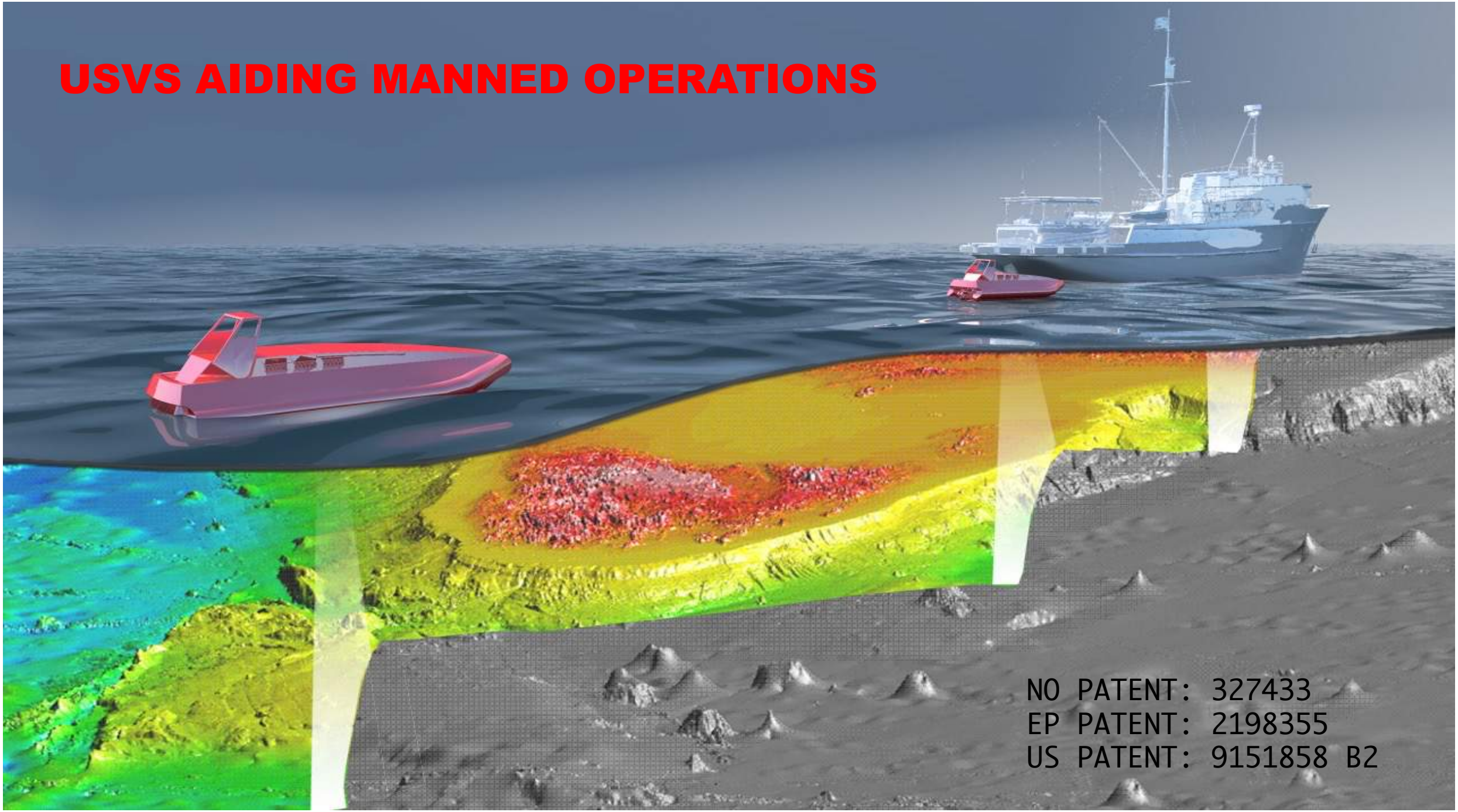
UNMANNED SYSTEMS

COST EFFICIENT AND RISK-REDUCING MARITIME DATA ACQUISITION

MARITIME ROBOTICS

- Established in 2005
- Located in Trondheim, Oslo and Eggemoen, Norway
- Main markets are geospatial mapping, environmental monitoring, transportation and defence/security
- Turnover: 43,1 mill NOK (2019)
- Growth: 20% per year
- Employees: 30

USVS AIDING MANNED OPERATIONS



NO PATENT: 327433
EP PATENT: 2198355
US PATENT: 9151858 B2

MARITIME
ROBOTICS

MARITIME ROBOTICS

MARITIME ROBOTICS
USV PLATFORMS

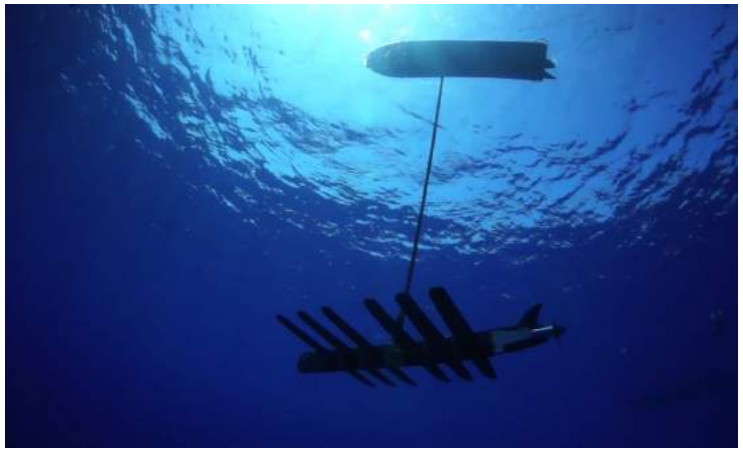
SHELTERED WATERS

OTTER

COASTAL/OPEN WATERS

MARINER

OCEANS



WAVE GLIDER

UNMANNED BY
MARITIME
ROBOTICS

MARITIME ROBOTICS
USV SYSTEMS

SHELTERED WATERS

OTTER

COASTAL/OPEN WATERS

MARINER

REFERENCES

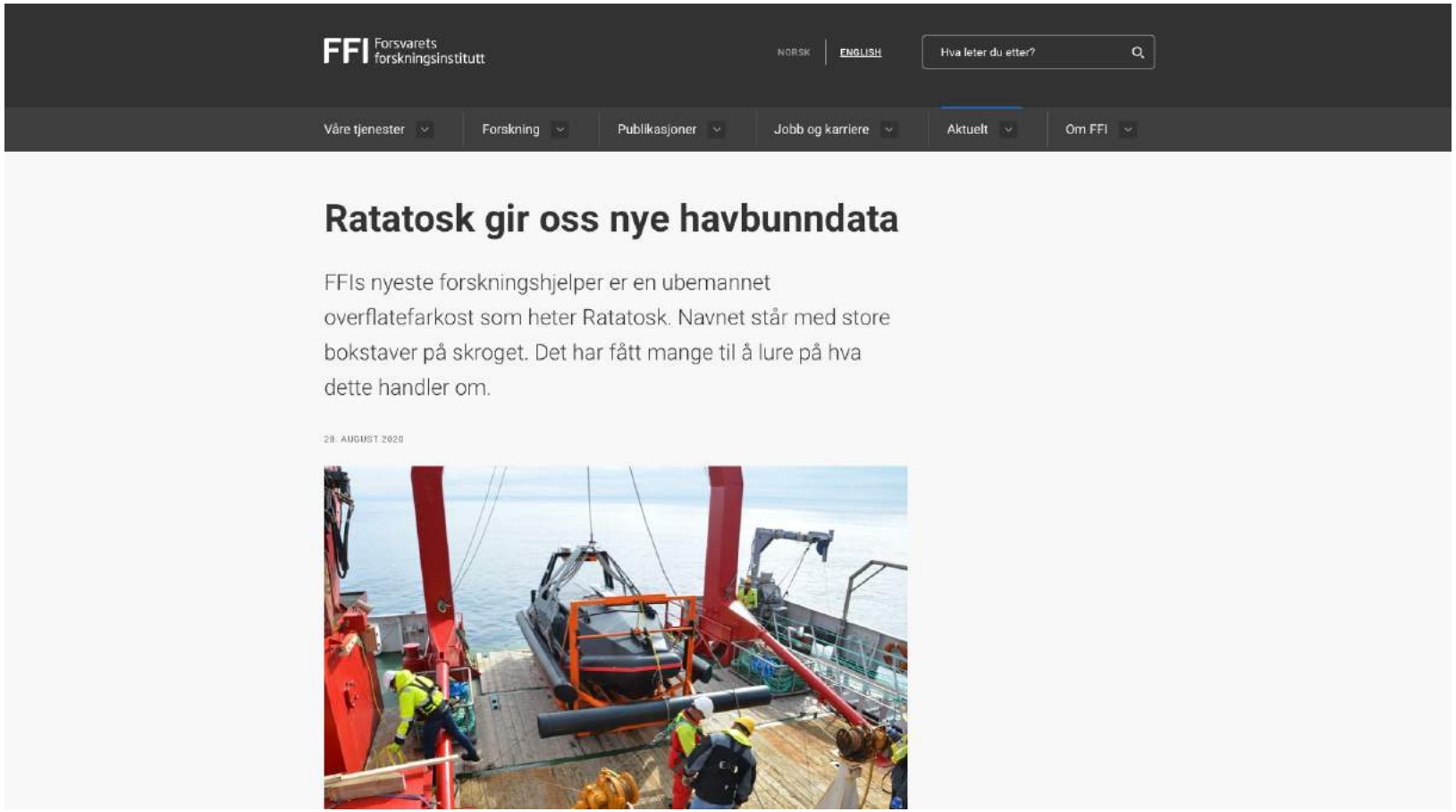
- Delivered more than 30 Otter USVs to customers worldwide
- 4 Mariner USVs delivered to seismic market, military and RnD market
- Several conversions of boats for unmanned operation

UNMANNED BY
MARITIME
ROBOTICS

Unmanned by
MARITIME
ROBOTICS

MARINER FOR THE NORWEGIAN DEFENCE RESEARCH ESTABLISHMENT (FFI)

https://www.ffi.no/aktuelt/nyheter/ratatosk-gir-oss-nye-havbunndata



MARITIME ROBOTICS

massterly
a Kongsberg Wilhelmsen joint venture

Autonomous Vessels enabling emission-free logistics

Massterly is Kongsberg and Wilhelmsen's joint effort to develop the autonomous maritime market

TECHNOLOGY

- Leading in development of autonomy
- Frontrunner in digital development
- Trusted on cyber security

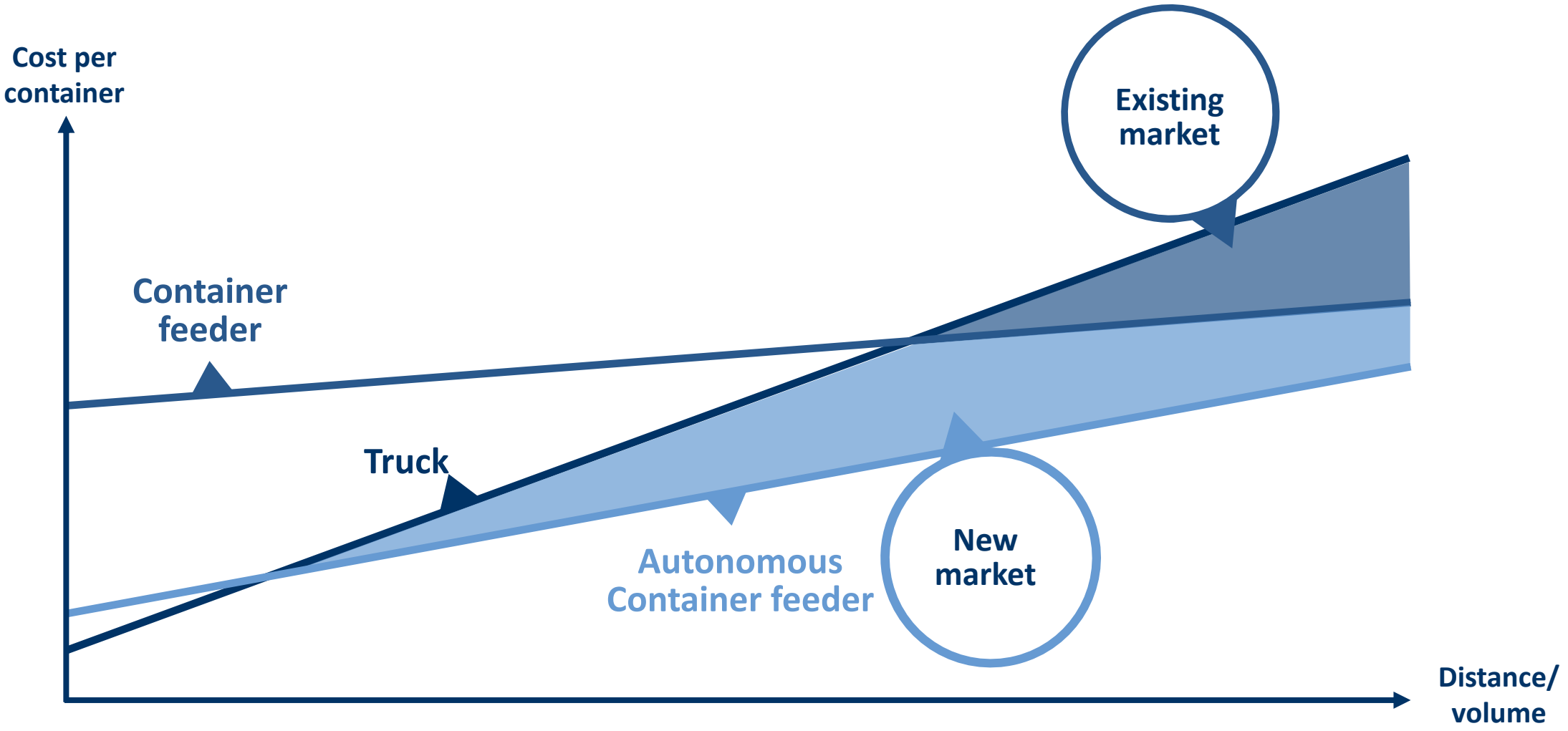
OPERATION

- Experienced in vessel operation
- Major logistics operator at sea and on land
- One of the largest maritime network globally

What shall we deliver?

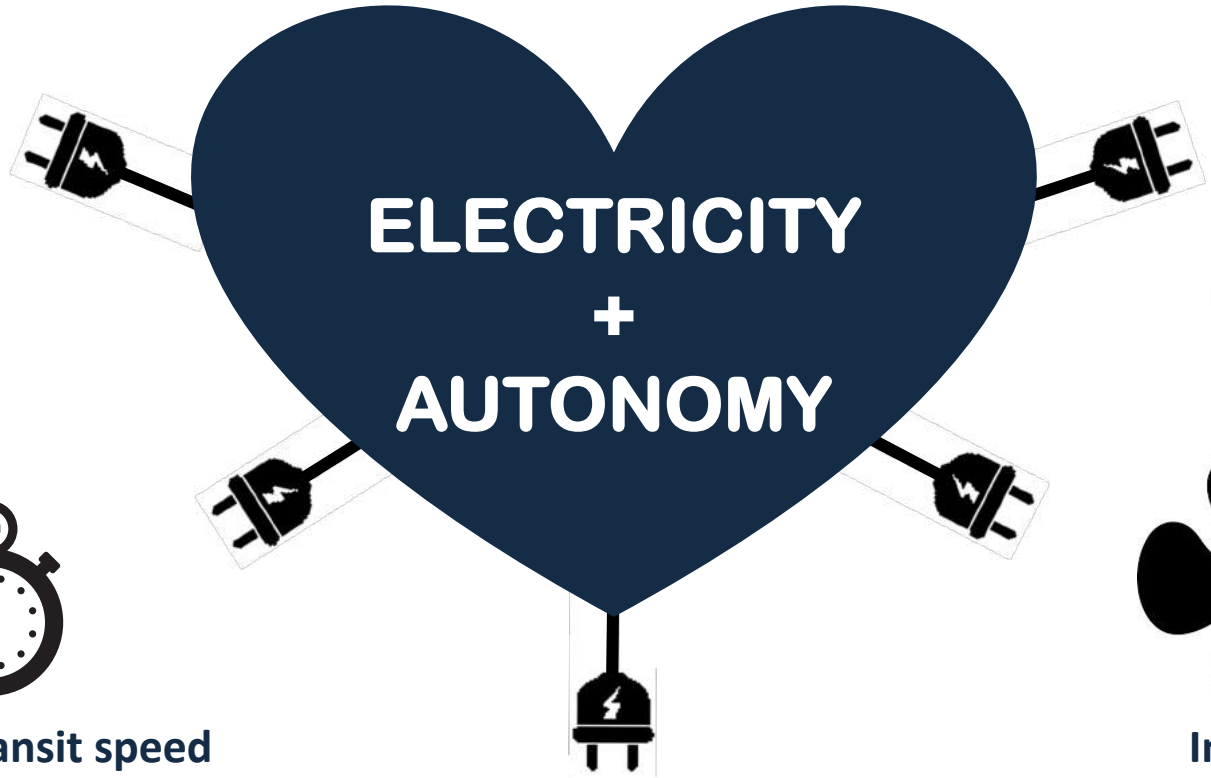
Environmentally friendly logistics
enabling the shift from road to sea

Creating a new market for ocean transportation



Autonomy is the means, not the target

- Lower operational cost
- Improved safety and efficiency
- Zero / low emission vessels



Reduced CO2 emissions
Zero emission solution

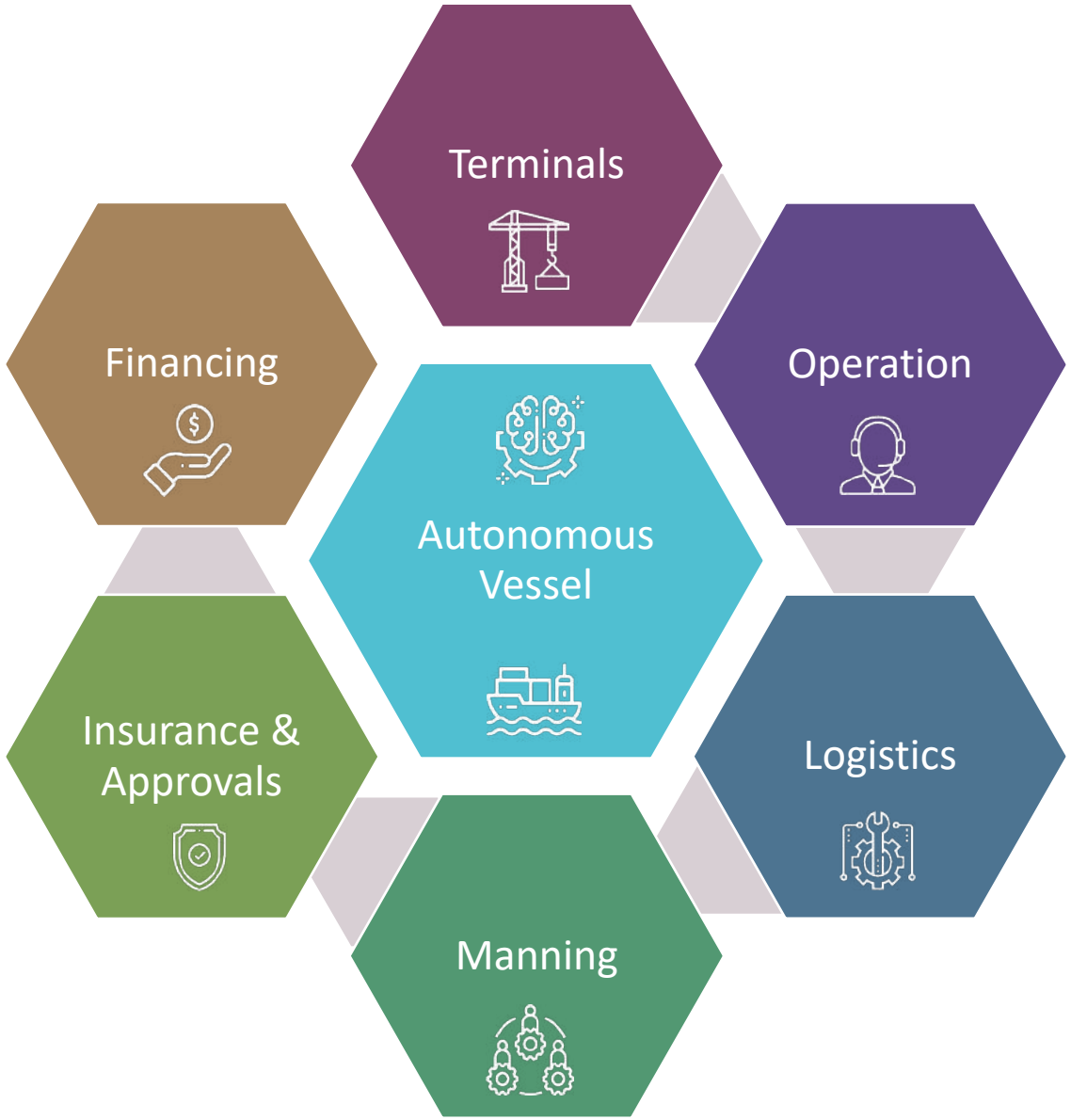
Reduced fuel cost
Electricity is cheaper than diesel

Reduced transit speed
Reduced speed reduces energy consumption

Increased maneuverability
Electric power increases response and maneuvering capabilities

Reduced maintenance
Fewer moving parts and simpler to maintain

Customers can get support in their entire value chain



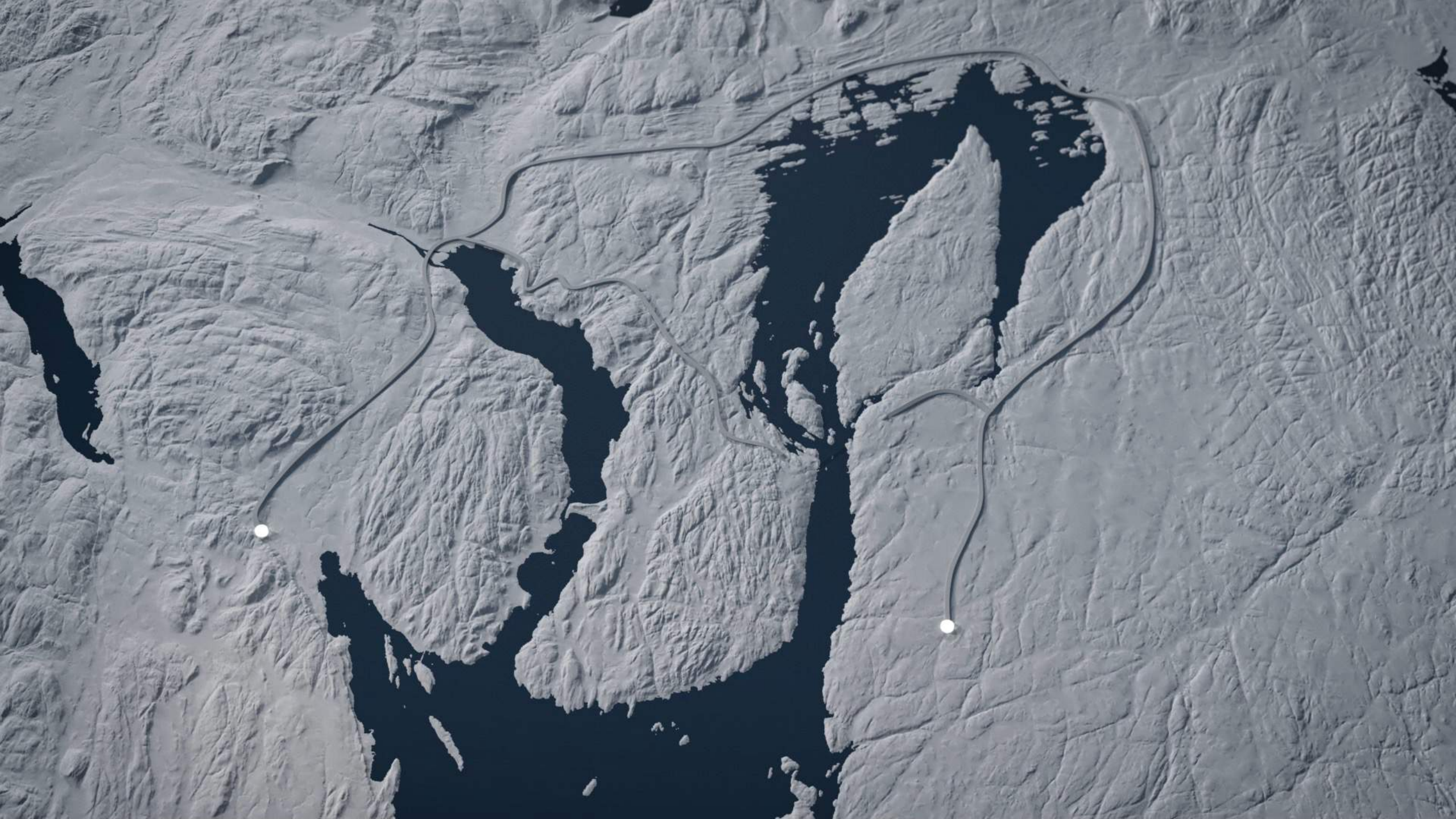
Zero Emission
YARA
Yara Birkeland

VARD
MARIN TEKNIKK
Yara Birkeland
YARA
Zero Emission

7 MW battery capacity segregated in 8 rooms
(equals 80 Tesla cars)

Zero Emission
YARA
YARA

ASKO
Bærekraftig og klimanøytral
ASKO
Bærekraftig og klimanøytral
ASKO
Bærekraftig og klimanøytral
ASKO
Bærekraftig og klimanøytral
3
ASKO
Maritime
NAVAL DYNAMICS
KONGSBERG



COCHIN SHIPYARD LIMITED
KEEL LAYING CEREMONY

COCHIN SHIPYARD

REMOTE OPERATIONS CENTRE

Integrated Solutions for Remote Operations

Enabling remote operations of vessels and other floating structures in a safe, efficient and secure manner.

MONITOR Operations

One-way, high-level monitoring service

SUPPORT Operations

Empowering the onboard crew by remote support

ASSISTED CONTROL Operations

Alleviate the workload of the onboard crew by providing assistance remotely

DIRECT CONTROL Operations

Enabling unmanned vessel operations with control from a remote location

AUTONOMOUS Operations

Level 4 Autonomous vessel operations with supervision and intervention capability from a remote location

FLEET Operations

Large scale fleet operations including mission management, planning, scheduling, resource management supplementary to other operational solutions

massterly

Clearing the road towards autonomy by joint efforts

Sjøfartsdirektoratet
Norwegian Maritime Authority

DNV·GL

University of South-Eastern Norway

Different autonomy levels

1. Decision support
2. Automatic
3. Periodically unmanned
4. Unmanned
5. Fully autonomous

Items under discussion

- Captain's role
- Crew & competence in Remote Operations Centre
- Compliance with SOLAS, ISM Code and ISPS Code
- Flag state regulations, local rules and permits
- Legal aspects and division of responsibilities
- Insurance

Guiding principle: Autonomous functions to have a level of safety equivalent or better compared to conventional operations

We are creating new jobs in the Remote Operations Centre

DNV

STANDARD

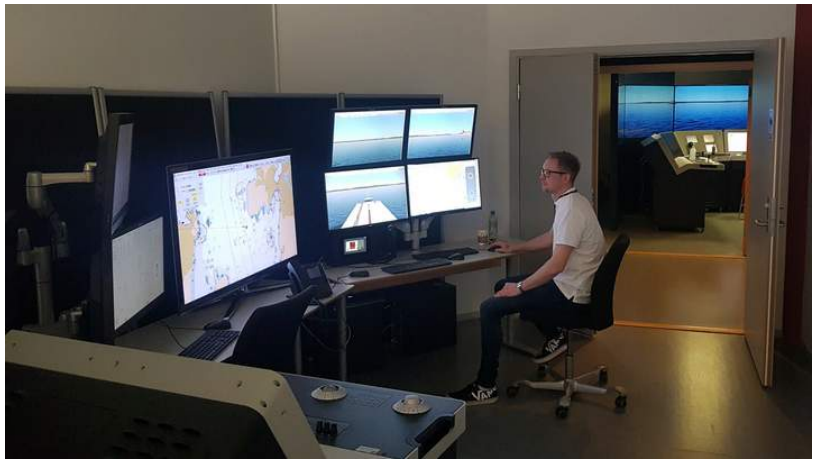
DNV-ST-0324 Edition August 2021

Competence of remote control centre operators

The PDF electronic version of this document available at the DNV website dnv.com is the official version. If there are any inconsistencies between the PDF version and any other available version, the PDF version shall prevail.

Det var flere kapteiner og navigatører med ulik bakgrunn og erfaring med på verdens første kurs for landstyring og overvåking av autonome skip. Fra venstre: Thomas Fevang, Espen Berglund, Nikolai Smit, Ragnar Stangring og Petter Kyseth. (Foto: Monica Hemer/USN)

TORE STENSVOLD MARITIM 31. MAI 2021 - 14:00



massterly
a Kongsberg Wilhelmsen joint venture

REMOTE OPERATION CENTER (ROC) OPERATOR

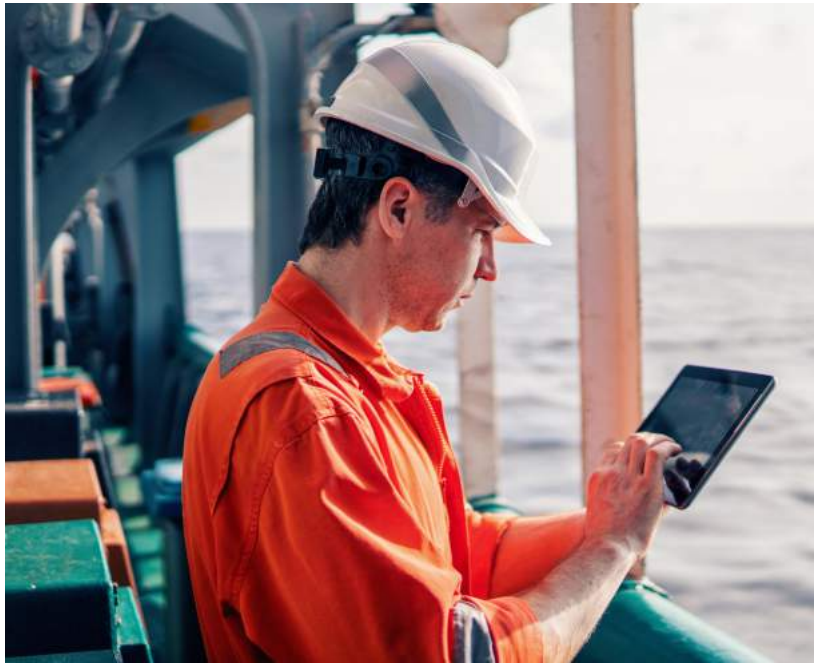
What we offer

- Being part of an organization that is taking a global leading role in a technology revolution within the maritime industry.
- Working with the future of propulsion systems on vessels, including several types of zero emission energy carriers.
- Opportunity to work with cutting edge technology
- Working with a strong support team backed by Massterly, Wilhelmsen Ship Management and Kongsberg Maritime

Please provide your application and CV as soon as possible.

If you have any questions about the application, please contact Jon Nordgard on +47 97758539.

Future needs for skills & competence in Maritime



COMPETENT SHORE-BASED CREW FOR THE ENERGY TRANSITION (NEW FUELS)

INNOVATION AND DIVERSITY IN THINKING

LEARNING FROM OTHER INDUSTRIES

massterly

a Kongsberg Wilhelmsen joint venture

Feel free to contact us for more information

Name: Pia Meling
Title: Vice President, Sales & Marketing
Email: pia.meling@massterly.com
Mobile: +47 95 77 03 25

USN
University of
South-Eastern Norway

University of
South-Eastern Norway

University of South-Eastern Norway

Shore Control Centre for Maritime Autonomous Surface Ships

Christian Hovden
Assistant Professor
TNM – IMS – Electrical Power - Automation - Robotics

Launch Yara Birkeland in Oslo 19th Nov.

«The maritime industry has to be understood in the context of its development. As the captain on the bridge said: the captain will be removed from the bridge.»

- Prime Minister of Norway Jonas Gahr Støres launch speech

Launch Yara Birkeland in Oslo 19th Nov.

«The maritime industry has to be understood in the context of its development. As the captain on the bridge said: the captain will be **removed from the bridge**.»

- Prime Minister of Norway Jonas Gahr Støres launch speech

SCCO Competence Framework Timeline

DNV & WSM 2017

USN Q2 2018

KM 2018

NMA 2018

SCCO Project Q4 2018

MASS Mini-Workshops 2019

Competence Framework Workshops 2019

First Draft Q3 2019

Course Design Workshops Q4 2019

Course Design Finalized Q3 2020

Pilot Course Q2 2021

Massterly Remote Operations Center - Certified Operators

Massterly Remote Operations Center - Certified Operators

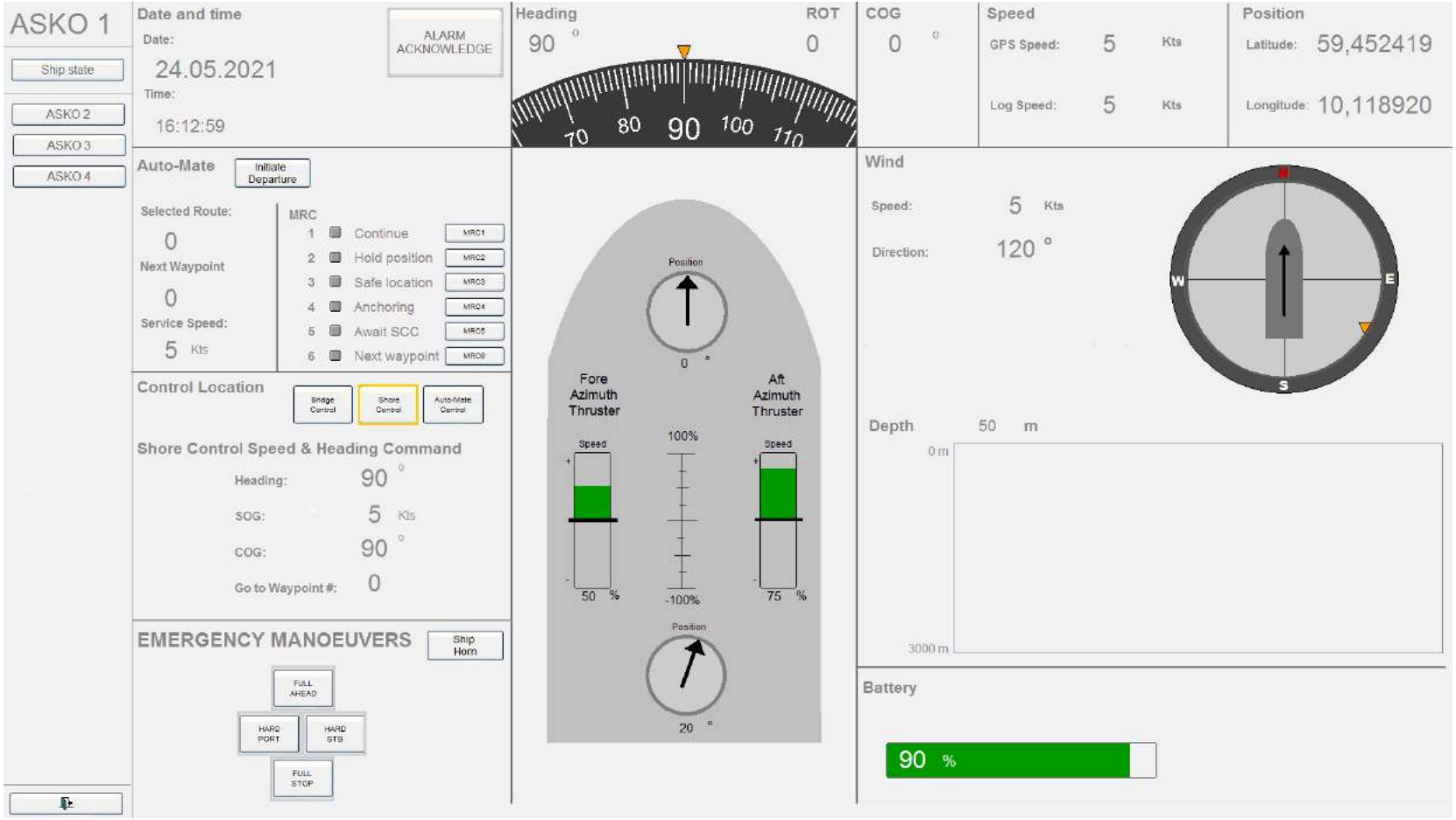
Remote Operations Center Operator Competence – Pilot Course 2021– ASKO Seadrones

Remote Operations Center Operator Competence – Pilot Course 2021

Remote Operations Center Operator Competence – Pilot Course 2021

Remote Operations Center Operator Competence – Pilot Course 2021

Remote Operations Center Operator Competence – Pilot Course Conning Display



Remote Operations Center Operator Competence – Pilot Course – Ship Overview HMI

AutoDrone 2022 – Sponsor? => www.autodrone.no

Thank You!

www.usn.no

www.autodrone.no

Bridging humans and data, a gamechanger in digital twins and virtual Prototyping

Jørgen Drønnen CSO

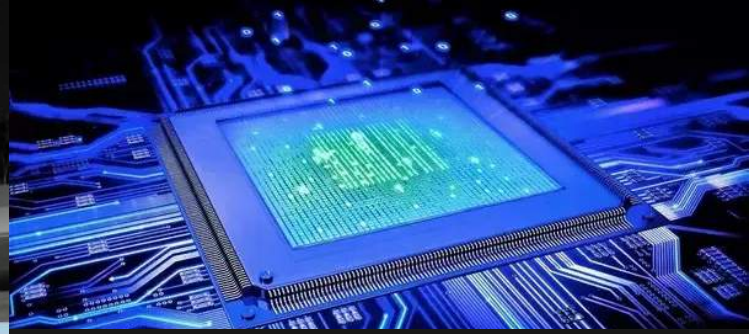
Why use Digital Twins?

- Not 3d models - so much more.
- Rapidly simulate and test operations,functions, assets etc. regardless of complexity
  - Vessels/rigs/assets into simulator in weeks, not months
  - Specific objects modelled in days, not weeks
- Enables discussion, redesign and perform new testing
- Improve data-driven decision-making
- Integrate sensors into physical assets or monitor log files and other sources to collect data
- Understand complex data: Insight and common understanding

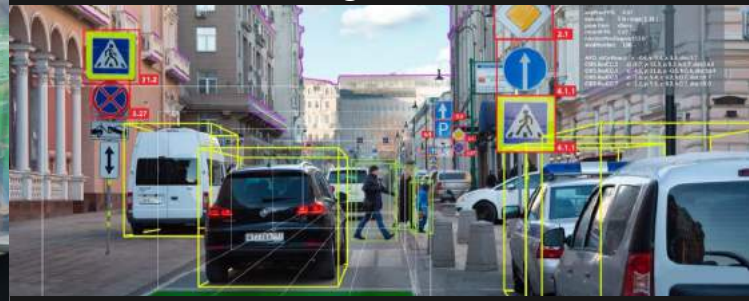
OSC
Improving reality

Linking Humans to machines will change the world

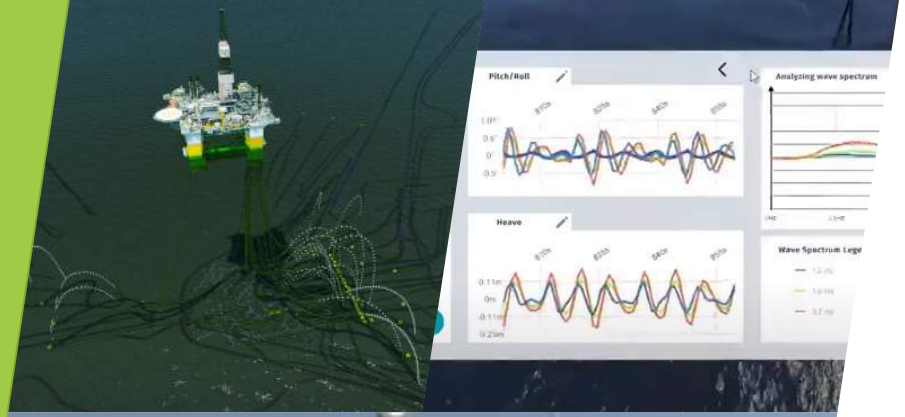
Simulation (digital twin) is the **BRIDGE** between Humans and complex “big” data (machines)

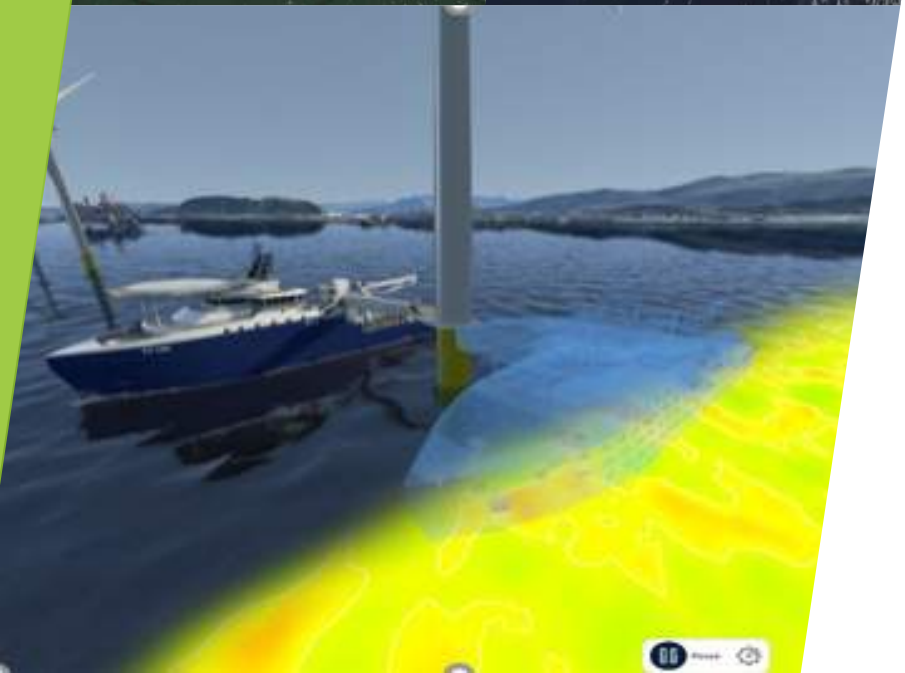


MACHINE is amazing at **DATA PROCESSING**



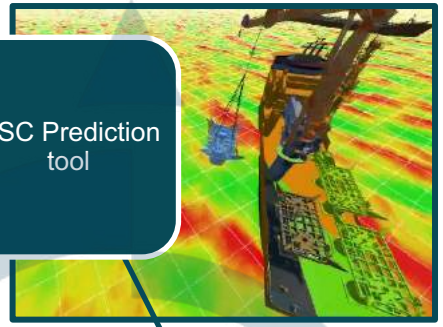
HUMANS are amazing at evaluation of risk through **VISUAL INPUT**





Simulation tools

- Scenario builder/configurator
- Simulation Weather system:
  - Integration to real live weather data.
  - Predicted weather data
  - Different Ocean wave spectra (i.e ISSC spectrum, JONSWAP spectrum)
- Analytical tools:
  - Plot out graphs and information (forces, tension, weights etc.)
  - Measuring tools
  - Clash detection
- Augmented features
- SANDBOX
- Record and Playback
- Planning tool
- Remote observation tool



OSC Prediction tool

Mission planning

GPS

MRU

Thruster

Gangvei

PMS

Wave radar

Data Aquisition

Digital Twin

Remote access

OSC Decision Support

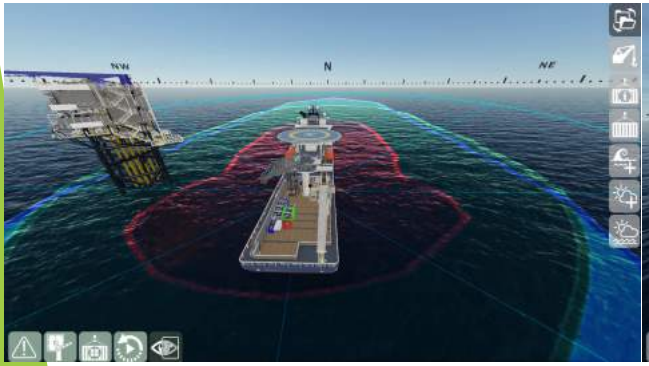
OSC

OFFSHORE SIMULATOR CENTRE

NMK

Graphical Digital Twin

- Taking real world sensor data, and using simulator visuals
- Enables augmented features to convey key information



Talent / skills

General:

- Automation
- Computer Science
- User interface

From our developers:

- Bridging the gap between the virtual- and real world is fascinating and of great interest to me. Gaming technology used in virtual prototyping and simulation creates many opportunities.
- In the world of gaming one can try and fail, reset and load from checkpoint. This transfer directly to out simulation scenarios and training sessions.
- Computer engineers and Unity developers become more and more important as we move into autonomous operations and controlling scenarios and processes in a simulation environment require fast development and technical knowhow.

Thank You

Jørgen Drønnen CSO jd@osc.no

Western Norway University of Applied Sciences

Maritime autonomous operations

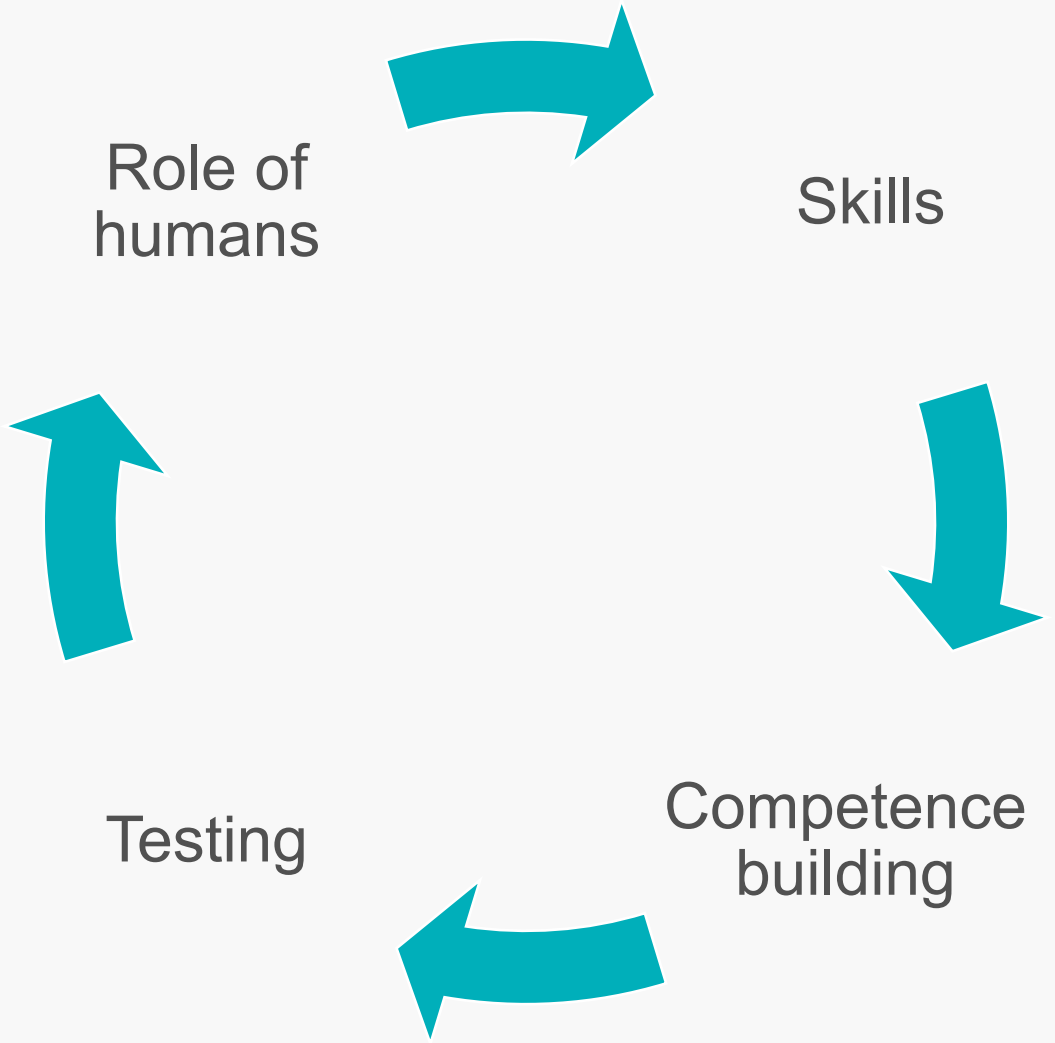
The human factor and implications on job roles and skills

Margareta Lutzhoft
Department of Maritime Studies
HVL

Why Haugesund?

- Land of the Viking kings
- HVL
- Autonomous testing area

Today - Future Maritime Technology



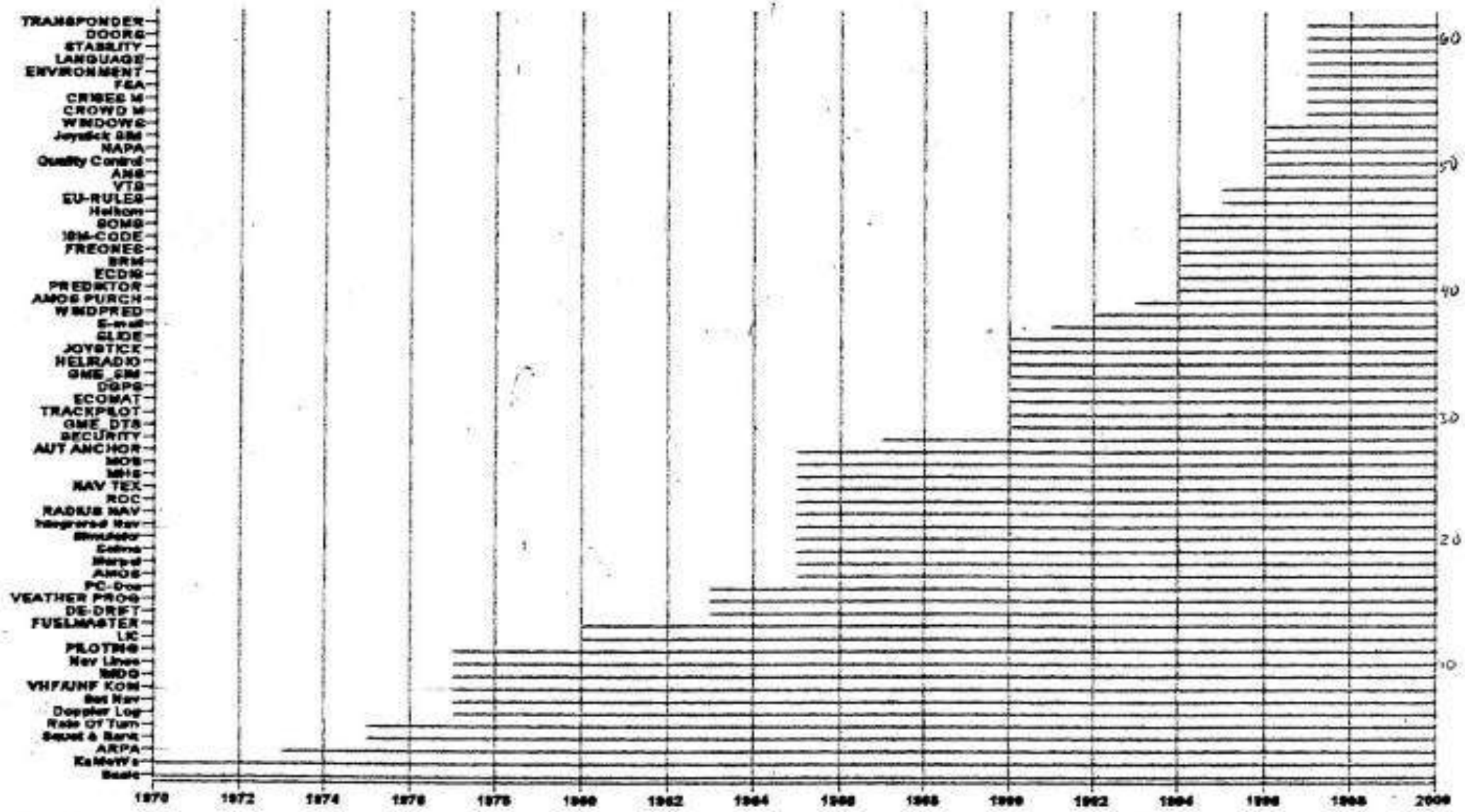
B. Top 15 skills for 2025

1	Analytical thinking and innovation
2	Active learning and learning strategies
3	Complex problem-solving
4	Critical thinking and analysis
5	Creativity, originality and initiative
6	Leadership and social influence
7	Technology use, monitoring and control
8	Technology design and programming
9	Resilience, stress tolerance and flexibility
10	Reasoning, problem-solving and ideation
11	Emotional intelligence
12	Troubleshooting and user experience
13	Service orientation
14	Systems analysis and evaluation
15	Persuasion and negotiation

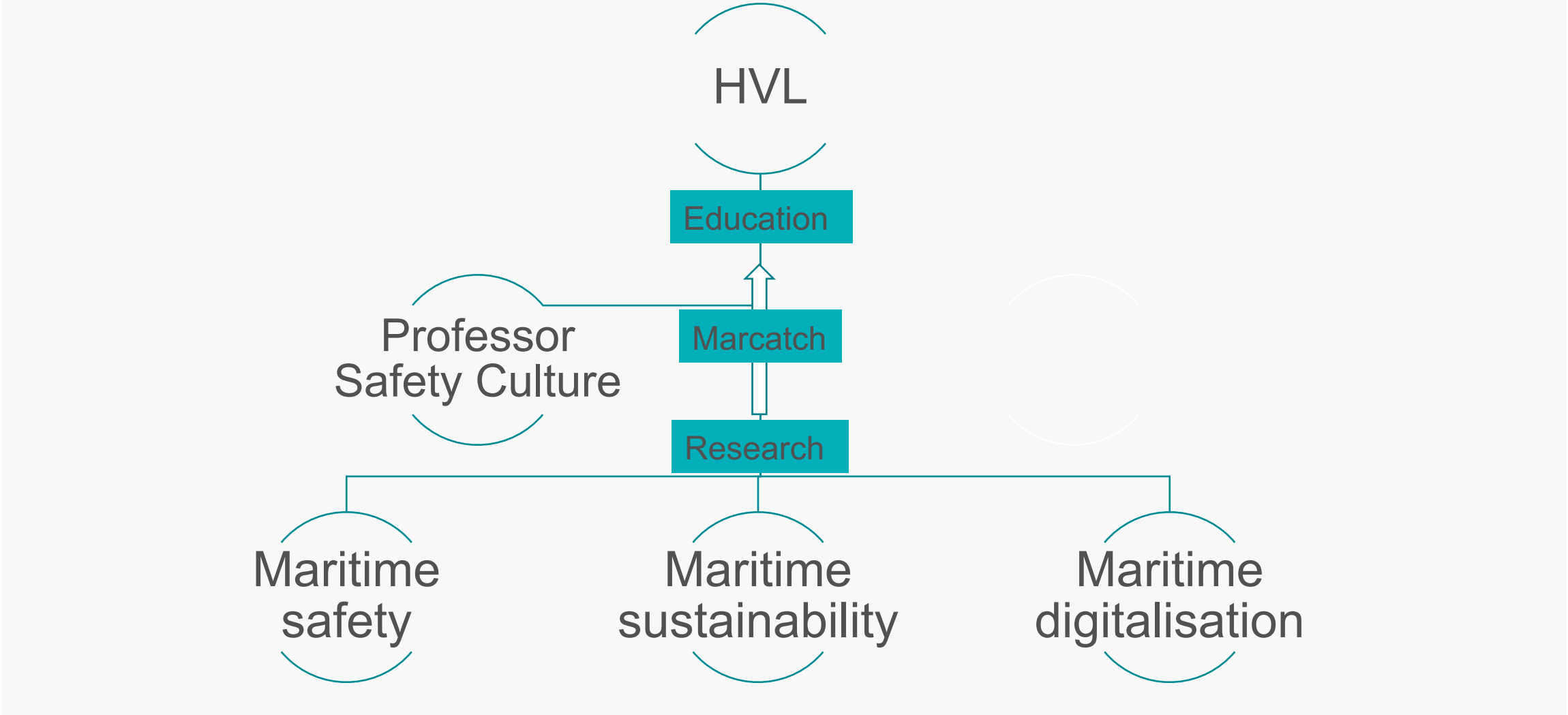
Source

Future of Jobs Survey 2020, World Economic Forum.

THE INCREASE in SKILLS REQUIREMENTS 1970 -2000



Ulla-Forre project for regional competence building 2021-



Test area Haugesund

HUMANE

Human-centred autonomy

Forecasting workshops

System safety and cyber security

October 2018 in Trondheim

Legal implications

January 2019 in Oslo

Training and education

November 2019 in Vestfold

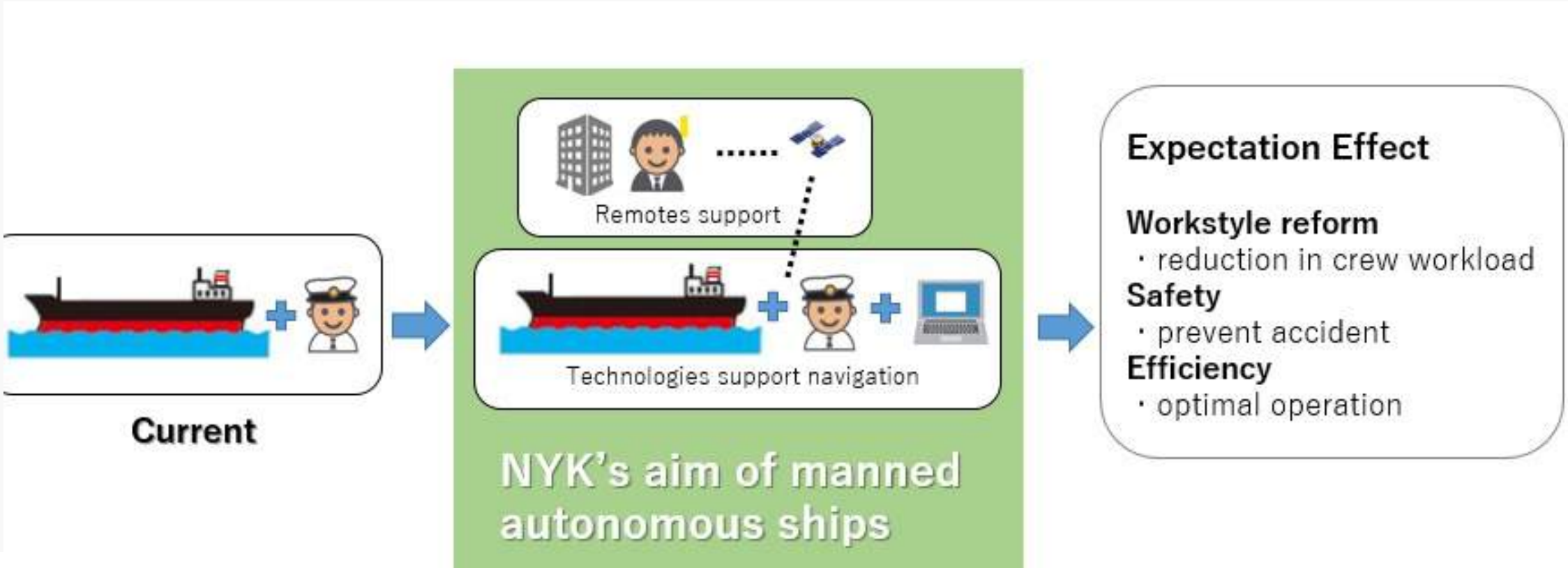
Maritime AI ecosystem – smart ships

June 2020 on Zoom

CIRM	SINTEF	Inmarsat	BIMCO
Massterly	BW Gas	BW Offshore	SeaBot XR
Rolls Royce	Bellona	MTI-NYK	BMT Global
DNV-GL	Lloyd's Register	InterManager	Wärtsilä
InterManager	ABB	Norcontrol	SIMAC
Kongsberg Maritime	Kongsberg Seatex	Maritime Robotics	University of Gothenburg
F-Secure	RISE Viktoria	EXMAR	Safe Marine
Norwegian Maritime Authority	Norwegian Coastal Administration	Swedish Transport Agency	Wilhelmsen Ship Management
European Maritime Safety Agency	Danish Maritime Authority	University of Southampton	University of South-Eastern Norway
IMarEST's Maritime Autonomous Surface Ships Special Interest Group	The International Transport Workers' Federation	Aboa Mare Maritime Academy and Training Center	Shanghai Merchant Ship Design & Research Institute (SDARI)
National Maritime College of Ireland	Gard	Møkster	Åbo Akademi University
Norwegian University of Science and Technology	International Marine Contractors Association	Western Norway University of Applied Sciences	

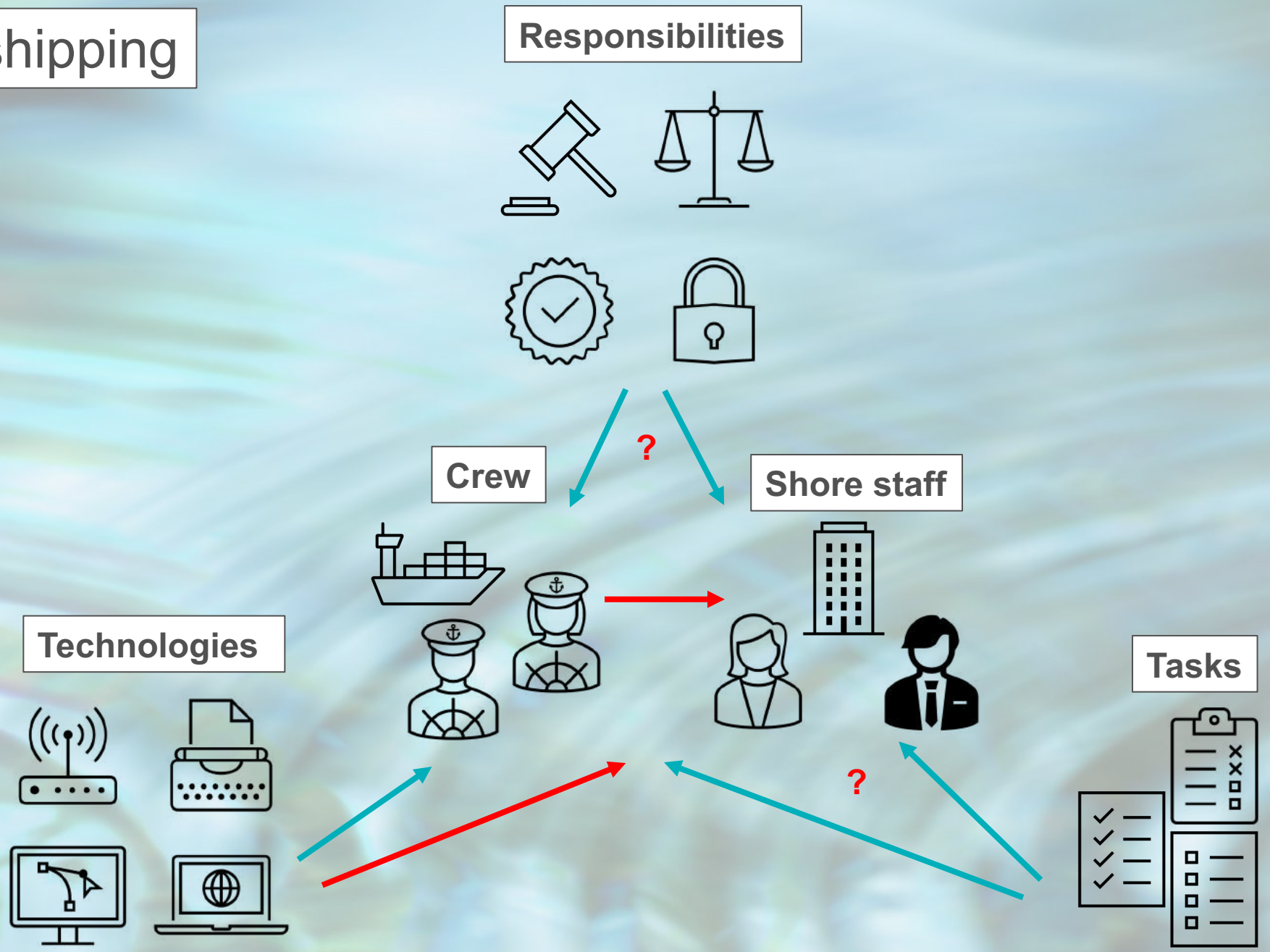
Shipping is a socio-technical system

- Autonomy, high automation, smart ships
- Autonomy does not mean unmanned

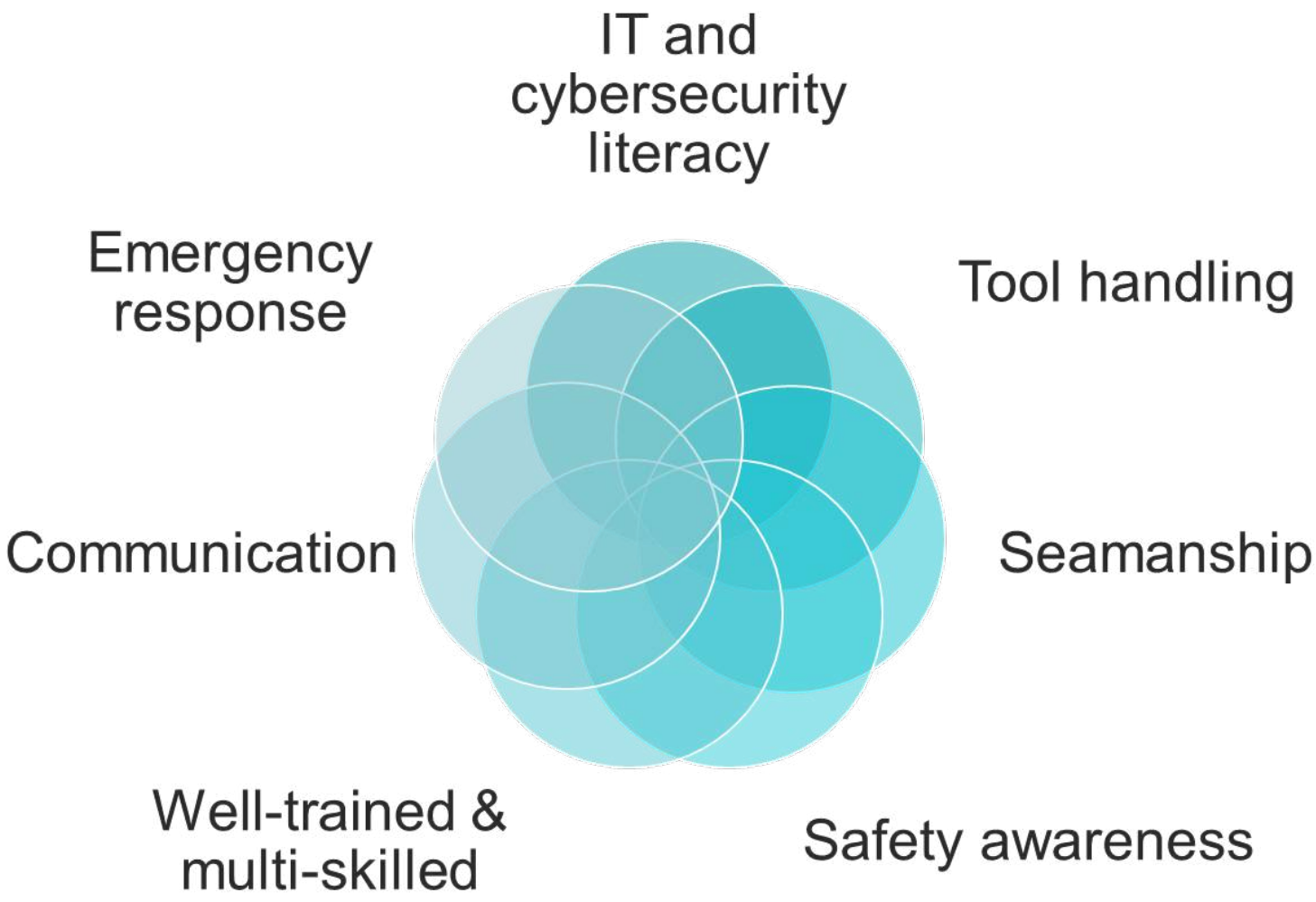


Conventional shipping

Future shipping



Top future skills for the maritime industry (HUMANE, 2020)



A. Hynnekleiv, M. Lutzhoft, J. V. Earthy Towards an ecosystem of skills in the future maritime industry

What to expect?

- Adaptation
- Life long learning
- Ecosystem of skills
- Ability to find the information (or a person)
- Cybersecurity awareness
- Environmental awareness

New technology and competence in maritime

- Be multidisciplinary
- Keep humans at the centre
- Changes in crew/staff, tasks, technology and responsibilities
- Look at sociotechnical systems
  - Example: Green Shipping Program considers the traffic system for future coastal ferries, not individual ships

- Maritime safety … Human-centred operations, design, technology and education
- Digitalization … smart ships, high automation, autonomy
- Green shipping … batteries, wind, hydrogen