

DIGITALIZATION IN OIL AND GAS

- What is it really?
- How do we address it as an Industry?

Oil & Gas UK - Safety 30

June 6th, 2018

WALTER QVAM | @Wqvam

sintef.no, dnv.gl.com, digitalnorway.com

The Oil and Gas industry is a “late bloomer”

/Evolution rather than revolution

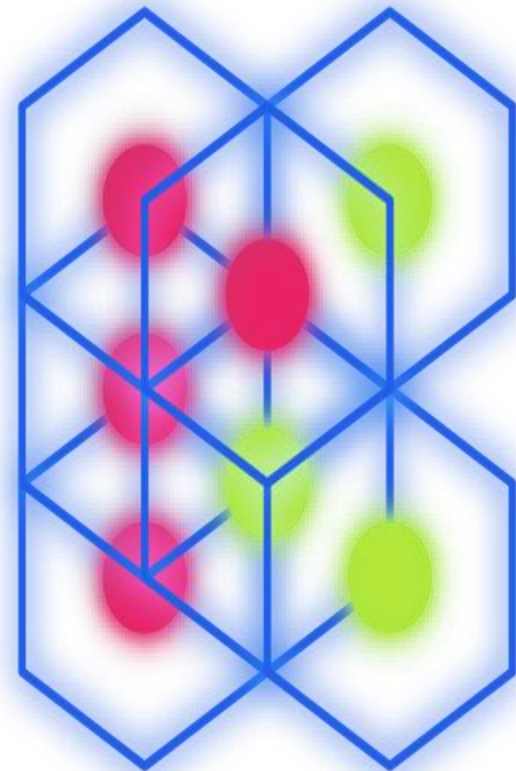
- Safety, Environment, Long cycles, Complex Value Chain/Supply Chain, Business to Business, Projects – and culture

/Make no mistake!

- Digitalization will be very important

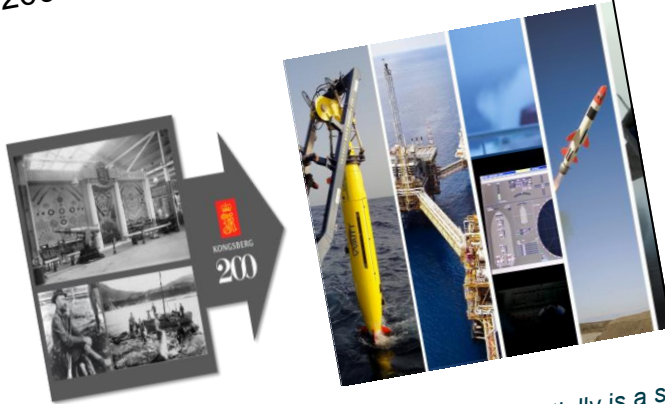
/Understand it and drive it!

- Industry wide initiatives (eco system)
- Learn from and work with others
- The role of the Regulator
- The role of the Safety Authority



In 2014 we started to ask ourselves: How will digitalization affect KONGSBERG? How do we lead? How do we innovate?

"FROM WROUGHT IRON TO DATA"
- 200 YEARS OF TECHNOLOGY INNOVATION



Today, KONGSBERG essentially is a so
electronics and data corporation

WORLD CLASS - through people, technology and

24/09/2017

KONGSBERG PROPRIETARY - See Statement of Proprietary Information

**TODAY WE ARE A LEADING TECHNOLOGY
CORPORATION**



KONGSBERG MARITIME

Global market leader within
both offshore and merchant
marine applications

- Dynamic positioning
- "Full picture" integrated automation and control systems
- Hydro acoustic technologies
- Solutions for sustainable fisheries
- Autonomous underwater vehicles, underwater robotics



KONGSBERG DEFENCE
SYSTEMS

Modern product portfolio in
growing defence and
aerospace niches

- Missiles
- Air defence
- Command & control systems for land and naval applications
- Complex lightweight structures for the F-35
- Space technologies, satellite services and surveillance



KONGSBERG PROTECH
SYSTEMS

Unrivaled global market leader
in remote weapon stations

- PROTECTOR RWS M151/M153
- MCT-30 medium caliber turret
- Other specialized remote weapon stations



KONGSBERG DIGITAL

A leading industrial software
environment

- An important step in the Group's strategy for developing the next generation of digitalized products and services
- Building on existing software and simulation environments in KOGT and KM
- Group responsibility for developing new digital solutions and related technology alliances

KONGSBERG DIGITAL

24/09/2017

WORLD CLASS - through people, technology and dedication

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DIGITALNORWAY
TOPPINDUSTRISERETET AS

A national force multiplier to drive growth and digital competence building



The Founders and owners of DigitalNorway



Nærings- og
fiskeridepartementet



A formidable technology wave.....



Is this time different?

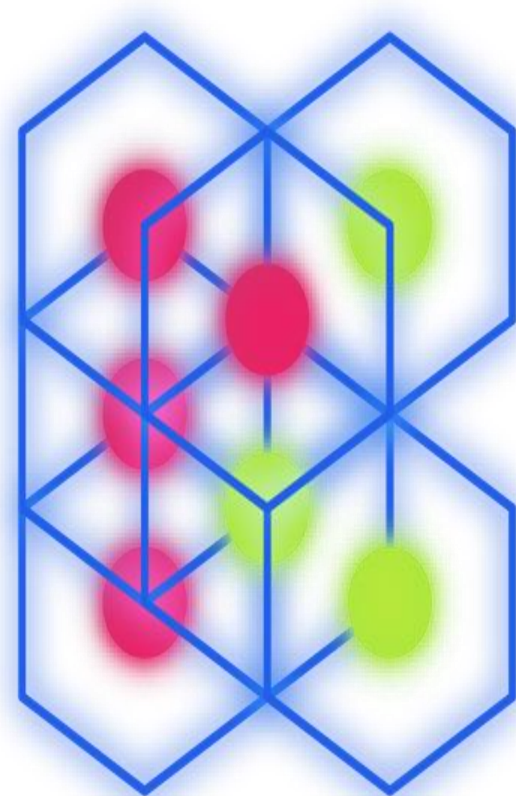
Yes – because:

- ✓ The change is global and without limitations
- ✓ Sensors are installed everywhere
- ✓ The technology, in particular AI - is here and affordable
- ✓ Data storage and data power is available and “for free”



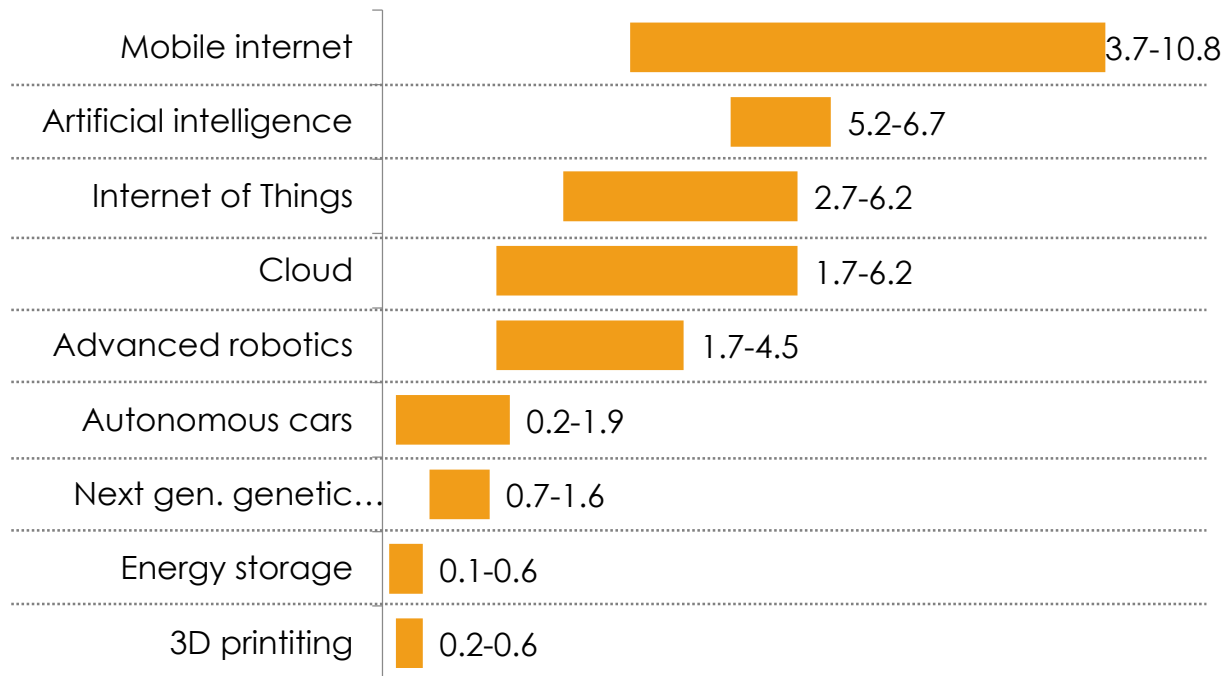
The competitive landscape changes

- /Entry barriers removed or drastically reduced. Start-ups and unknown competitors breaks into new sectors
- /Geographical boundaries becomes much less significant. Global reach
- /Scale becomes ever more important. Marginal cost getting close to zero



Significant investments in certain technologies drive accelerated adoption

Potential for 9 selected technologies in 2025, USDbn



NOTE: Economic impact, including consumer surplus – impact from other potential applications not sized

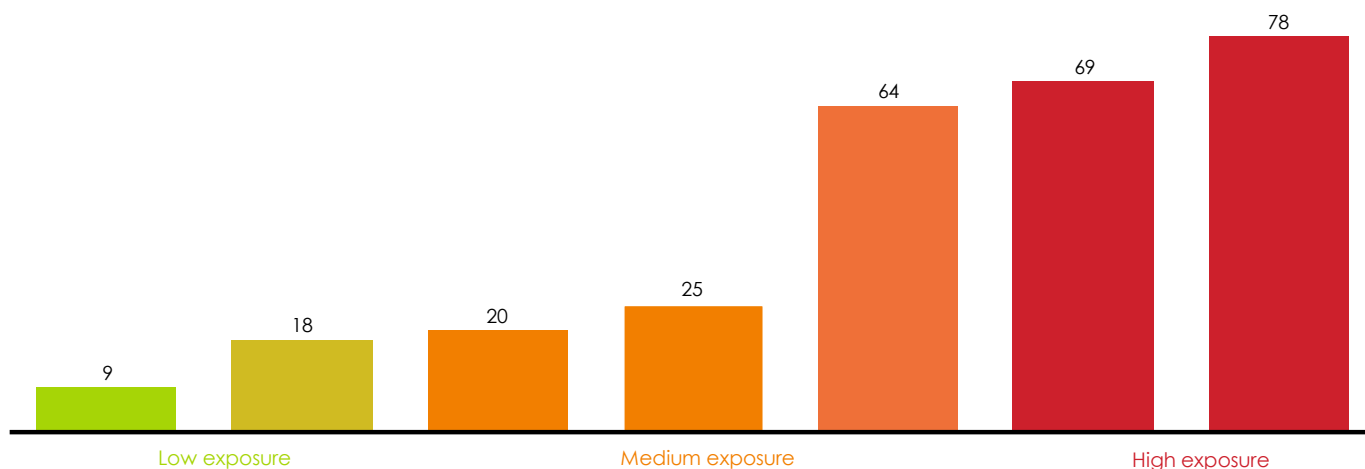
Source: McKinsey Global Institute analysis

Job content changes, many will disappear – and many will be created

Time spent across all industries, %



Technical achievable level of automation, % of time used on activities that can be automated



Source: McKinsey Global Institute analysis

Three trends

- several technology groups

/ Gartner's three macro trends

/ Much "hype"

/ Butalso significant R&D and investments

/so – some technologies are here very soon

Three Trends

AI Everywhere

Deep Learning
Deep Reinforcement Learning
Artificial General Intelligence
Autonomous Vehicles
Cognitive Computing
Commercial UAVs (Drones)

Conversational User Interfaces
Enterprise Taxonomy
Ontology Management
Machine Learning
Smart Dust
Smart Robots
Smart Workspace



Transparently Immersive Experiences

4D Printing
Augmented Reality
Brain-Computer
Interface
Connected Home

Human Augmentation
Nanotube Electronics
Virtual Reality
Volumetric Displays



Digital Platforms

5G
Digital Twin
Edge Computing
Blockchain
IoT Platform

Neuromorphic Hardware
Quantum Computing
Serverless PaaS
Software-Defined Security



gartner.com/SmarterWithGartner

Source: Gartner
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Gartner

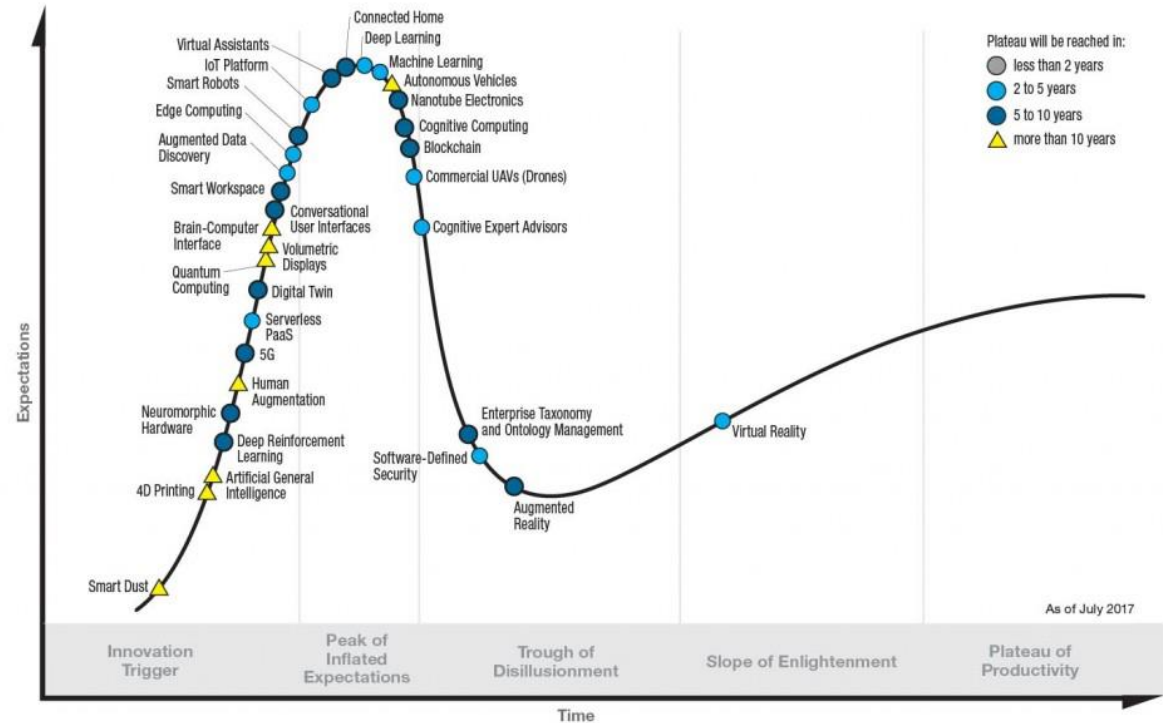
Significant differences in maturity and speed

/ Certain technologies are maturing

/ Follow closely.....

- Virtual Reality
- Augmented Reality
- AI/Machine learning
- Commercial drones
- IoT / Sensor technology
- Digital Twins
- Blockchain

Gartner **Hype Cycle** for Emerging Technologies, 2017



gartner.com/SmarterWithGartner

Source: Gartner (July 2017)
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Gartner

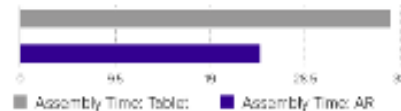
Augmented Reality in design, construction and operation



- / Use cases show significant potential
- / Boeing + Iowa State University Study
- / Aircraft Wing First-Time Assembly

30%↓

Reduction in assembly time
using AR vs. 3D Tablet
Instructions



94%↓

Reduction in errors using
AR work instructions vs.
tablet



Digital Twins

"Everything"
"All"
"Always"

Ingredients:

- / Simulation software and tools
- / Sensors and IoT
- / Machine Learning and Predictive Analyses
- / Common, open architecture, API's



Drone inspection of flares, towers, constructions

Ingredients:

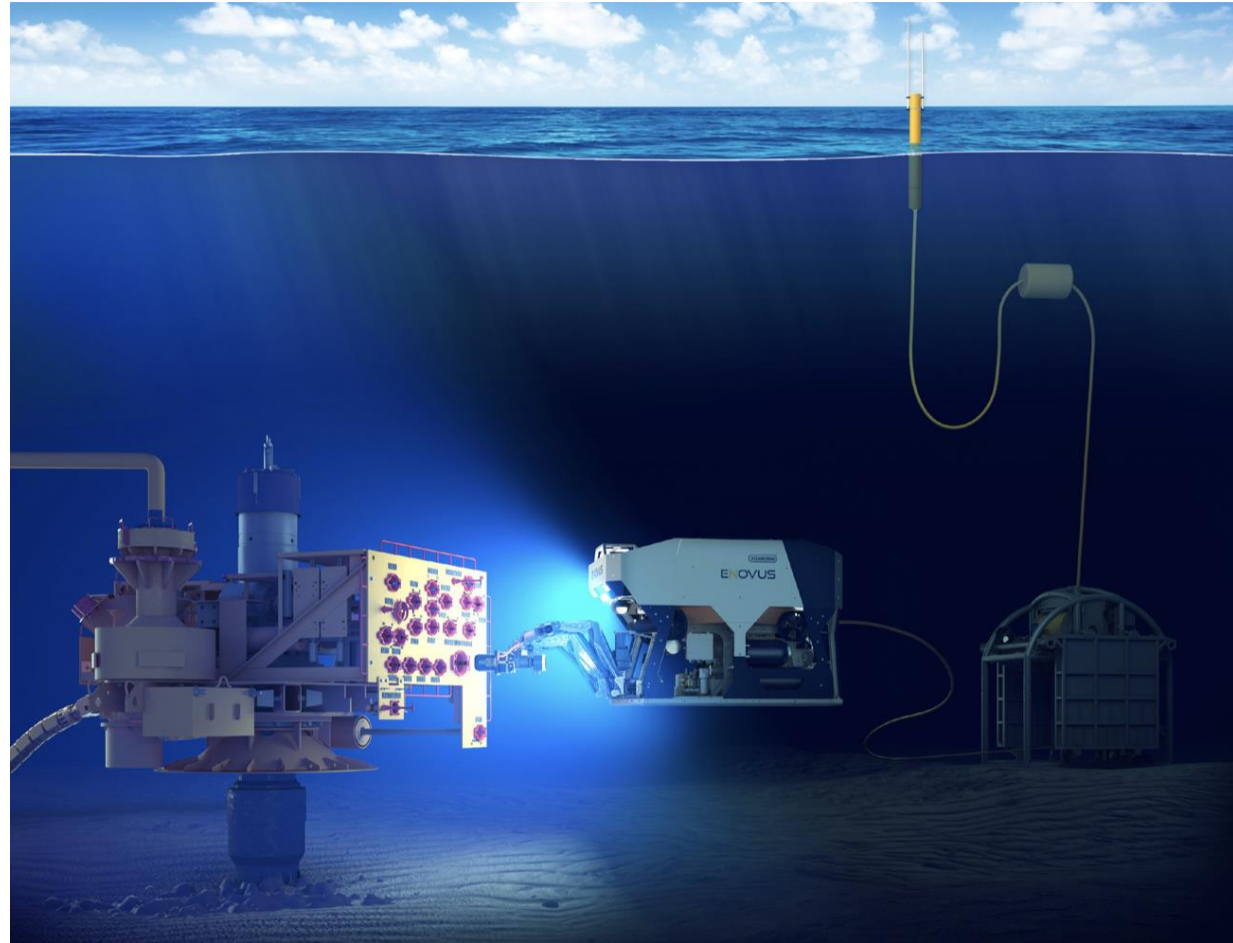
- / Commercial Drones
- / Data storage and algorithms
- / Common, open architecture, interoperability, API's
- / Machine Learning and Predictive Analyses



ROV's becoming truly remote. AUV's becoming truly autonomous

Ingredients:

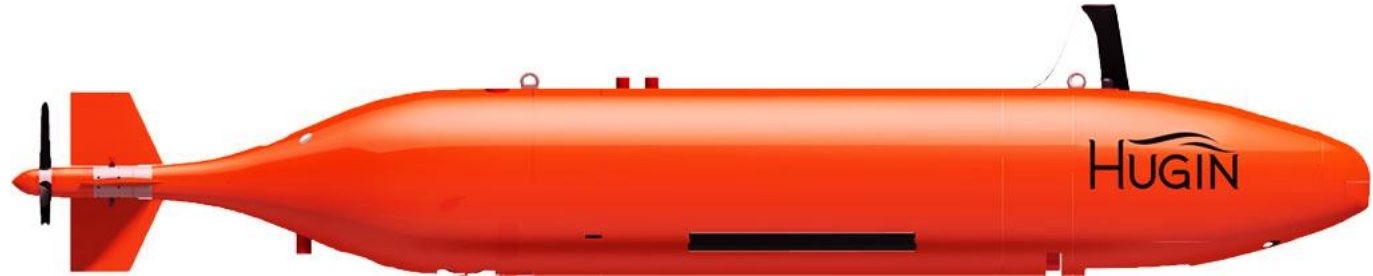
- / Commercial E-ROVs
- / Battery Technology
- / Data storage and algorithms
- / Common, open architecture, interoperability, API's
- / Inspection, maintenance data and algorithms
- / Machine Learning and Predictive Analyses



ROV's becoming truly remote. AUV's becoming truly autonomous

Ingredients:

- / Commercial AUVs
- / Battery Technology
- / Data storage and algorithms
- / Common, open architecture, interoperability, API's
- / Inspection, maintenance data and algorithms
- / Machine Learning and Predictive Analyses



Robots do jobs in hazardous areas

Ingredients:

- / Commercial Robots
- / Battery Technology
- / Data storage and algorithms
- / Common, open architecture, interoperability, API's
- / Inspection, maintenance data and algorithms
- / Machine Learning and Predictive Analyses



Look to other industries and “steal with pride”!

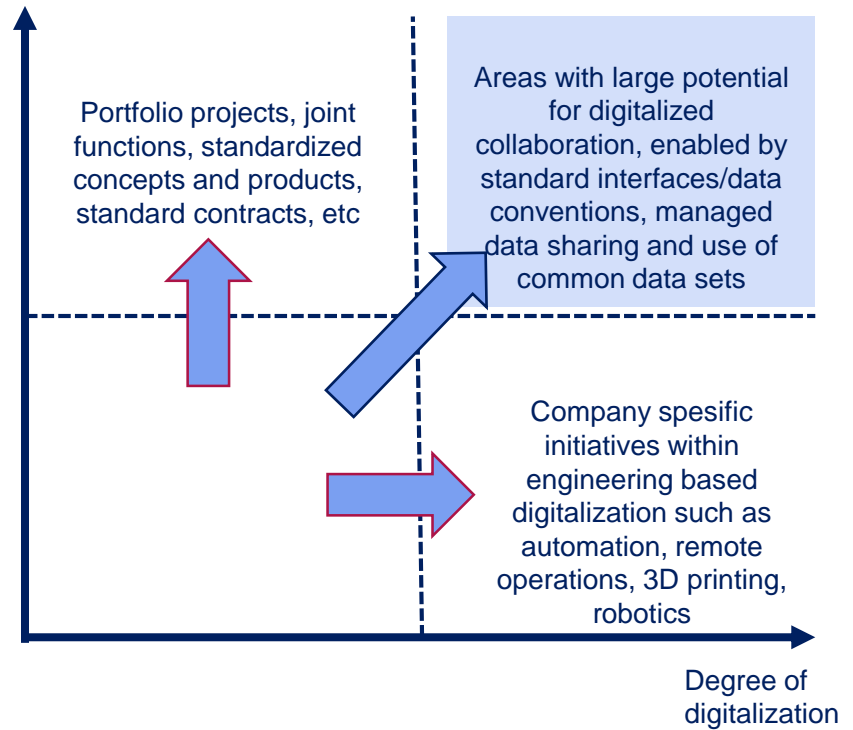
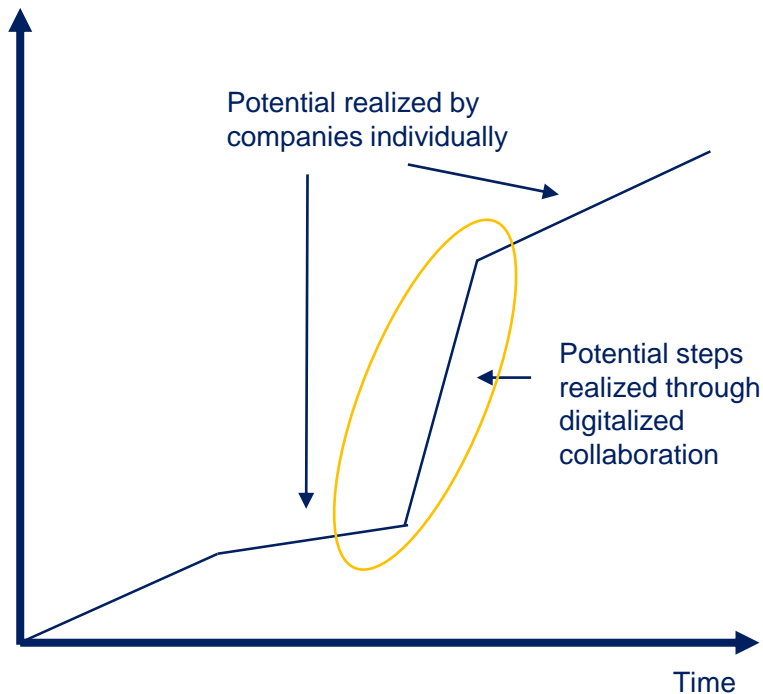
*Norwegian Airport Authority and KONGSBERG
remotely operating 30 small airports*

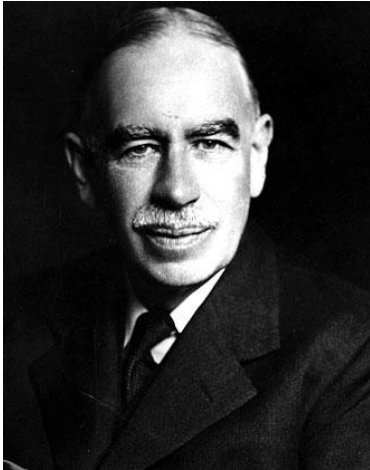


Digitalization enables reduced «system costs»

Realized value

Degree of collaboration





“The difficulty lies not so much in developing new ideas as in escaping from old ones.”

John Maynard Keynes 1883-1946



«ROI»:

RETURN ON
INVESTMENT
or
RISK OF
IGNORANCE?



Where and how do we establish the safety barriers in the digitalized oil and gas industry?

The barriers are changing

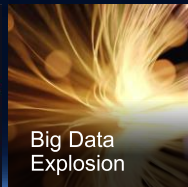
- / Human errors reduced
- / Hazardous jobs/positions removed
- / Digital Twins "eliminates" interface controls
 - Document approvals?
- / Work processes significantly changed
 - Internally and between companies and institutions
- / Efficiency and Productivity improved
- / Vulnerability increased
 - Cyber security
 - Technology and automation risks increased



Fundamentally, this change is about leadership – not technology



Ubiquitous
Connectivity



Big Data
Explosion



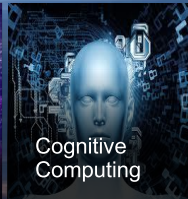
Software



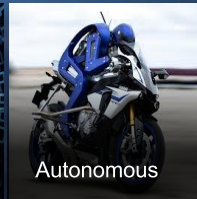
Automation/
Robotics



Artificial
Intelligence



Cognitive
Computing



Autonomous

- **LEADERSHIP**
- **WORK PROCESSES**
- **NEW BUSINESS MODELS**
- **NEW VALUE CHAINS**
- **NEW SERVICES**

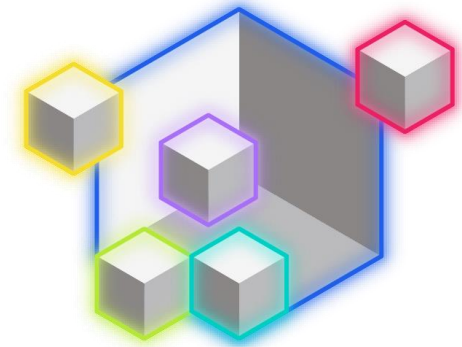
70% of the new work tasks will be done by today's employees

- / A significant training challenge
- / Shared by management, employees, union representatives
- / New structures and work patterns
- / Change management
- / Life long learning
 - Each company
 - Every employee



In successful big changes, the regulator and authorities have played a significant role!

Supporting change with a proactive, enabling mindset



Thank You!

@WQvam