

**Maritime Autonomous Surface Ships  
Human supported by technology vs.  
technology supported by humans?  
Impact on the seafaring profession**

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**5<sup>th</sup> International Ship Autonomy and  
Sustainability Summit  
Hamburg, 3 September 2024**





# MISSION

To be the world centre of excellence in postgraduate maritime and oceans education, professional training and research, while building global capacity and promoting sustainable development.

# VISION

To inspire leadership and innovation for a sustainable maritime and oceans future.



# Maritime Autonomous Surface Ships

Human supported by technology vs.  
technology supported by humans?

Impact on the seafaring profession

1. Factors impacting the uptake of technology
2. Autonomous or smart ships
3. Education and training
4. Autonomous shipping in the context of research and education

Photo source: <https://atos-eu.org/2021/03/10/maritime-autonomous-ships-and-shipping/>

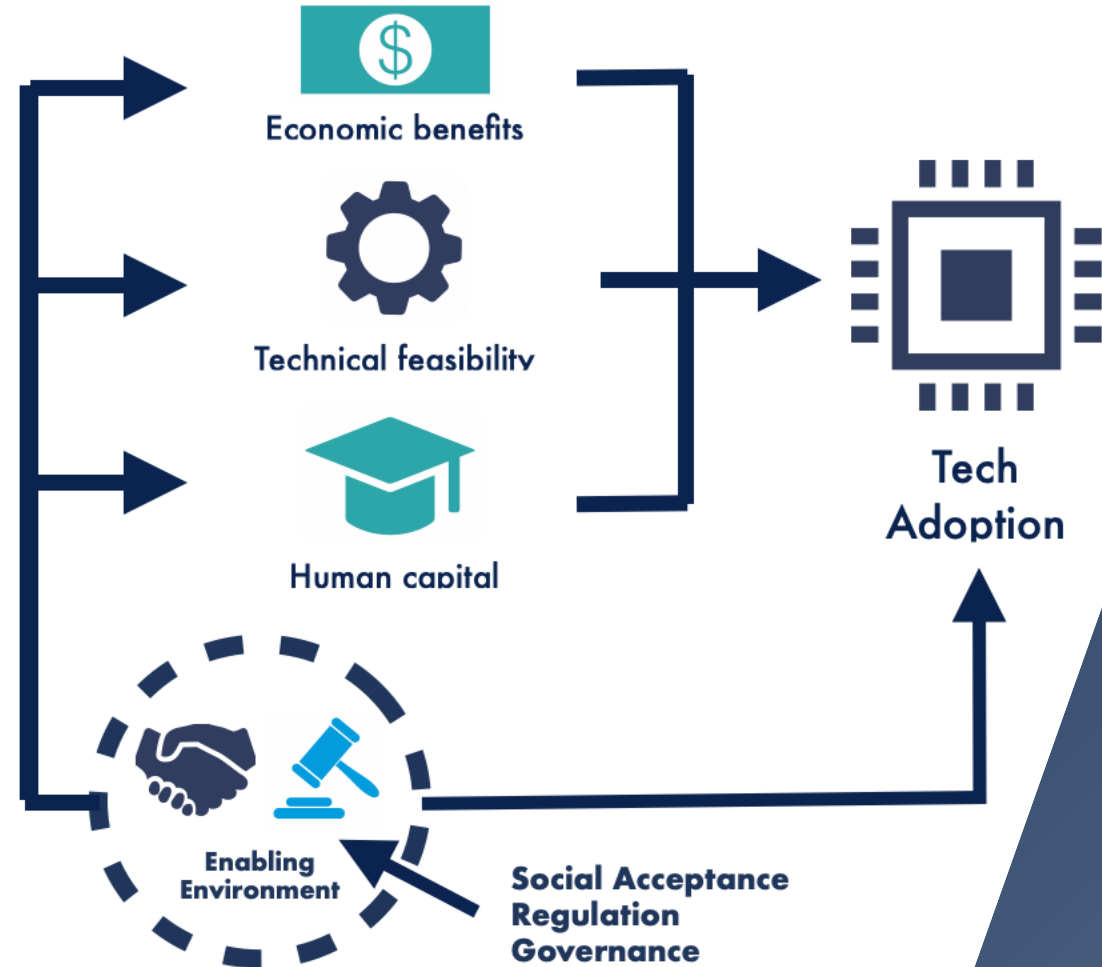
Maritime Autonomous Surface Ships (MASS) – Human supported by technology vs. technology supported by humans? – Impact on the seafaring profession  
Jens-Uwe Schröder-Hinrichs, WMU – 5<sup>th</sup> International Ship Autonomy and Sustainability Summit, Hamburg, 3 September 2023

# Factors impacting the uptake of technology

## Technology Adoption (TechAdo) model

Adoption of technology is influenced by six basic factors:

- Economic benefits
- Technical feasibility
- Human capital
- Social acceptance
- Regulation
- Governance



Source: Fonseca et al. (2021)

# Factors impacting the uptake of technology

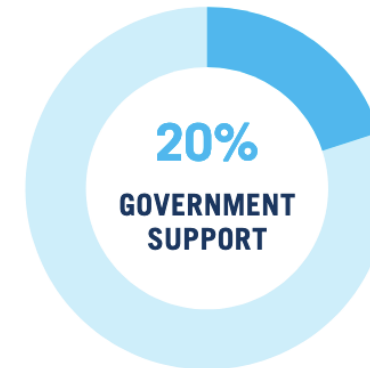
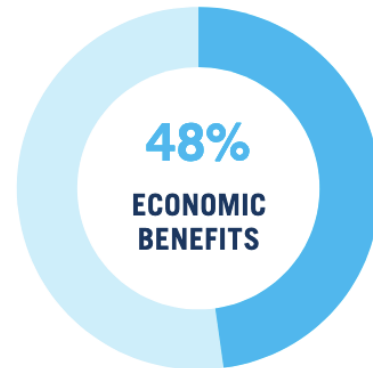
Source: WMU (2019)

## The situation in 2019 – five years ago

# HIGHLY AUTOMATED SHIPS



### ENABLERS

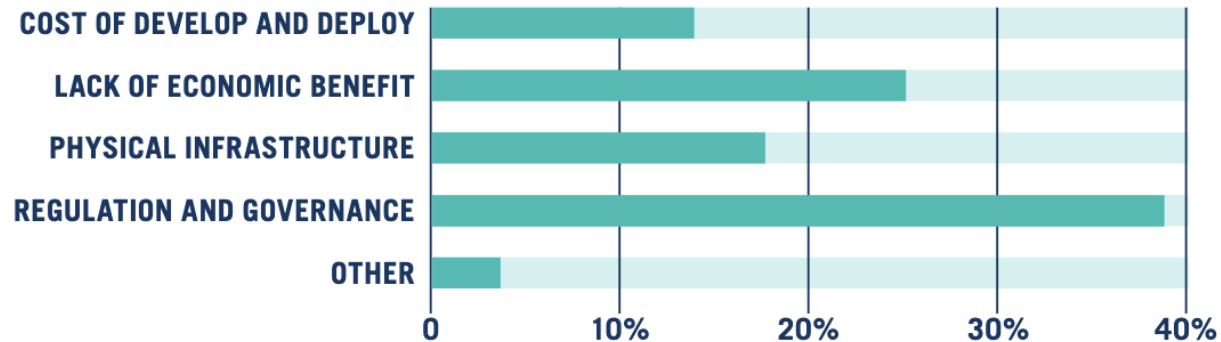


### HURDLES

14%  
COST

25%  
ECONOMIC  
BENEFIT

39%  
REGULATION AND  
GOVERNANCE

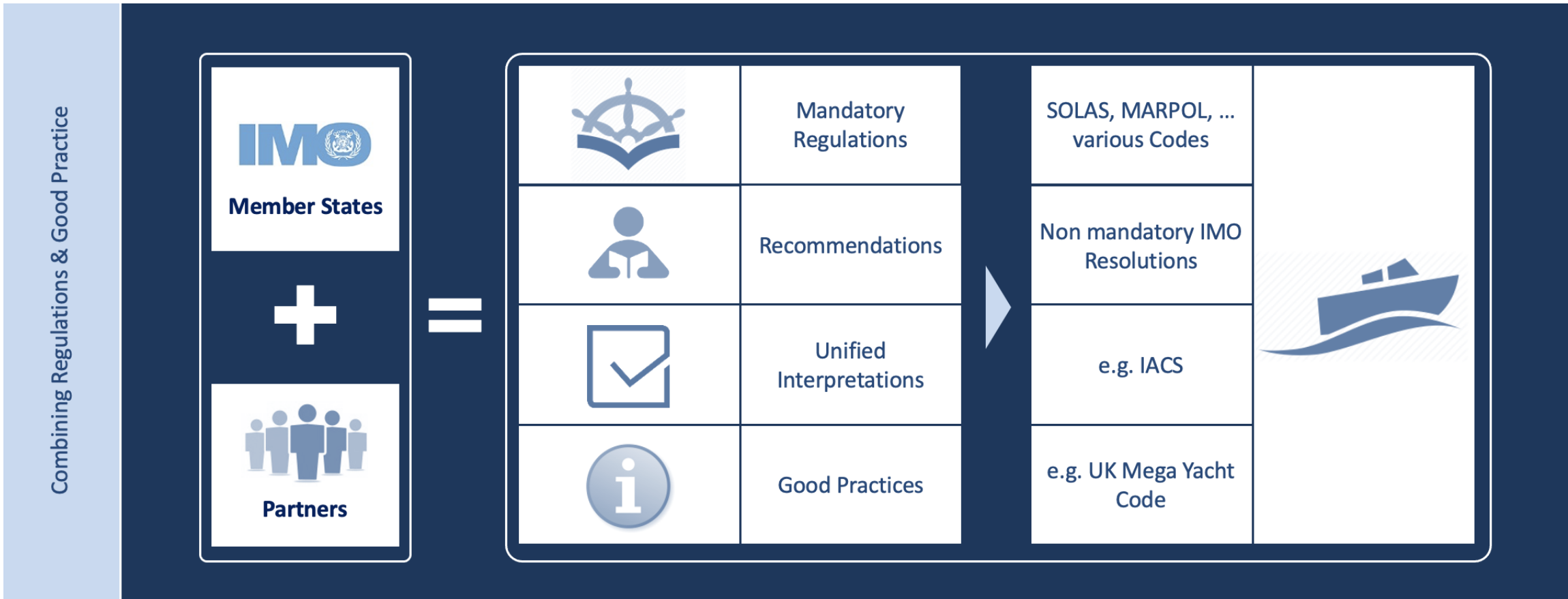




# Factors impacting the uptake of technology



The IMO System of Regulations is complex as it is based on compromises agreed by the international maritime community.





# Factors impacting the uptake of technology

## Regulatory development within IMO

1. Regulatory scoping exercise in 2021 to identify regulatory challenges
2. Joint MSC/LEG/FAL Working Group on MASS in 2022 – addressing common issues, such as defining the role of MASS master and crew
3. Development of a goal-based MASS Code started in 2023 with the objective to enter into force in 2028



# Autonomous or smart ships?

## First trials have been initiated

Japan (2022)



China (2019)



Norway (2022)

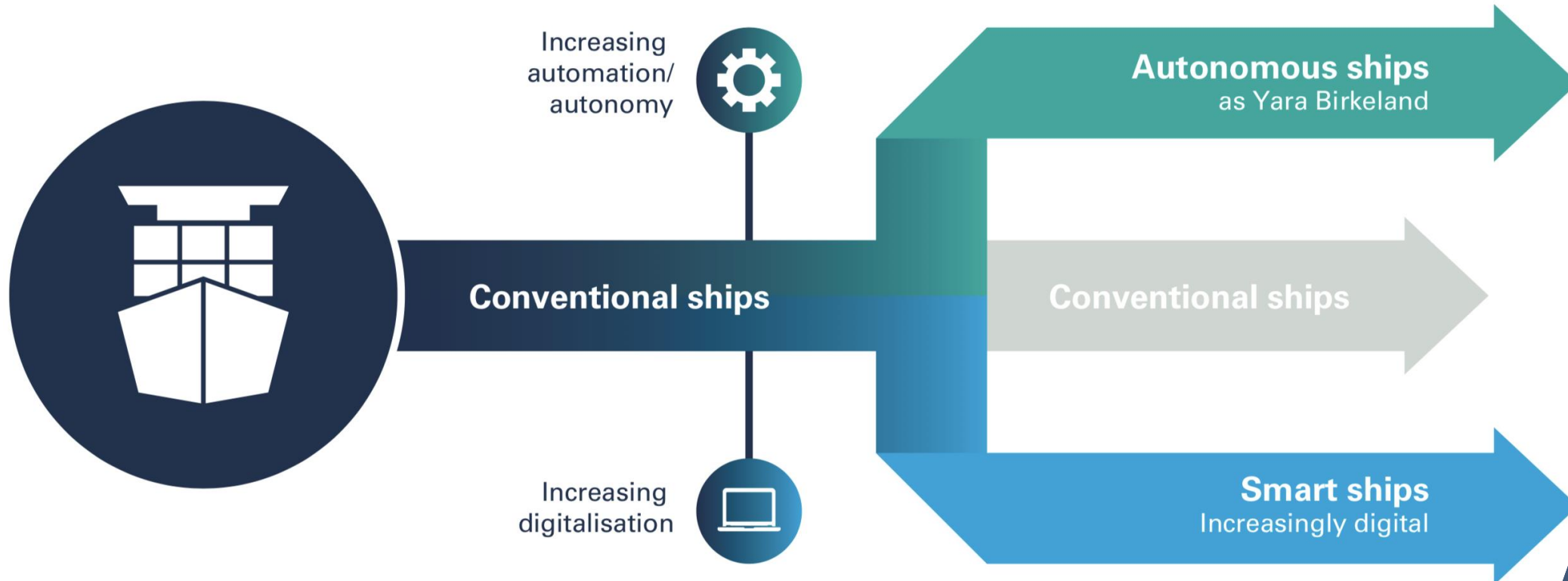




# Autonomous or smart ships?

Source: WMU (2019)

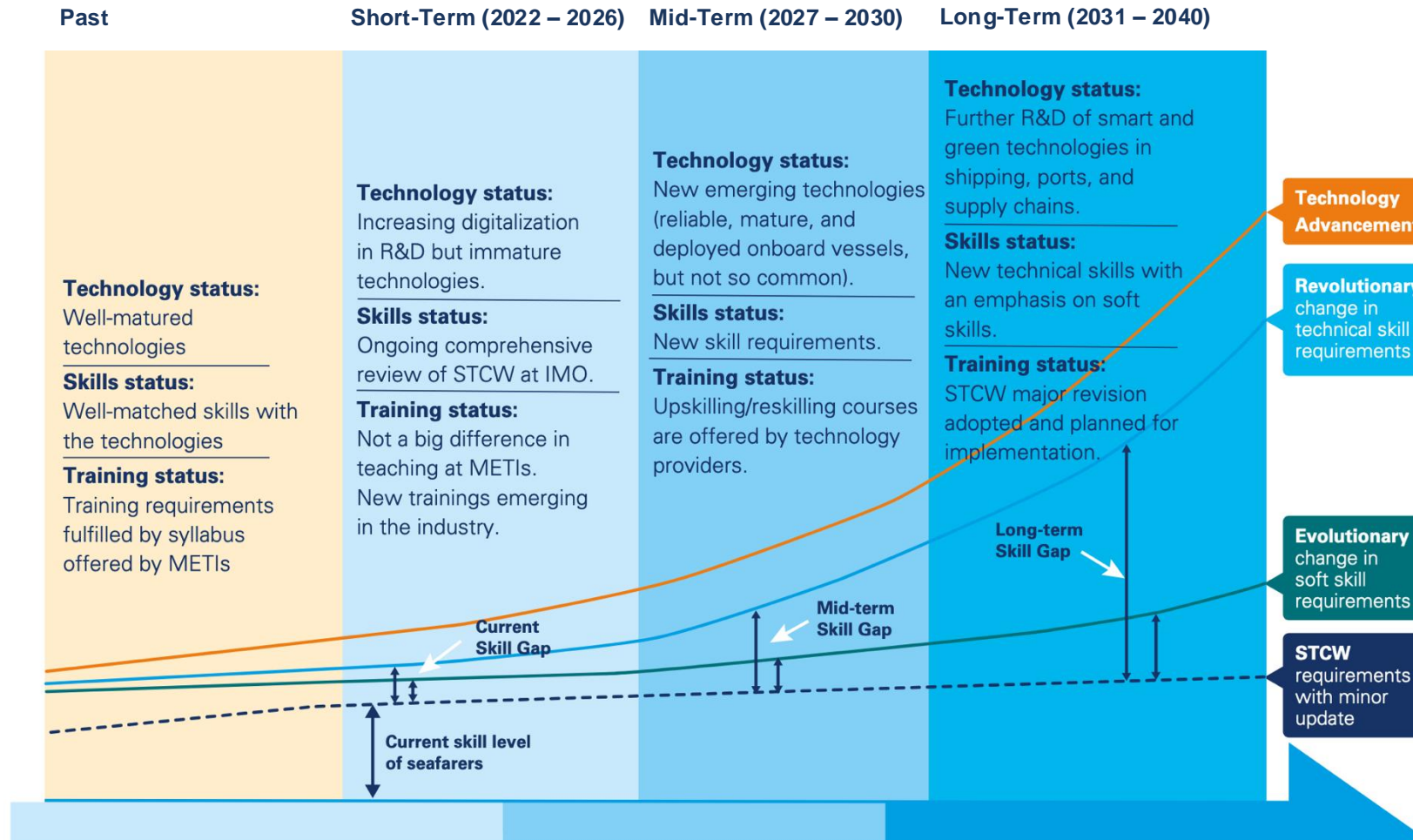
## Implementation scenarios for autonomous shipping



# Education and training

## Technology advancement and skill/training requirements over time

Source: Kitada et al. in WMU (2023)

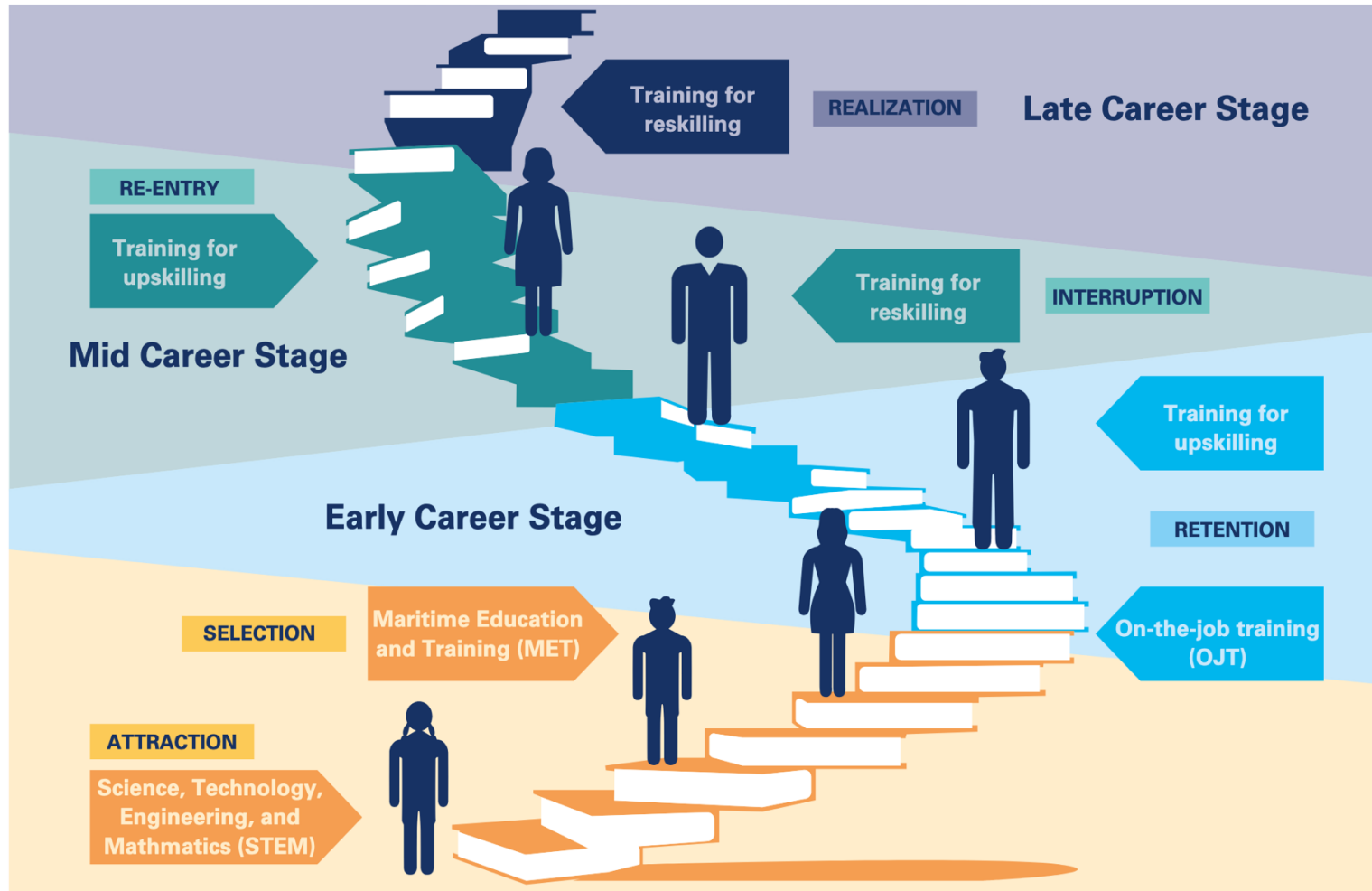




# Education and training

## Future seafarer career model

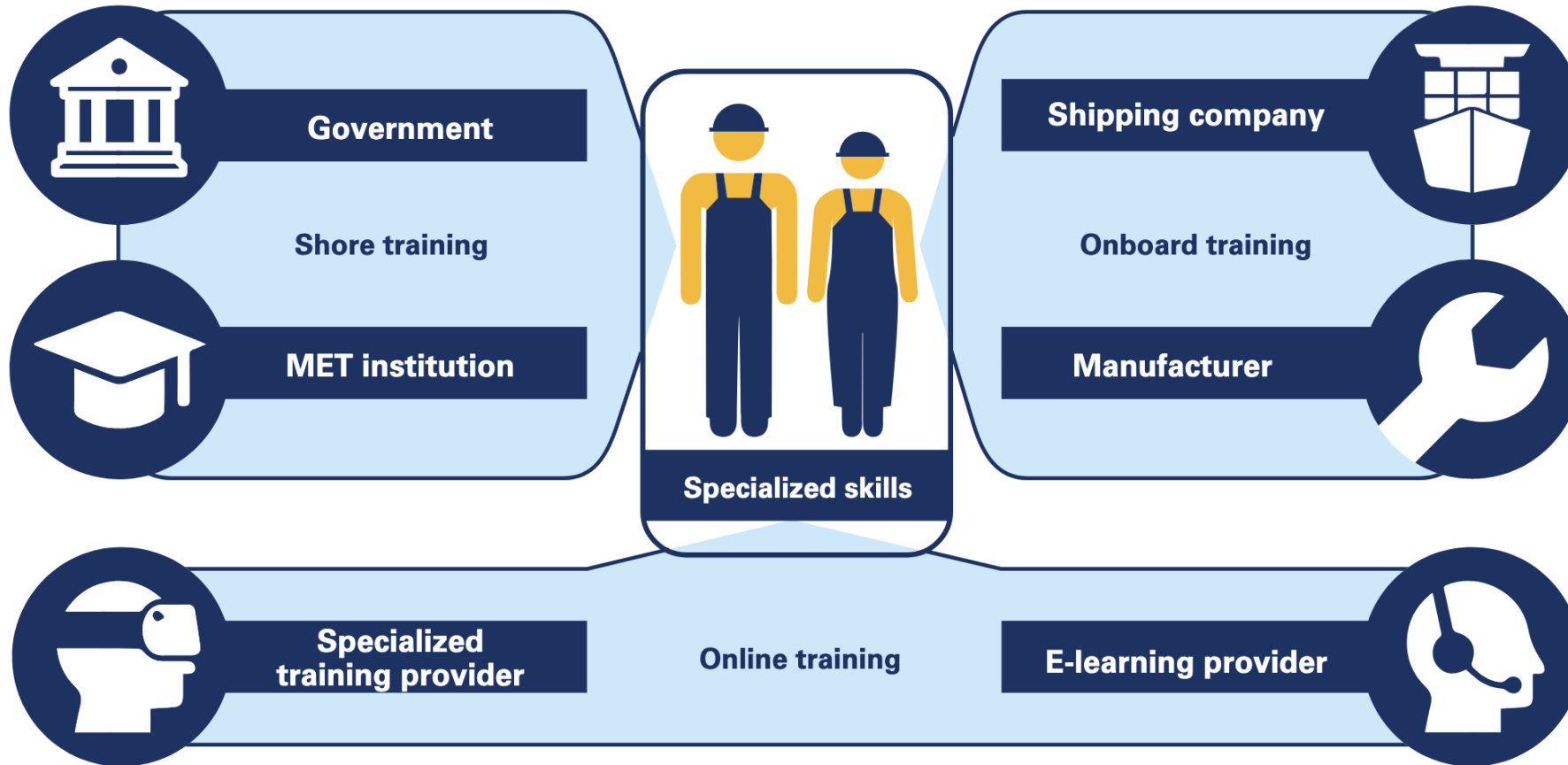
Source: Kitada et al. in WMU (2023)



# Education and training

## Training options in an age of autonomy and digitalization

Source: Kitada et al. in WMU (2023)



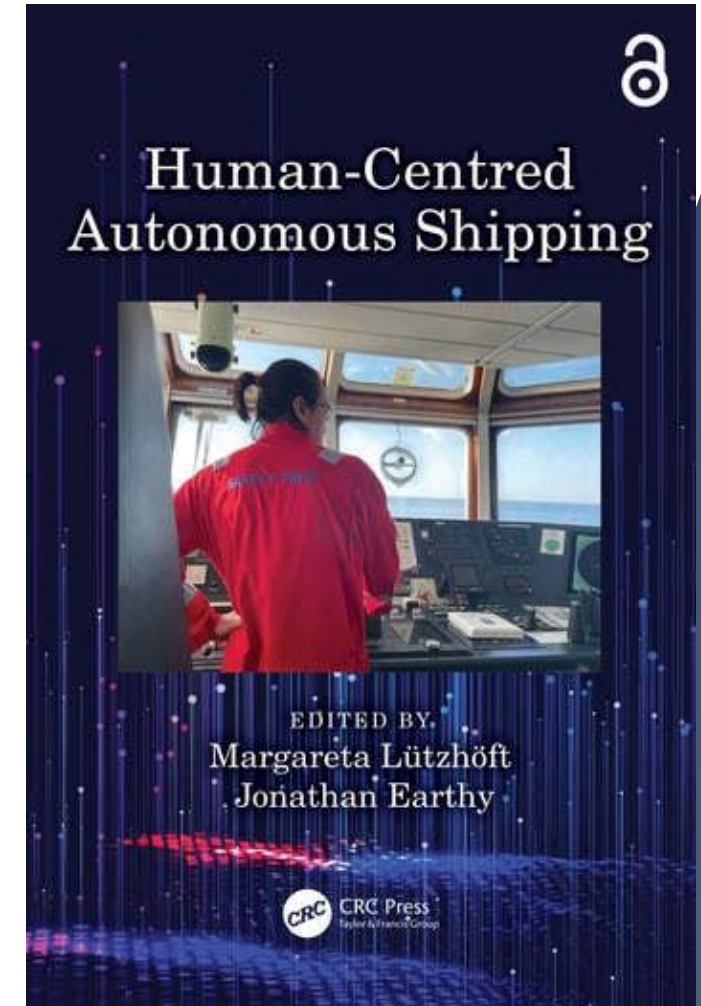


# Autonomous shipping in the context of research and education

## What does the supply side of industry need to consider/do to meet the social and sociotechnical requirements?

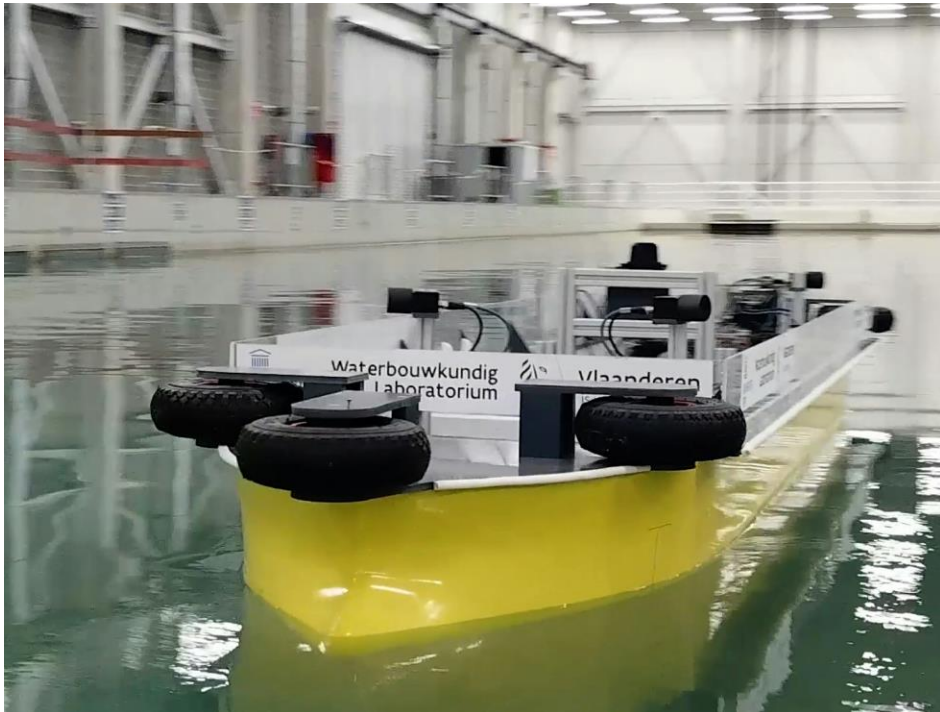
- less unnecessary watchkeeping
- safe behaviours
- understandable explanation
- identify barriers to the job to be done
- taking account of context
- meaningful work making use of human abilities
- most cost-effective automation
- automating the boring stuff
- demonstrating that seafarers are valued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

Source: Earthy & Lützhöft



# Autonomous shipping in the context of research and education

Developments for autonomous shipping represent a major opportunity for research, development and education





# Autonomous shipping in the context of research and education

Are we widening the gap between developing and developed countries?

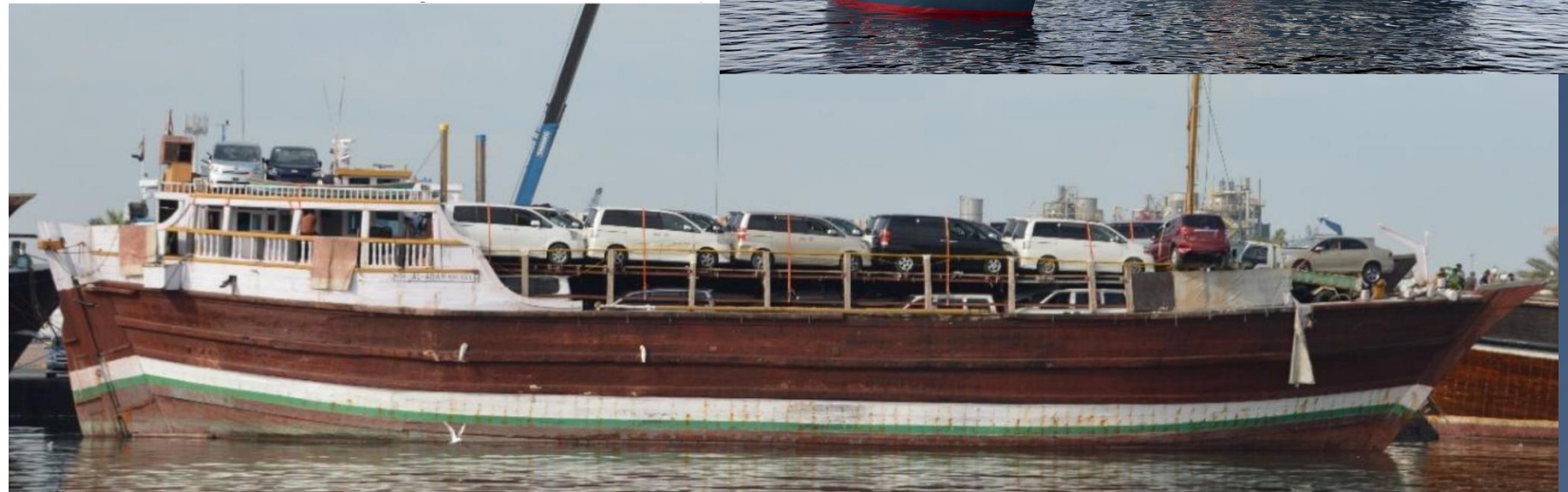
Norwegian project between Reach Subsea, Kongsberg and Massterly to introduce Unmanned Surface Vehicles (2023)

**Source:** Norsk Skipfarts Forum



Al Adam, a large (around 50m long) Indian dhow loaded with second-hand cars about to leave Sharjah for Yemen (Sharjah, December 2019)

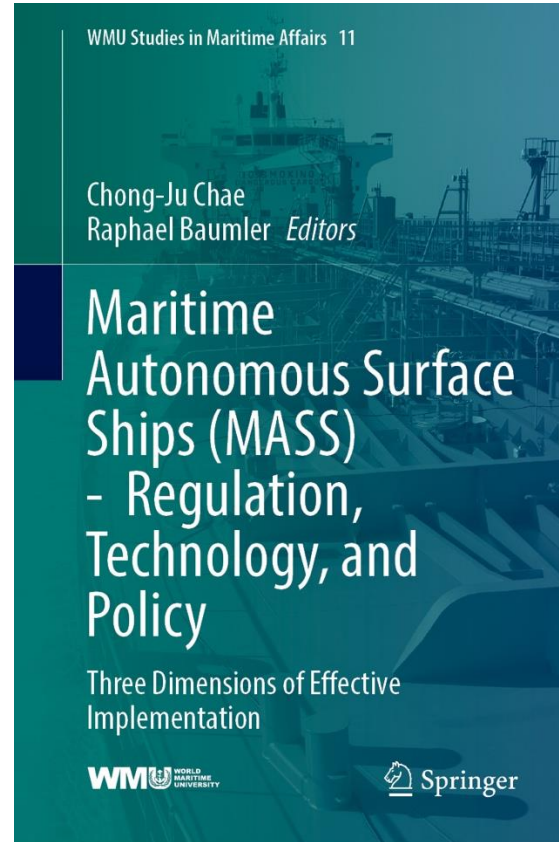
**Source:** Lendjel & Ahmed (2021)



# WMU's work on autonomous shipping



[https://commons.wmu.se/cgi/viewcontent.cgi?article=1091&context=lib\\_reports](https://commons.wmu.se/cgi/viewcontent.cgi?article=1091&context=lib_reports)



<https://link.springer.com/book/9783031694363>

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Any questions in relation to this presentations can be addressed to:

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**THANK YOU!**