmatched by human counterparts
14. **Packing robot.** State-of-the-art high speed robotic packing technology
15. **Safety solutions.** Single solutions to complete safety systems; wash down rated
16. **Traceability (MES/DCS).** Product and process genealogy; track quality, safety, compliance

17. **Complete portfolio of IP69K solutions.** Ultimate solutions for harsh washdown conditions
18. **Service.** Global installed base, domain expertise, performance across product lifecycle
19. **Industrial Automation (MES/DCS).** Automation solutions to drive efficiency, productivity and capacity
20. **Electrification products.** Full range of low- and medium-voltage solutions to connect, protect, control and measure
21. **Renewable energy.** Sustainable, efficient and reliable power

80+ digital offerings

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ABB Ability™ Manufacturing Execution Systems

Vertical integration for inventory levels reduction

Before
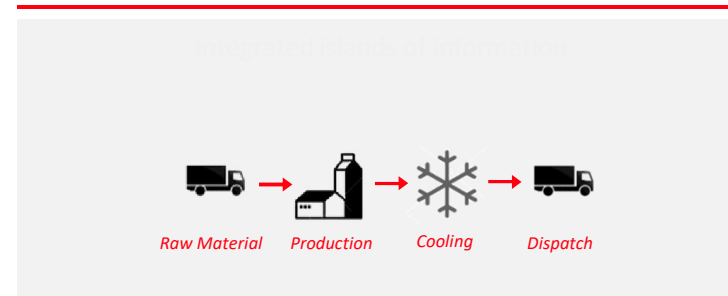
Raw Material → Cooling → Production → Cooling → Dispatch

Manual, paper driven process:

- Inherent quality losses and delays

- Real time production status not available
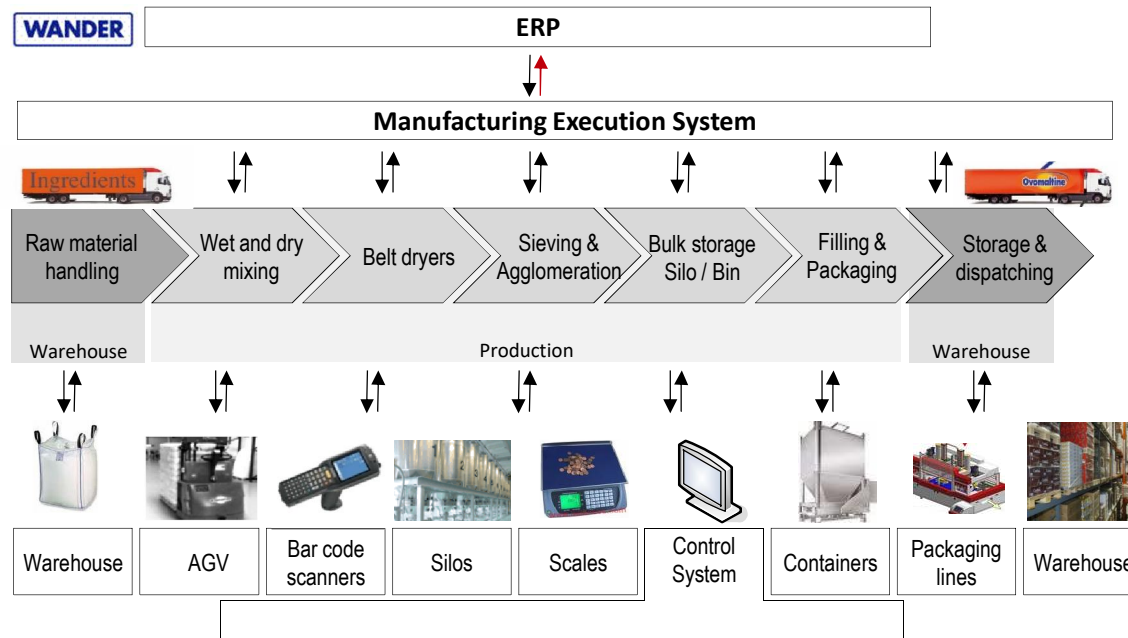
- High inventory levels to keep process running

Now

Raw Material → Production → Cooling → Dispatch

Integrated business and production system:

- Enables real time production information visibility

- Throughput time reduced from 3 to 1.5 days

- Raw material delivered fresh to production (just in time)

- Logistics for produced goods planned near real-time

The highest TCO cost lever reduced, process optimized

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ABB Ability™ Manufacturing Execution Systems

Interoperability for highest output and full traceability

Seamless integration of people, equipment and systems along the production

ABB Ability™ Connected Services for Robots

Less Downtime and More Control

Customer

MAN Trucks & Bus Germany

- MAN is a leading manufacturer of commercial trucks and busses. The member of the VW Group operates production plants in 7 countries
- The German plants in Munich and Nuremberg supply trucks from 7,5 to 44 tons for the European market
- MAN targets to grow their share of today 16% of the European truck market

ABB Solution

ABB Ability™ – Connected Services

Connected Services for 190 robots

- Condition monitoring
- Back up management
- Fleet management
- Asset optimization
- Remote Access

Value

- Availability
- Performance
- 25% less incident
- 60% faster trouble shooting
- Increase productivity and competitiveness

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ABB Ability™ Digital Power Train

Motors, Pumps and Drives that let you know when it's time for Service

An affordable, clever and easy solution that

– Improves Safety

– Reduces Downtime

– Saves Energy

– Reduces Maintenance Costs

– Optimizes Investment

– Mitigates Risk

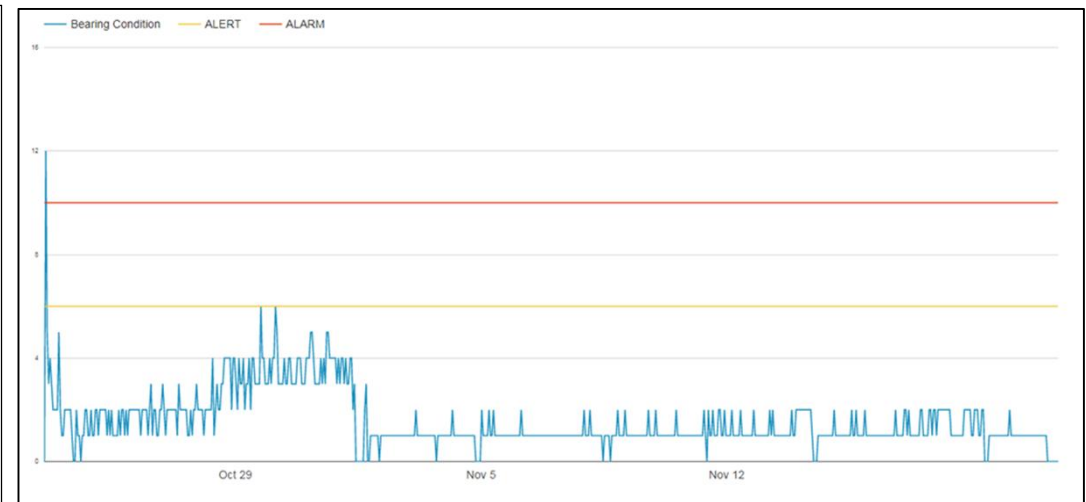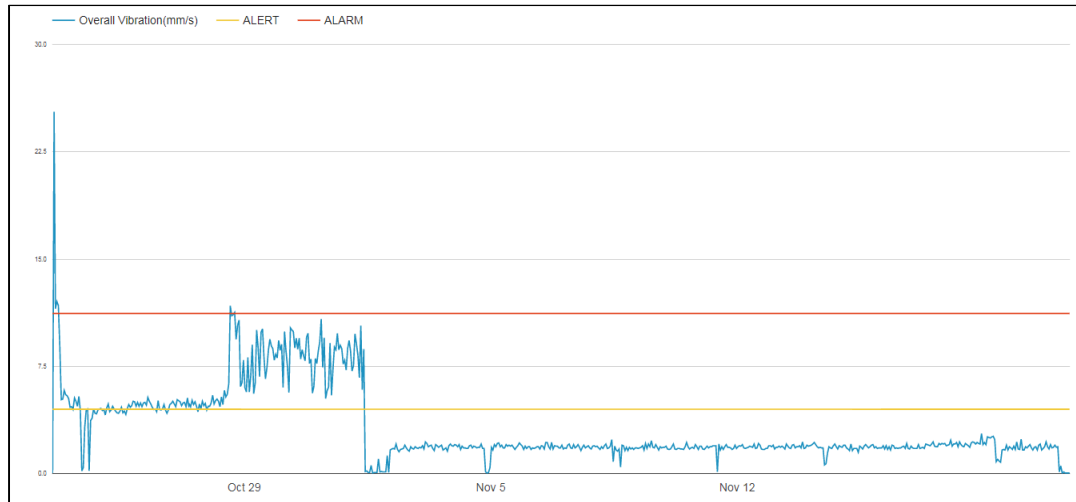Takes predictive maintenance to the smallest of motors and pumps in the plant

Revolutionizing business models and changing how we interact with our customers

Using a smart device to deliver **"asset-as-a-service"**

ABB
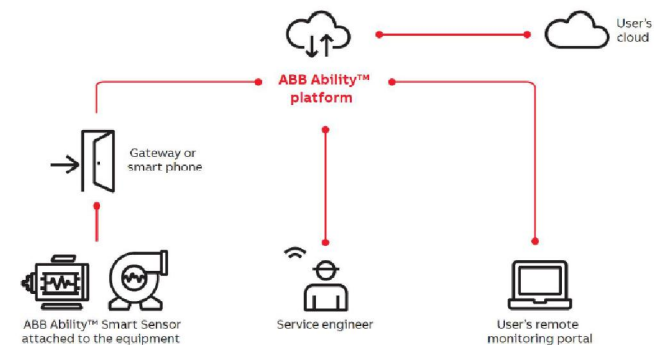
Fulfilling the value proposition at Customer 'A'

Smart Sensor prevents unplanned downtime

- Smart Sensors installation - 5 motors on 23 Oct 2017.

- One motor was exhibiting higher than normal vibrations from the time of installation. The levels were in the alert zone. Vibrations increased suddenly to near alarm levels on 28 Oct after noon.

- The vibrations and bearing condition was monitored and on 31 Oct 2017 a decision to carry out a smooth planned change out of the motor was taken. The motor was replaced with a spare motor. The sensor was shifted to the newly installed motor. The vibration levels of the newly installed motor have been good.

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Singapore: increasing ship connectivity

ABB Ability™ Collaborative Operations Center

Ship owners, in collaboration with ABB's experts, monitor the performance of their fleets 24/7 from the centers in Singapore, Norway and Singapore, following the sun across the globe.

Ship owner saves up to 50% on dry docking costs - data is collected from systems and analyzed during dry dockings.

Connect ship's crew with their technical & nautical departments in the office, customers can speak to an ABB expert engineer with a ships data in front of them.

http://www.abb.com.sg/cawp/seitp202/149d007a29fd43fb48257fdb002362a7.aspx

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Southeast Asia: Paper Machine Improves Productivity, Quality and Cost

ABB Ability™ Collaborative Operations Center

A customer challenged by output quality (Sheet Breaks) and variability.

ABB's solution for Advanced Process Control gives sustaining results:

25% reduction in sheet breakage and grade changes

5% reduction in raw material

15% improvement in process variability
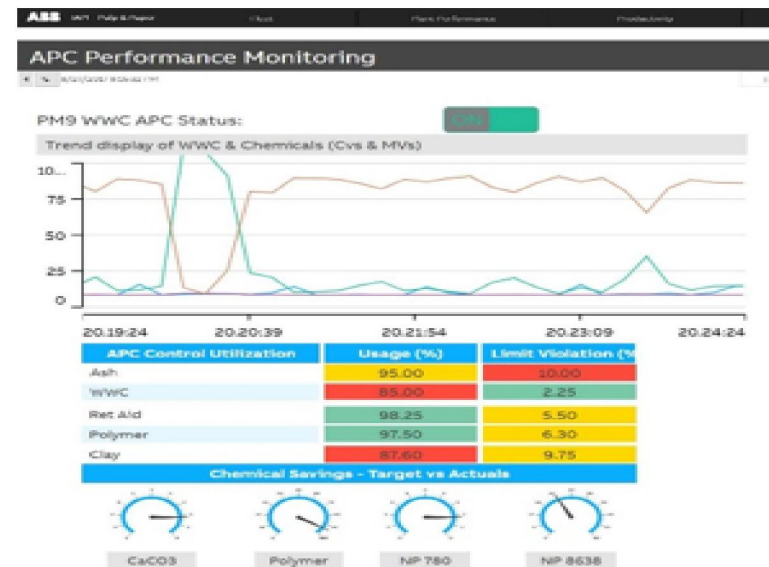
ABB delivers value in a performance based contract.

ABB South East Asia– Customer Experience and Digital Center

Bringing Expertise and Customers together – Launching Q4 2018

Customer Experience and Digital Center

ABB Ability™ Collaborative Operations Center

Connecting Plant, Equipment and Expertise

Monitoring & optimizing customer operations

ABB Ability™ Digital Solutions Center

Co Developing Innovative Solutions and bridging the IT/OT divide

Customer Experience Center

ABB's Digital Value Chain and Demonstration of technologies across the whole portfolio

Training

World Class Digital Training facility for Customers, Partners, System Integrators and ABB

World Class Infrastructure

Operator Workplace

Armor Rooms

Collaboration tools

Workshop Rooms

Expertise

Monitoring Engineers

Solution Architects

Domain Experts

IOT Specialists

IT/OT Experts

ABB