A Human Perspective on Maritime Automation and Autonomy
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Content

› Autonomy and automation – what’s the difference?
› Humans and automation – what do we know?
› Automation in maritime – what have been the problems?
› Autonomy in maritime industry – what about the humans?
› On-going projects

› Summary
Autonomy – a hype or a paradigm shift?

http://smartupsindy.com/3-hyped-companies-avoid-mistakes/
Everyone is doing it…

- YARA Birkeland will initially operate as a manned vessel, moving to remote operation in 2018, 2019, 2020
- Japan’s largest container line will test a remote-controlled vessel across the Pacific Ocean in 2019
- Finnish Maritime Fully Autonomous by 2025
- Maritime Unmanned Navigation through Intelligence in Networks
- Kongsberg and Wilhelmsen join for autonomous ships – April 2018
- BHP Billiton pushes for autonomous ships in the coming decade
- MOL Expands Artificial Intelligence Research
- Rolls-Royce, DNV GL, NTNU And SINTEF Ocean Simulation Platform For Creating Future Ships
- Wärtsilä remote vessel control from 8,000 km

Source: [https://www.dn.no/](https://www.dn.no/) Per Thrana

- 22 March 2018 the Uber fatality
- 3 April 2018 - Airports across Europe warned of disruptions “there has been a failure of the Enhanced Tactical Flow Management System”, which compares traffic demand with local air traffic control regions.

– It looks like they are crashing, said Torbjørn Røe Isaksen, minister of Trade and Industry, when he took control of a so called autonomous ship in Trondheimsfjorden.
Autonomy – to bin or not to bin?

› Society of Automotive Engineers (SAE) has abandoned the term autonomy since it:
  › becomes synonymous with automated.
  › obscures communication and/or cooperation with outside entities
  › should be considered cooperative rather than autonomous

› However the term autonomy is useful to discuss *significant* changes to a system such as
  › Relocating the responsibility to a remote location
  › The use of artificial intelligence
  › A local reduction or removal of humans
What have we learned from human and technology interaction?
Automation

- Promises
  - Efficiency
  - Safety
  - Economy
  - Less human error

- Side effects
  - Increased knowledge demands
  - New risks
  - New accident types

Strong and silent

- Change is automatic
- Future movements are not shown
- More independence and authority
- Difficult to supervise/control

- The human has to know:
  - when and where to look
  - for what

- Availability is not observability
The impossible task and the ironies of automation (Bainbridge, 1983)

› Skills deteriorate when not used
› Formerly experienced may now be inexperienced
› Memory depends on frequency of use
› Knowledge develops through use and feedback
› Impossible to maintain attention for more than about half an hour.

It is humanly impossible to carry out the basic function of monitoring for unlikely abnormalities.

› The computer is being used to make the decisions because human judgement and intuitive reasoning are not adequate
› Automation can do the job better but the operator is being asked to monitor it

The human monitor has been given an impossible task.
Human-Technology interaction in the maritime industry
Technology Assisted Accidents

- Honda Point (Radiopejl)
- Stockholm - Andrea Doria (Radar)
- Royal Majesty (GPS)
- Janra (Elektroniska sjökort)
- Silja Europa (Integrerat bryggsystem)
- Savannah Express (Propulsion automation)
- ??? (Autonomy)
A projected future of maritime autonomy

- Vessels with no or significant reduced manning
- ‘Autonomous’, remote and conventional vessels will co-exist
- The captain is no longer on the vessel
- ‘Someone’ is responsible from a remote location
- A few autonomous concepts in territorial waters initially
Remote and responsible

Sources: Pixabay and Wikipedia (NASA)
The tool becomes the job

- Sensors – what do they sense?
- How is data translated to information?
- Is the operator as responsible as a captain?
- How skilled is the operator?
- How does the operator interact with other vessels?
- Trust or trustworthiness?
- Can technology be a crew member?

How skilled is the operator?
HUMANE project

› Hardware reliability & cyber security
› Skill sets, competence and knowledge
› Legal implications
› Organisational & job design issues

› Why?
  › Most of the technology is in place…?
  › Some bits are missing
  › What can we do to support and enable?
  › Everyone wants safe and efficient shipping
Maritime competence and test cluster Haugesund
Disruptive approach – centralise responsibility to reduce complexity

› What if the SCC is not best fit for taking the navigation responsibility?
› Could responsibility be allocated elsewhere?
› What if the governmental authorities is allocated responsibility in some geographical areas?
Summary

› Automation and autonomy – many similarities, but also need to understand the difference
› Humans and automation – consider known human-technology interaction in future design
› Automation in maritime – rapid development, but end-users are not considered enough (rewrite)
› Autonomy in maritime industry – some old challenges, but also some new. Responsibility is a key factor for future system design
› Work is in progress
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