Western Norway University of Applied Sciences

HUMANE

Human Maritime Autonomy Enable

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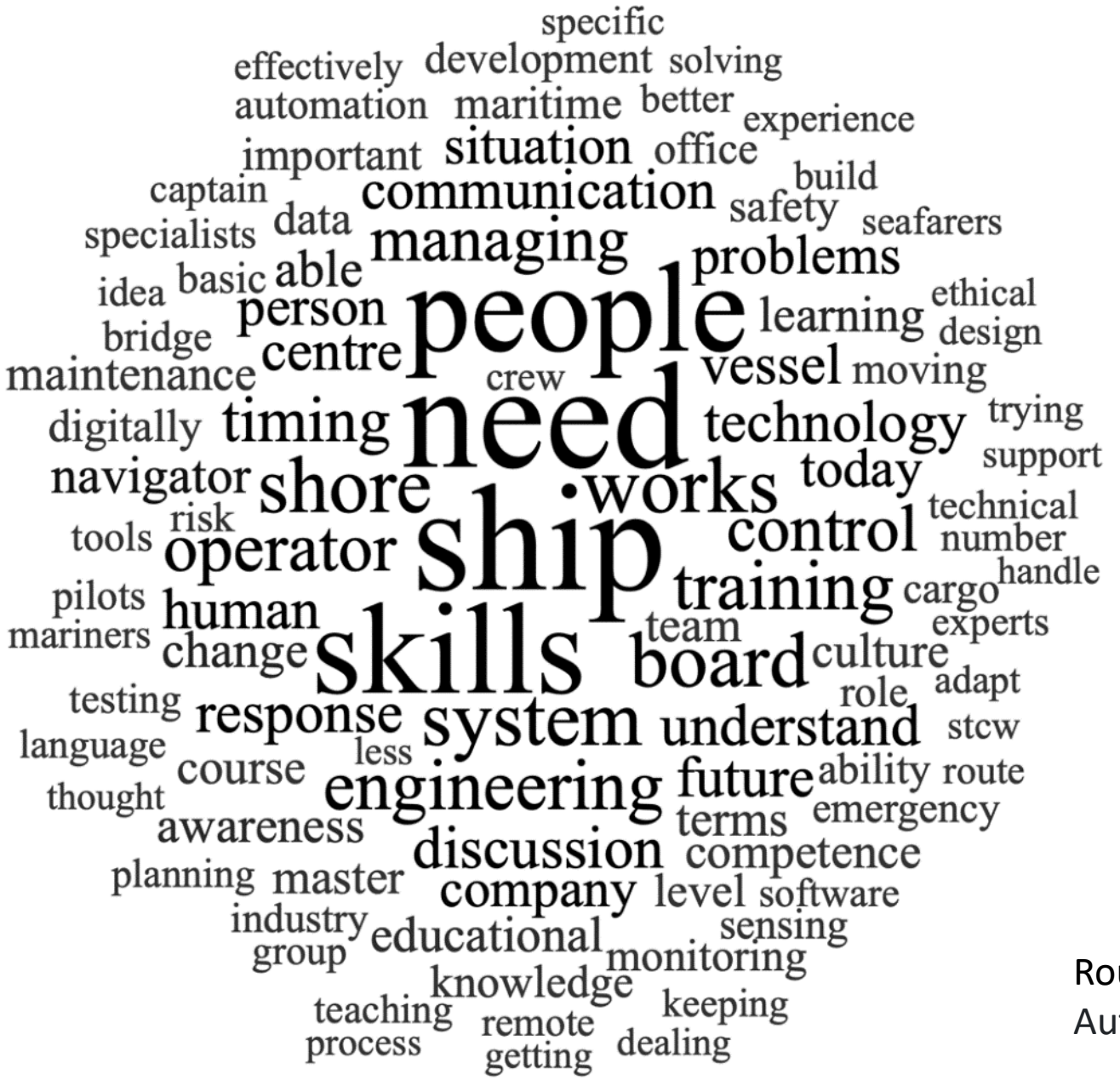
Jonathan Earthy

The project is financed by The Research Council of Norway



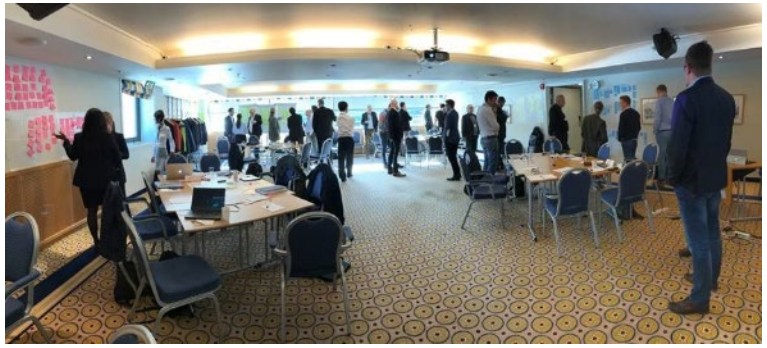
Routledge Human-Centred Autonomous Shipping

What else was going on at the time we started?

HUMANE

Human-centred autonomy

Forecasting workshops



System safety and cyber security

October 2018 in Trondheim

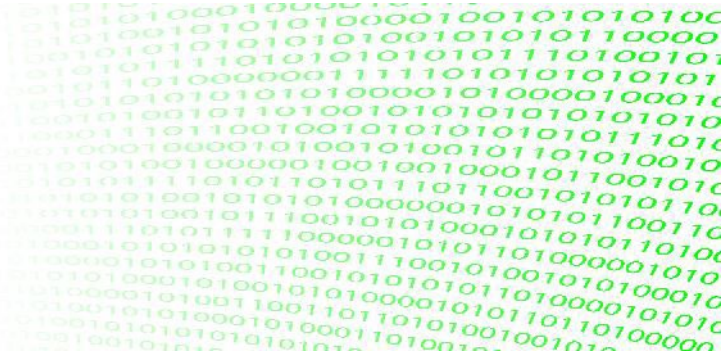
Legal implications

January 2019 in Oslo

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	

Training and education

November 2019 in Vestfold



Maritime AI ecosystem – smart ships

June 2020 on Zoom

Fireside chats

10 x 2021 on Zoom

Summary of insights and results

- The business case rules
- Human Factors is still there … in spite of the lack of research
- Humans will be “onboard” – and they will be seafarers
- Needed skills: maritime, IT, collaboration, adaptability, learning, systems & safety
- Safety needed but no baseline
- Autonomous ships will be close to shore and local, small or medium-sized
- Regulation issues are understood – single code to be developed
- Cyber security is a major risk
- Communication is still not solved
- Maritime is lagging in application of AI
- Digitalisation and humans - teaming

Massive credit to all colleagues in HUMANE

The safety set (from ISO, IMO, HCAI, HUMANE)
A Maritime Autonomous Ship System shall:

1a. Be identifiable as under control of an artificial intelligence, or

1b. Be identifiable as under remote control

2. Act in a manner that is understandable by seafarers on own and other ships and shore services (e.g. pilot, VTS, owner)

3. Communicate its status and capability to crew on own and other ships and shore services

4. Be able to explain its intention

5. Be able to explain its course of action

6. Recognise when it requires assistance

7. Request assistance

8. Place itself in a state in which it does not present a hazard to the environment, other shipping, fixed structures, or those rendering assistance

9. Whilst in a safe state allow authorised personnel to operate the [systems/functions] necessary to restore, replace or supplement lacking capability (defect, failure, events that are not reasonably foreseeable)

10. Render assistance to other ships and persons in distress

11. Transfer control to authorised personnel on request

12. Protect itself from unauthorised access

13. Be sufficiently dependable to fulfil its intended purpose.

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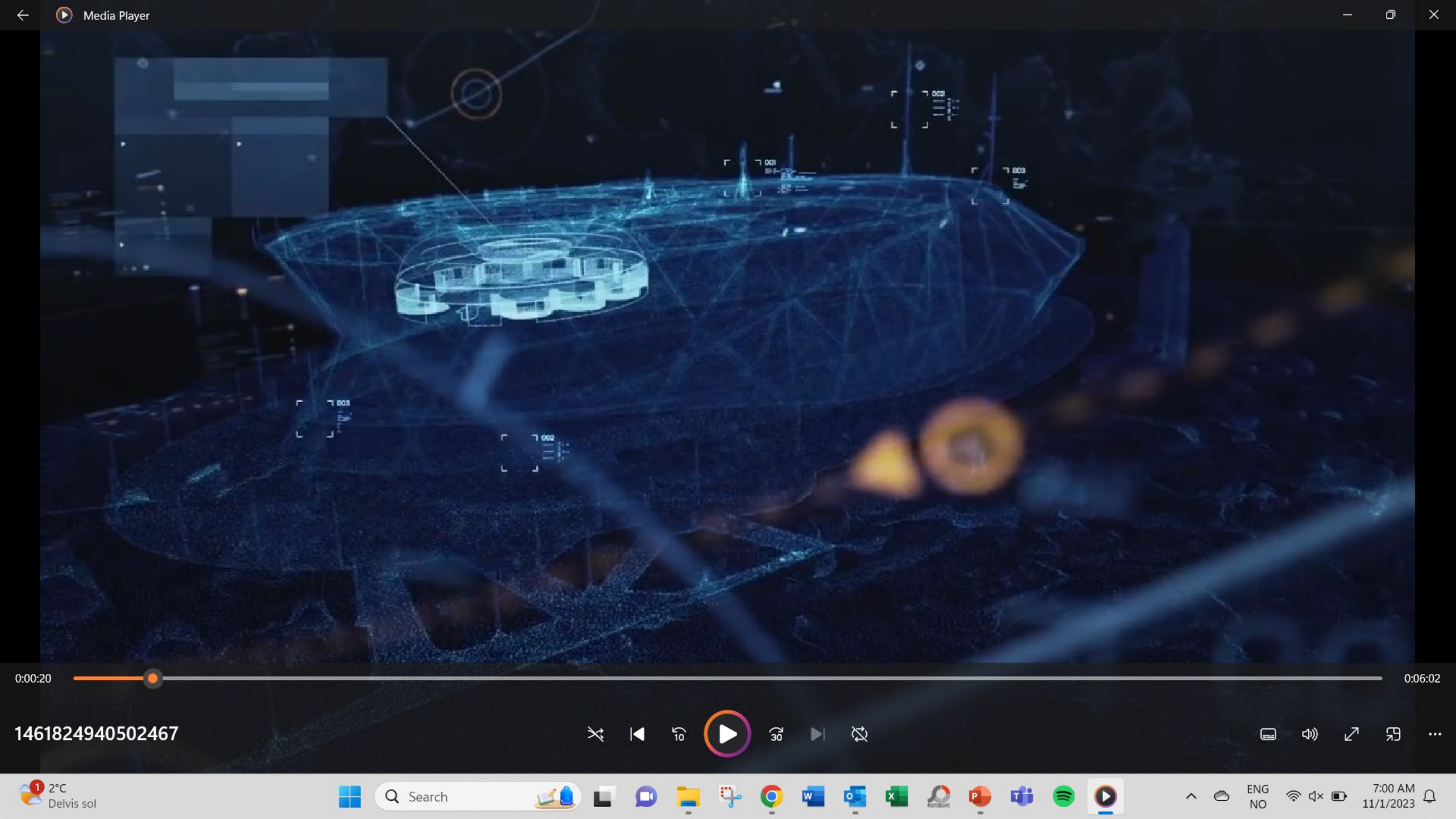
Summary

- What Rolls Royce intended
  - Integrated work system for ‘assisting’ unmanned ships world wide
  - Metaphor: Control room from process industry
- What HUMANE found
  - People onboard – remote *control* not apparent
  - Understanding benefits of, and genuine wish for, human autonomy teaming
- What industry seem to be doing
  - Something completely different
  - [and now we have to kill you]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The human element issues to address

What makes it a nice job

- safe and comfortable, positive user experience
- job designed so that people want to do it
- skills conservation
- optimising manning
- minimising use error
- accessible work location (e.g. ship or shore)
- hybrid teaming/team working, human augmentation
- adaptive/optimised workload
- equivalent safety and usability between alternative design concepts
- able to trust systems and their behaviour

How to make it a nice job

- less unnecessary watchkeeping
- safe behaviours
- understandable explanation
- identify barriers to the job to be done
- taking account of context
- meaningful work making use of human abilities
- most cost-effective automation
- automating the boring stuff
- demonstrating that seafarers are valued
- replace dangerous, dirty jobs but keep the enjoyable one
- human-centred design