A human centred approach to the future Vessel Traffic Services

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Objective

The objective for the presentation is to show how the human perspective has been used throughout the project of discussing the future Vessel Traffic Services

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What to remember from this presentation

- The human centred approach is used to:
  - Provide a broader view on the challenge of maritime autonomy
  - Understand how variety in the response of VTS-operators affect the VTS performance
  - Explore the future VTS through sociotechnical design principles

The future of shipping – more of the same, and something new

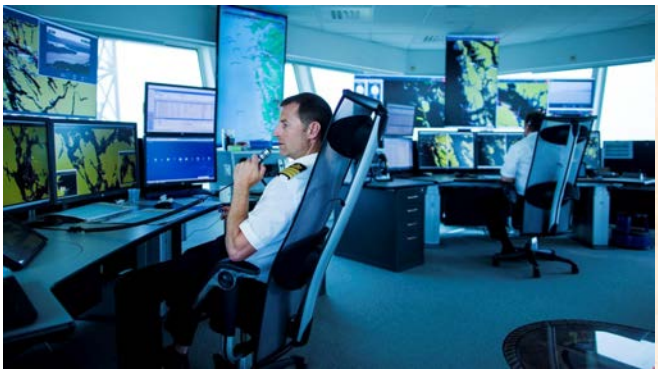
The prognosis predicts an increase of 41% in ship traffic from 2013 to 2040

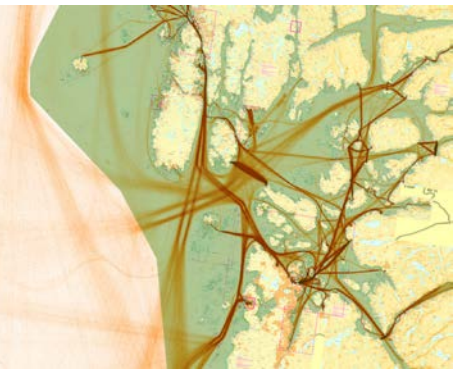
The vessels are expected to increase in size

Autonomy is expected to coexist with conventional vessels

Source:
Kongsberg https://www.km.kongsberg.com/ks/web/nokbg0238.nsf/AllWeb/98A8C576AEFC85AFC125811A0037F6C4?OpenDocument
Rolls-Royce https://www.rolls-royce.com/media/our-stories/discover/2017/worlds-first-remote-controlled-commercial-vessel.aspx

Measure to increase safety and efficency: Vessel Traffic Services





Source: Norwegian Coastal Administration

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A Human Perspective on Maritime Autonomy

- The challenge of using the term «autonomy»
- Humans will be in the loop, but there will be new loops
- Humans will be responsible, and remain in control

Source: Pixabay

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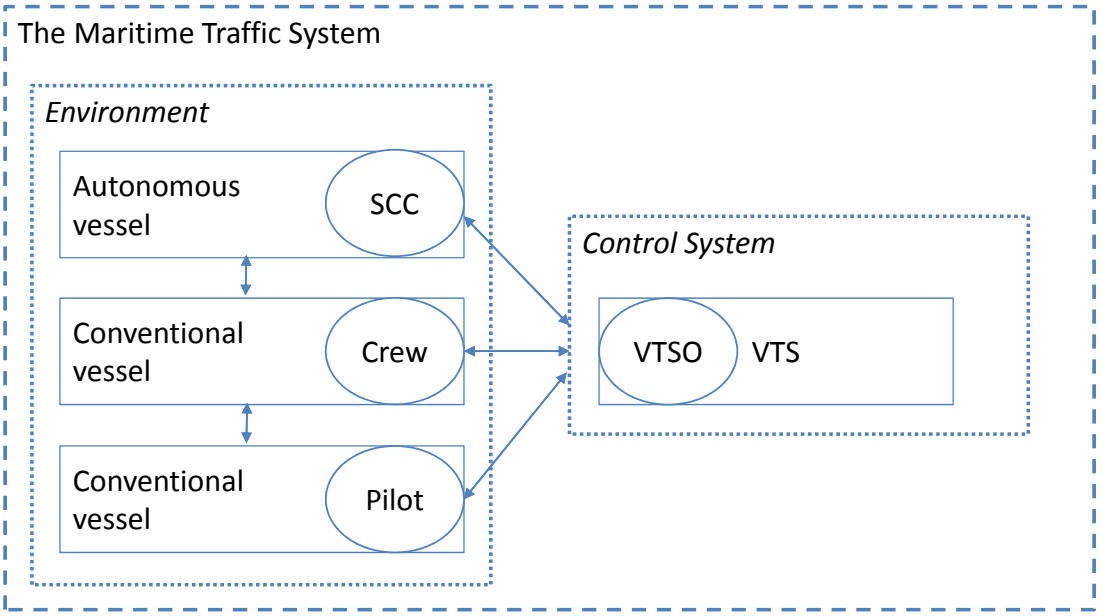

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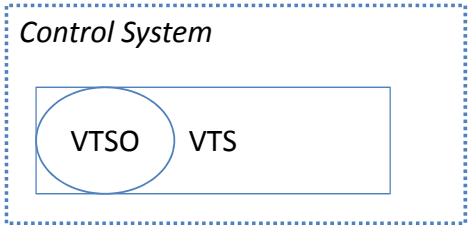
Requisite variety and the human role

- The VTS needs the **same or larger variety** as the environment it controls
- VTSOs **adapt their behaviour** to meet the demands in the environment



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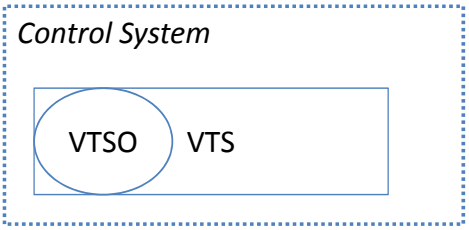
How VTS operators cope with complexity

- Identify how VTS operators use their **expert knowledge** and strategies in their interaction with vessels
- To examine if there are **variations** in the interaction with vessels between different operators



How the operators cope with complexity

- Operator experience
- Teamwork
- Organisational knowledge
- Communication

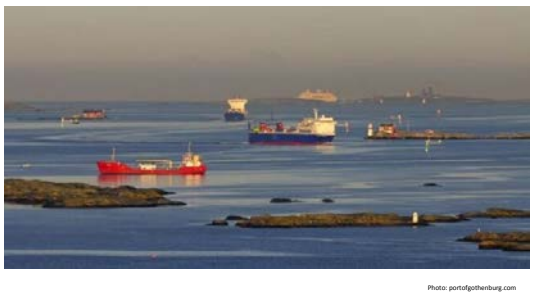


Photo: portofgothenburg.com

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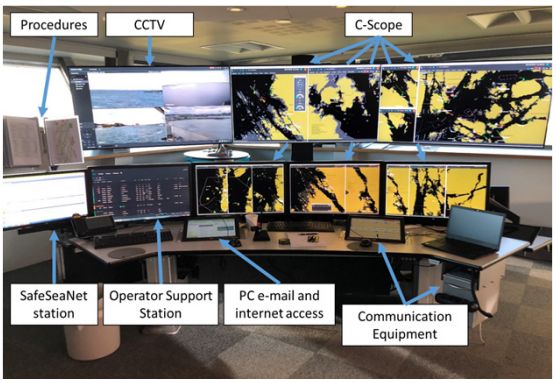
Organisational knowledge



- Technology development allows for more and **better functionalities to support** operators
- Functionalities **reduce workload**, and could allow for monitoring a larger geographical area
- The **constant development** and **personal interest** in new technology cause variation in how and when they are used
- **Transfer of experience** is difficult due to shift rotation

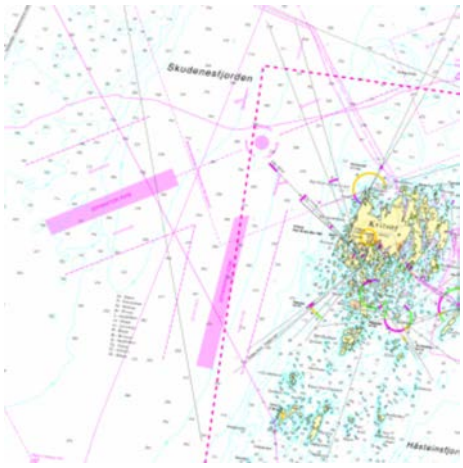
Organisational knowledge

- Most of the procedures are **prescriptive** (what), while a few are **descriptive** (when and how)
- Criteria in descriptive procedures is **well known, easy to follow,** cause **less variation** and could be **presented** on C-Scope
- Procedure where VTSOs are delegated authority to **order tug** is especially important
- VTSOs are positive about descriptive procedures, but the **variation in situations** makes it difficult to replace prescriptive with descriptive

Example of a prescriptive procedure:
"when the VTS operator assess that it is a risk for collision, the operator should warn the vessels"

Example of a descriptive procedure:
when a forecast of wind stronger than 18 m/s (force 8) is issued the operator shall recommend the vessel to be ready for immediate start

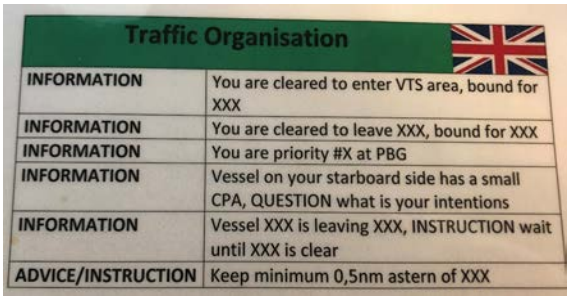
Organisational knowledge



- TSS and restrictions in parts of the fairway **increase predictability**
- TSS is considered to **reduce the variation** in traffic and makes it **easier for crew** to communicate intentions
- Situations (deviations from plan) were **spotted earlier** in TSS than outside

Communication

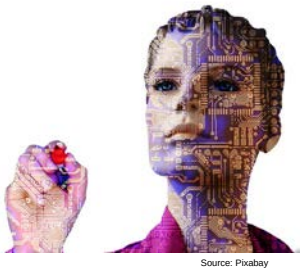
- Experienced VTSOs intepret **how** the crew communicate, not only what they say
- VTSOs say it is large variation between operators on **use of terms**, **what information** given and **when information** is provided, and variation is caused by their own **background and experience**
- VTSOs want the communication to be **short, concise and correct** and refer to SMCP
- **Norwegian** language is prinicipally used
- **Message markers** are mainly used when communicating in English



Traffic Organisation	
INFORMATION	You are cleared to enter VTS area, bound for XXX
INFORMATION	You are cleared to leave XXX, bound for XXX
INFORMATION	You are priority #X at PBG
INFORMATION	Vessel on your starboard side has a small CPA, QUESTION what is your intentions
INFORMATION	Vessel XXX is leaving XXX, INSTRUCTION wait until XXX is clear
ADVICE/INSTRUCTION	Keep minimum 0,5nm astern of XXX

The future Vessel Traffic Services

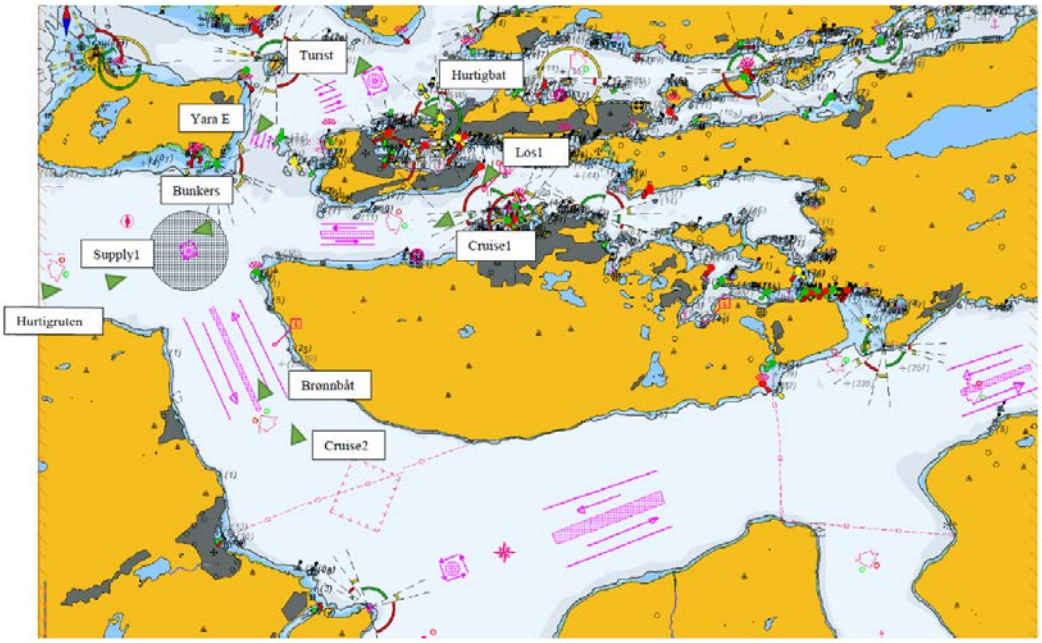
- How do we achieve joint optimisation of technology and operators?
- How could we reduce unnecessary variation?
- What services could facilitate for safe and efficient coexistence of autonomous and conventional vessels?



Source: Pixabay

Coexistence of autonomous and conventional vessels

- A proactive approach to the challenge
- Sociotechnical system design principles – **a democratic process**
- VTS managers and operators from all of the Norwegian VTS'
- A systemic approach to evaluate internal consequences and external effects of changes

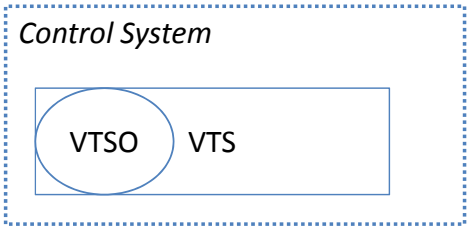


External: How the VTS affects the MTS

The Maritime Traffic System

Architectural principles for SoS:

1. **Stable intermediate forms**
   The stability in the period until the future system is constructed and finalised
2. **Policy triage**
   The triage of what to control, and acknowledgement of fully control the SoS is impossible
3. **Leverage at the interfaces**
   Due to the independence of the component systems, the architecture makes the interfaces essential
4. **Ensuring cooperation**
   Defining incentives for systems to participate in the SoS



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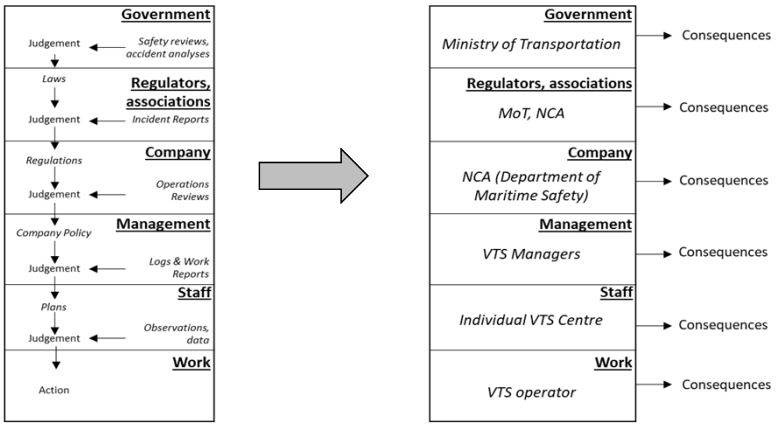
Internal: What are the consequences for the various VTS systems levels



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A human centred focus in the study

- A Human Perspective on Maritime Autonomy
  - AC 2018: Augmented Cognition: Users and Contexts pp 350-362
- How Vessel Traffic Service operators cope with complexity
  - Theoretical Issues in Ergonomics Science
- A sociotechnical perspective on the future Vessel Traffic Services
  - Necesse (in review)