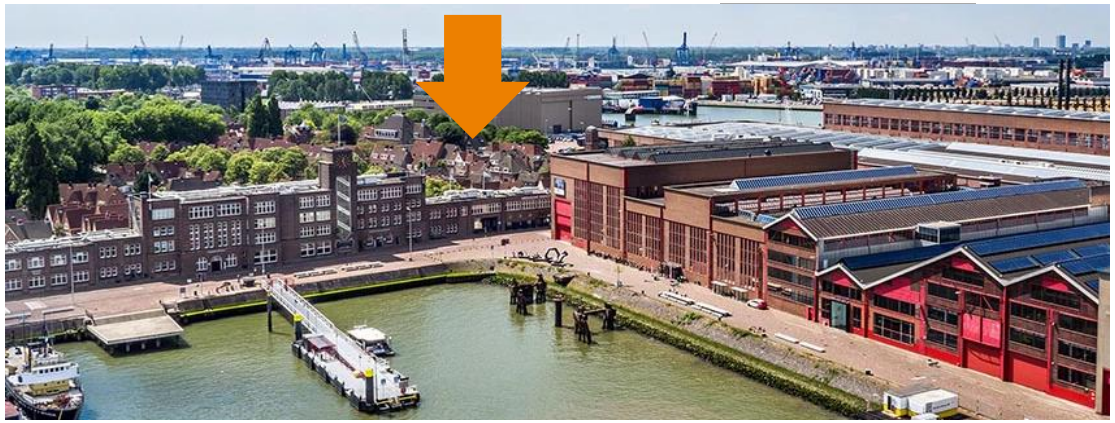
FROM HERE TO AUTONOMY

HANS VAN DEN BROEK

INTRODUCTION HANS VAN DEN BROEK

- Applied Research Professor Human Factors in maritime automation @ the knowledge centre sustainable ports, Rotterdam University of Applied Sciences (0.4)

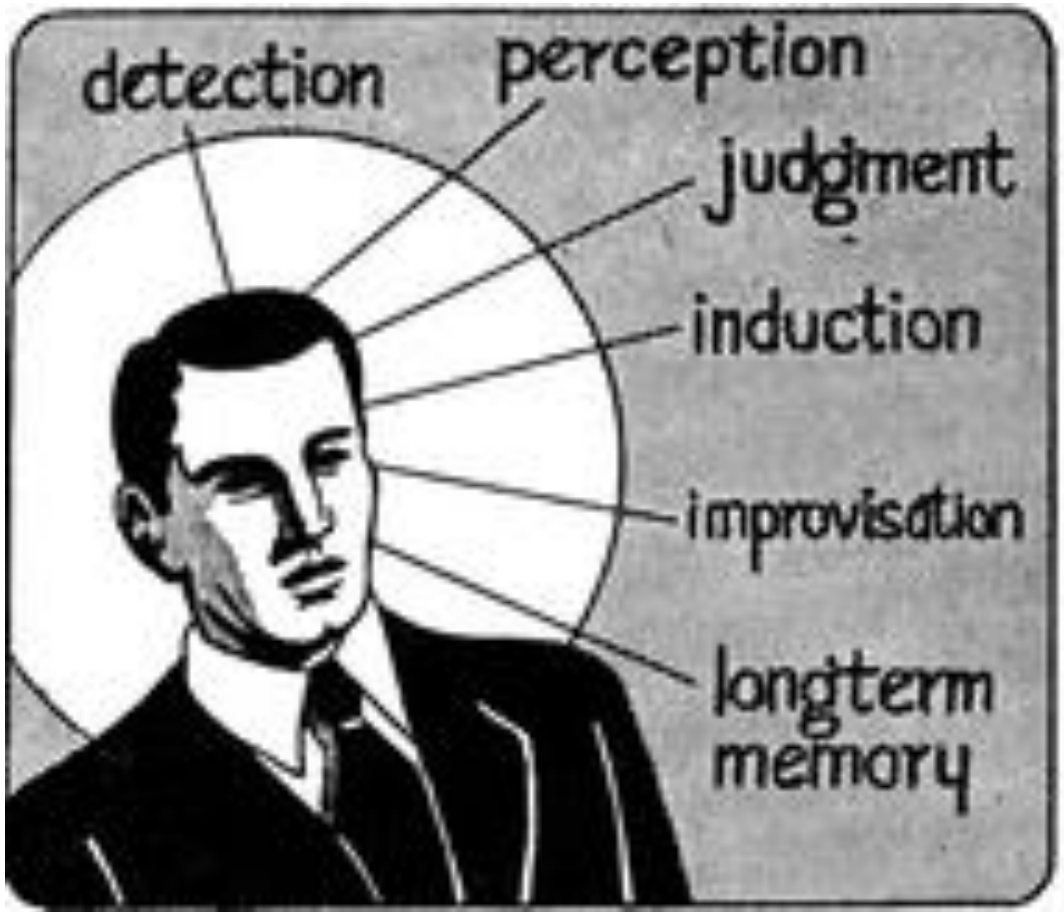


- Senior Human Factors Researcher, Human Factors in Maritime Operations @TNO, the Netherlands (0.6)
  - TNO is an independent not for profit applied research organization

AUTOMATION EVOLUTION

- Radar
- ECDIS
- AIS
- Auto Pilot
- Dynamic Positioning (DP) systems
- …

MEN ARE BETTER AT… MACHINES ARE BETTER AT…



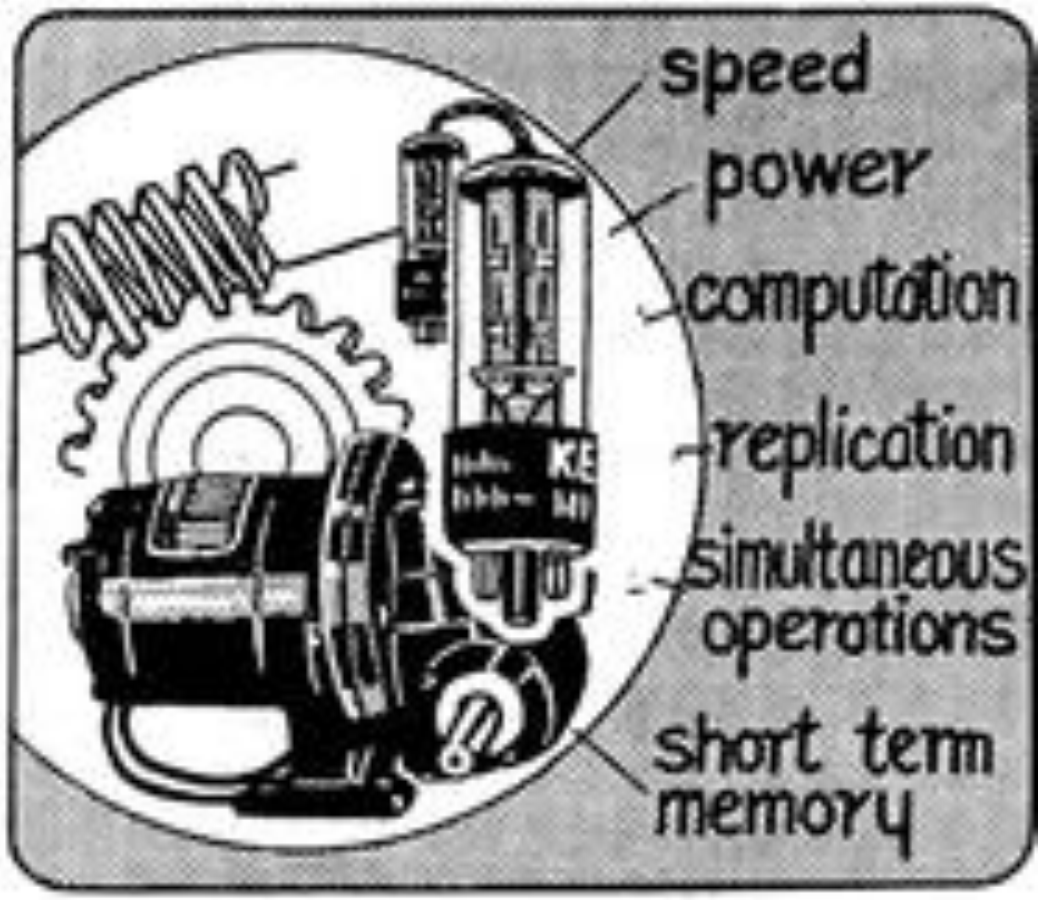
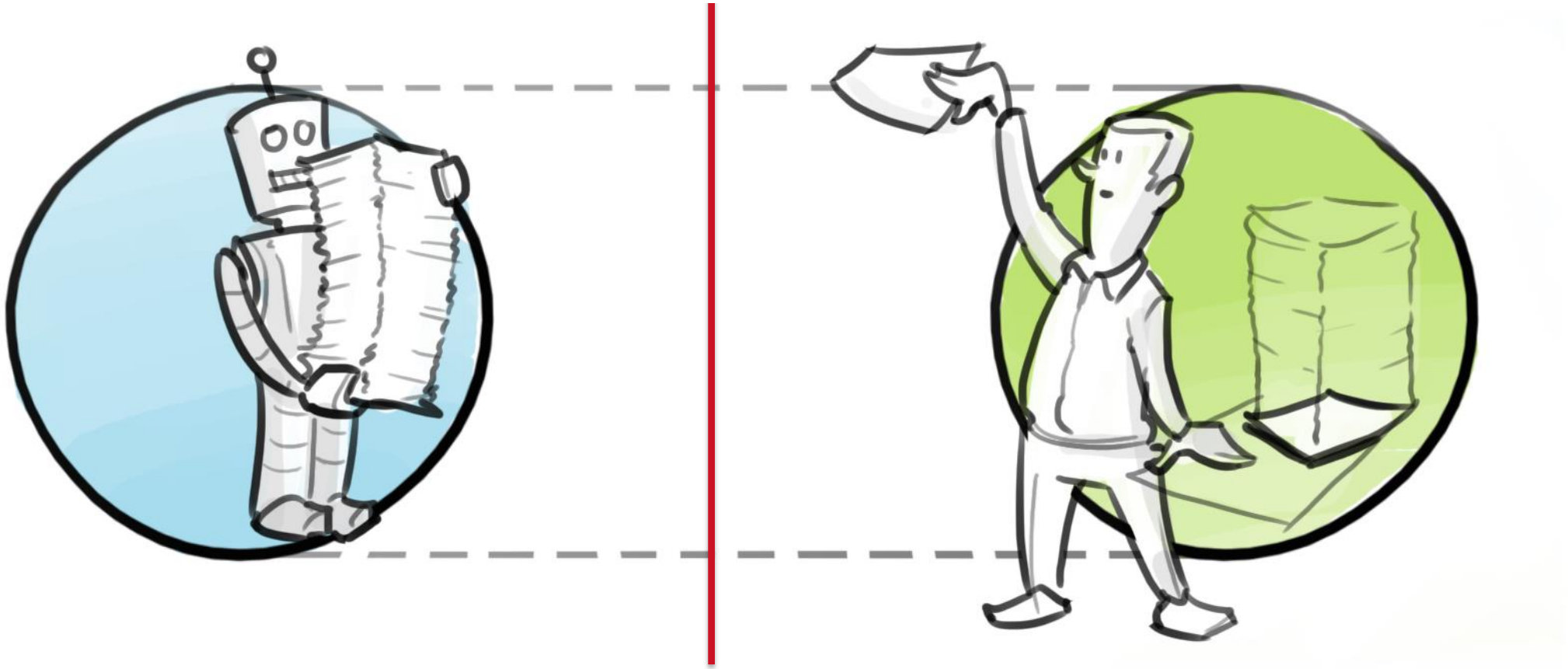


Illustration taken from the original publication of 1951



According to the International Maritime Organization (IMO):

A Maritime Autonomous Surface Ship (MASS) is defined as a ship which, in varying degree, can operate independently of human interaction

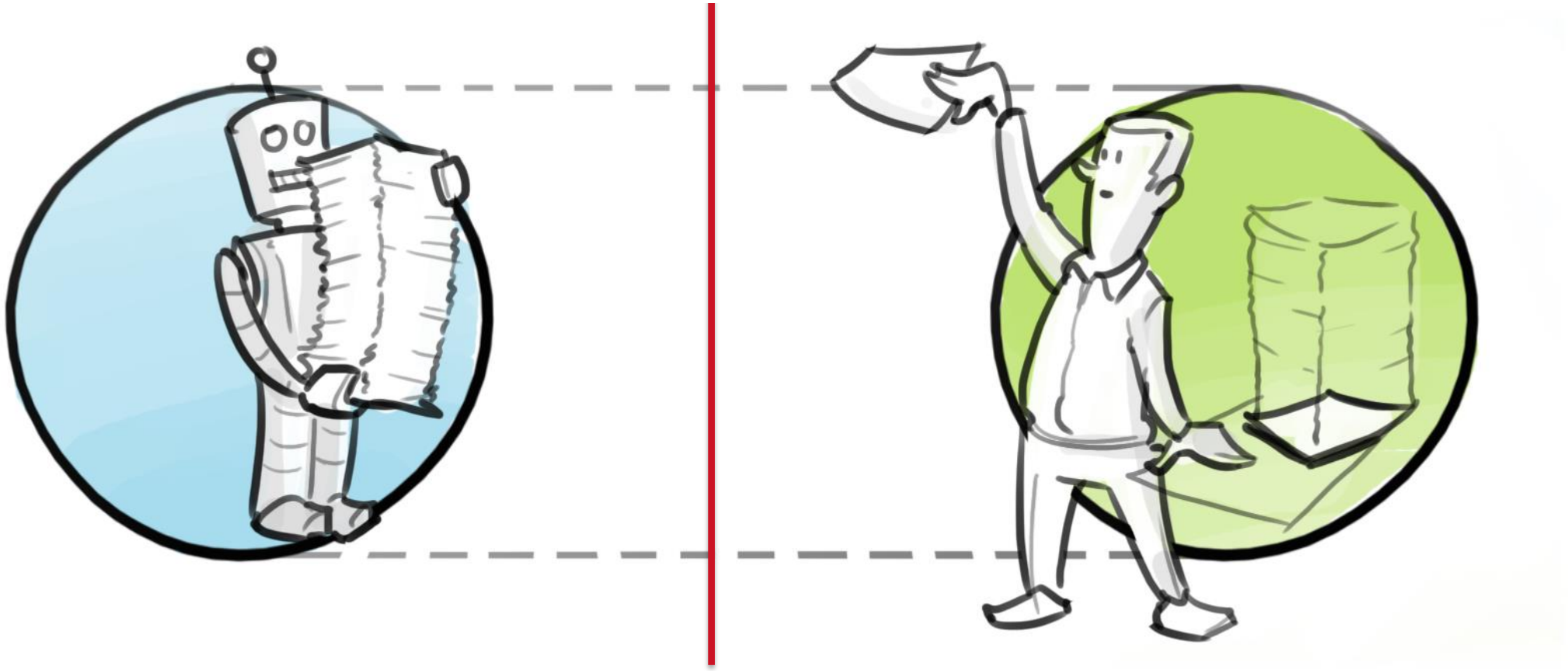

Dynamic Positioning Systems
bluewater


Maritime Autonomous Surface Ships (MASS)
Zero Emission
Yara Birkeland


Waymo Driverless Car


Drones (Aviation)


Truck Platooning



An autonomous system is a system which, in varying degree, can operate independently of human interaction

AUTOMATION CONUNDRUM (ENDSLEY)

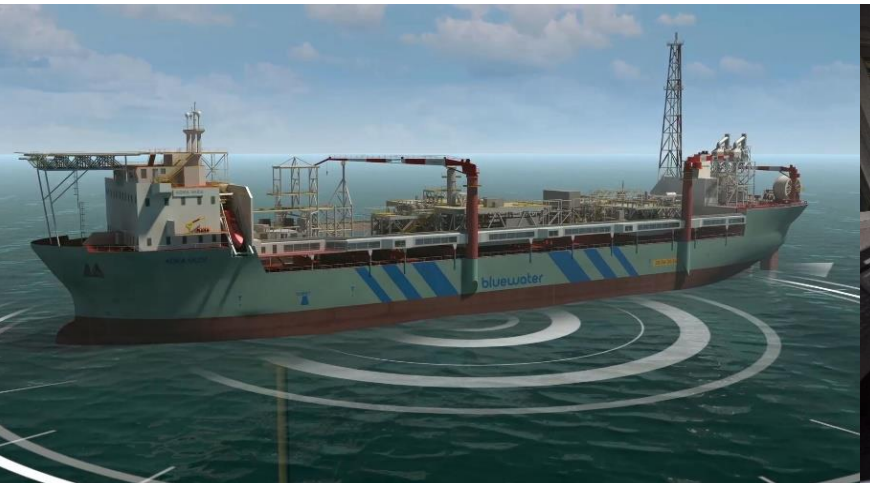
the more reliable and robust that automation is, the less likely that human operators overseeing the automation will be aware of critical information and able to take over manual control when needed…

HUMAN – MACHINE TEAMING

DYNAMIC POSITIONING ON BOARD AN FPSO

FLOATING PRODUCTION, STORAGE, AND OFFLOADING (FPSO) VESSEL

- Supervision task (monitoring what the complex system is doing)
- Loss of position (connected to the well with a suction hose); tolerance a few meters
- All information (and action) through a (complex) interface
- Vigilance (concentration over a long time period)
- Complacency, out-of-the loop performance, insufficient situation awareness
- Sense, assess, plan, act is time critical (automation surprise, cognitive lookup)

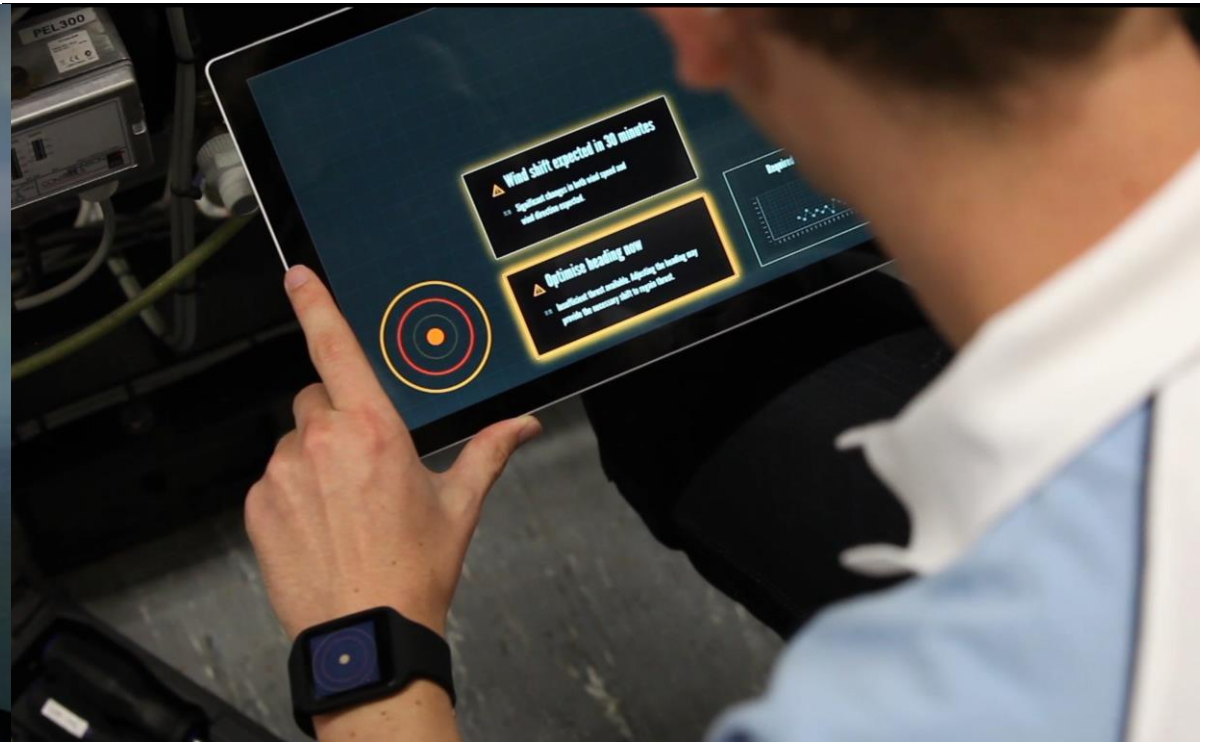


INTELLIGENT OPERATOR SUPPORT

- Situational Awareness
  - Support off early recognition of critical situations
  - Prediction of future situations
  - Change detection
  - Support procedure awareness
- Timely and context-specific push of information, providing the operator an adequate overview of the situation
- Should be able to explain itself
- The possibility for operators to leave the bridge to perform other tasks when condition allow (roaming)

CLICK THIS LINK TO WATCH THE VIDEO ON INTELLIGENT OPERATOR SUPPORT OF DP-OPERATORS

IOSS on the bridge, and…

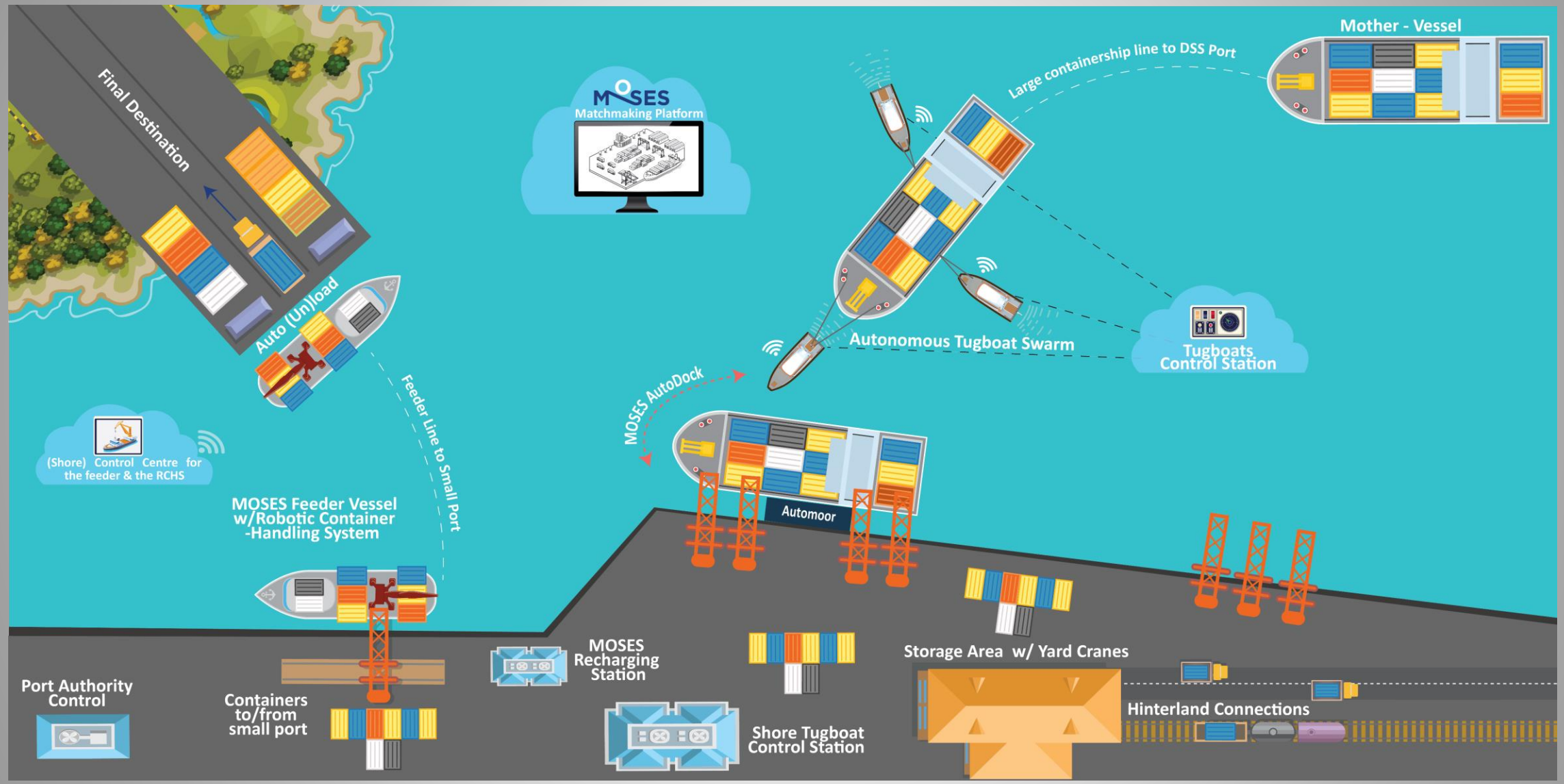


in roaming condition

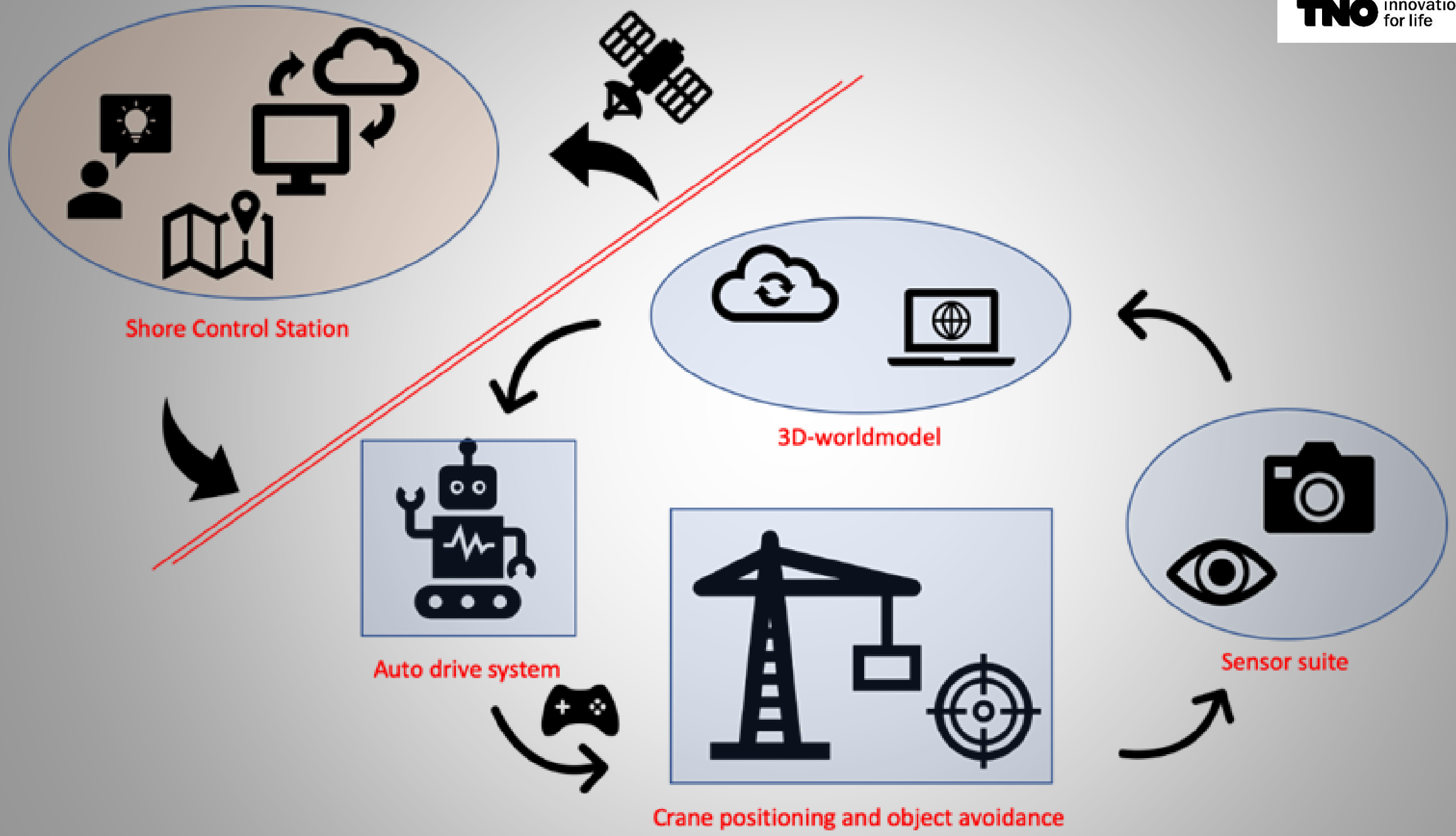
MOSES

- As part of Horizon 2020, the EU Commission has launched a series of research and innovation projects to contribute to more automation and autonomy in short sea logistics
- MOSES aim: enhance the Short Sea Shipping (SSS) component of the European supply chain by addressing the vulnerabilities and strains related to the operation of large containerships
- Two-fold strategy:
  1. SSS feeder service
  2. DSS ports efficiency: Technological solutions for reducing DSS ports inefficiencies – reduce berthing time, improve safety
- MOSES website: https://moses-h2020.eu/

MOSES project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 861678.


Final Destination
MOSES
Matchmaking Platform
Mother - Vessel
Large containership line to DSS Port
Auto (Un)load
Autonomous Tugboat Swarm
Tugboats Control Station
Feeder Line to Small Port
MOSES AutoDock
(Shore) Control Centre for the feeder & the RCHS
MOSES Feeder Vessel w/Robotic Container -Handling System
Automoor
Port Authority Control
Containers to/from small port
MOSES Recharging Station
Shore Tugboat Control Station
Storage Area w/ Yard Cranes
Hinterland Connections

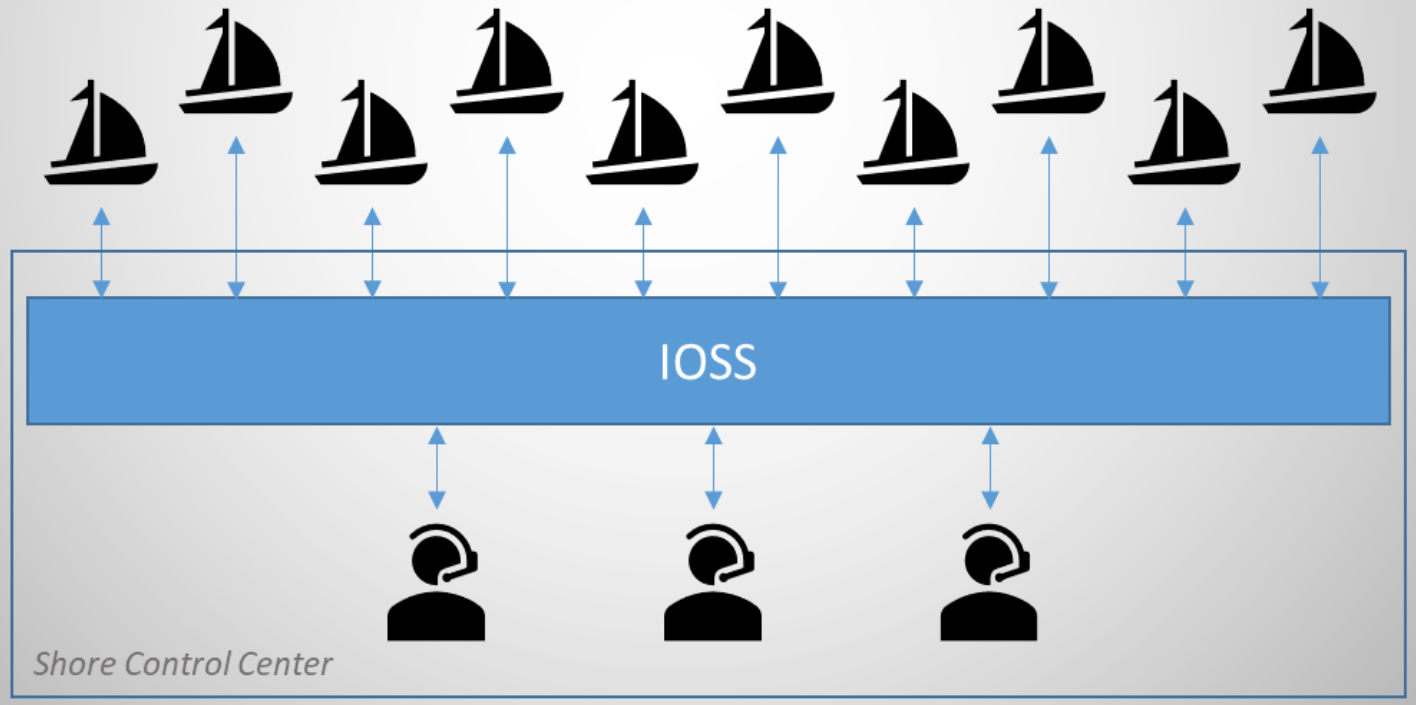

Robotic Container
-Handling System
der Vessel


Shore Control Station
3D-worldmodel
Auto drive system
Sensor suite
Crane positioning and object avoidance


TNO innovation for life

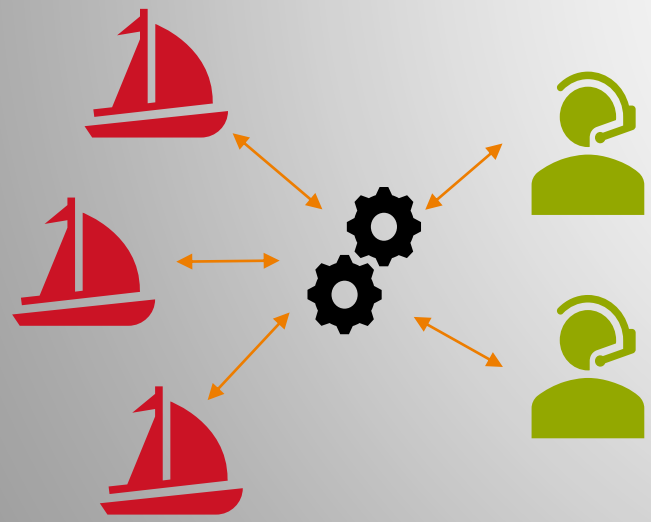
IOSS: Intelligent Operator Support System

"A system that supports remote operators in their supervision and control of autonomous cranes loading and offloading containers in parallel."



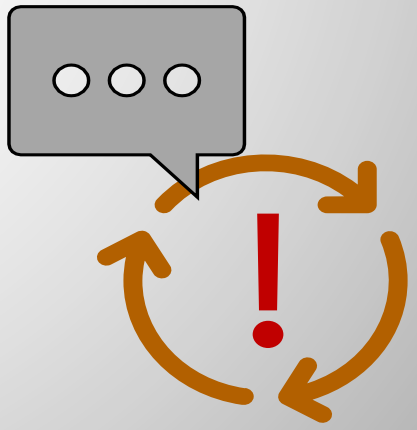
Dynamic Task Allocation

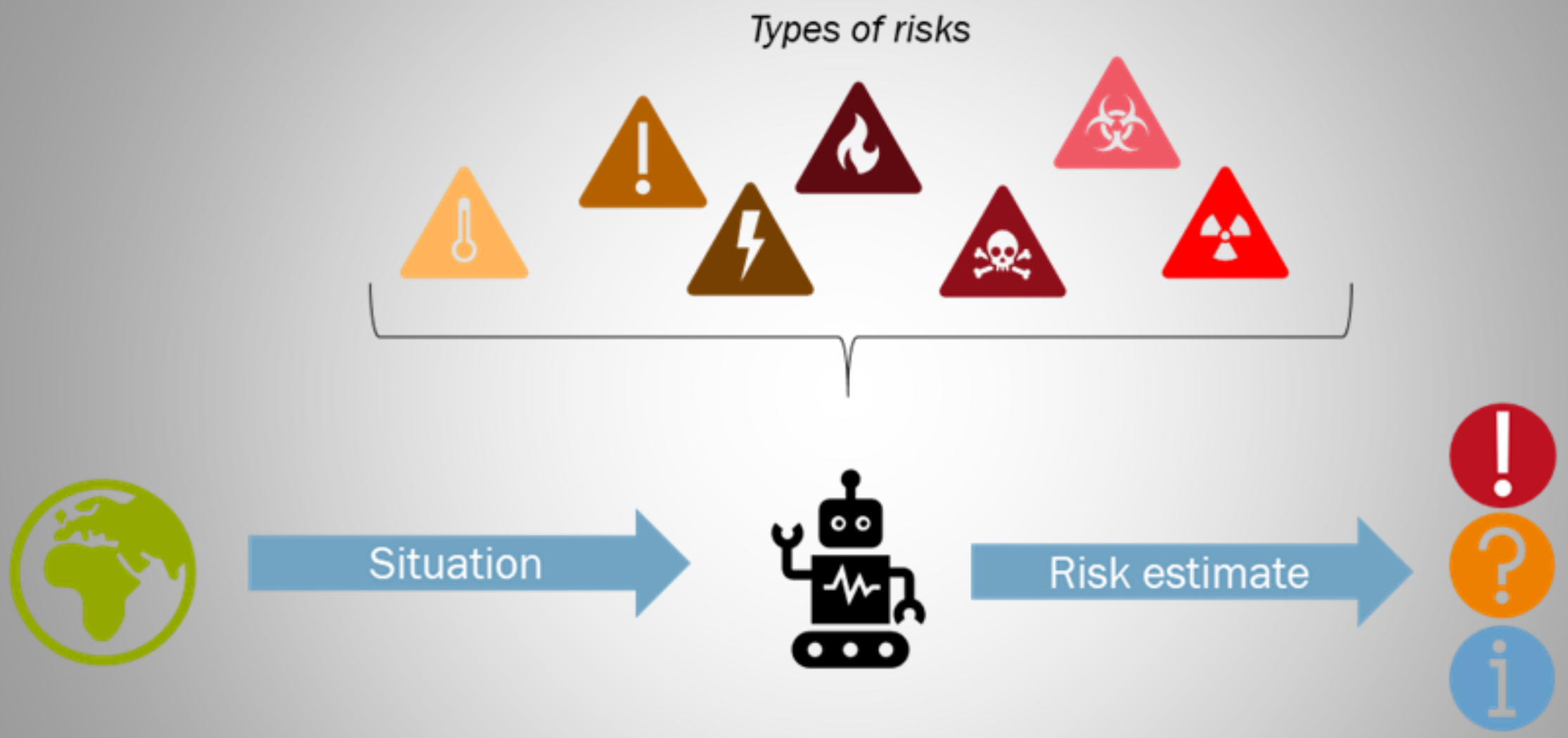
Allocating tasks over time to operators based on operator and task profiles, with real-time adjustments based on these changing profiles.



Situational awareness

Proactively bringing the operator into the loop with all relevant information for just-in-time awareness as well as a progressive disclosure paradigm for a fleet, vessel and immersive perspective.

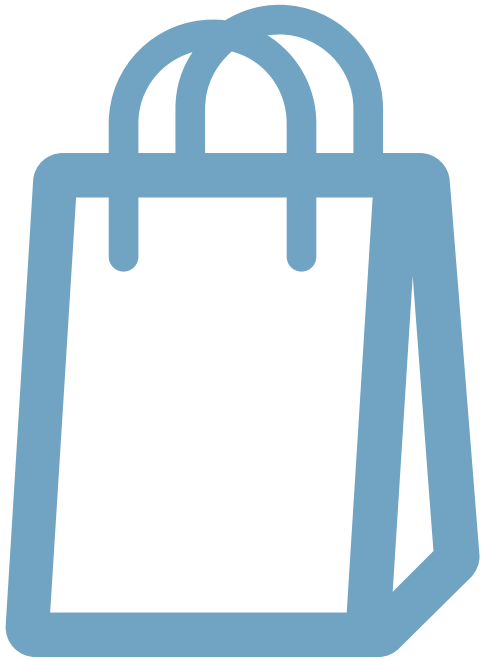




CLICK THIS LINK TO WATCH THE VIDEO ON THE TNO CONTRIBUTION TO THE MOSES-PROJECT

TAKE HOME MESSAGE

- Autonomy is not the same as “perfect automation” (which does not exists by definition)
- Autonomy requires teaming up with the humans in order to control the large range of operational conditions
- Autonomous systems will be first introduced and developed for niche logistical routes (short sea and inland shipping)
- Innovation depends on the development of other aspects of the maritime ecosystem, It will depend on the international interoperability along logistic routes
- The maritime ecosystem will not change with a big bang
- There are a lot of unknown unknows.
- New questions and issues will arise that will influence direction and speed of developments



THANK YOU

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