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
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

Measure to increase safety and efficiency: Vessel Traffic Services

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
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
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

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How the operators cope with complexity

- Operator experience
- Teamwork
- Organisational knowledge
- Communication
How the operators cope with complexity

Operator experience

Teamwork

Organisational knowledge

Communication

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 interpret 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 principally used
- Message markers are mainly used when communicating in English

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?
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

Control System

VTSO VTS

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

Government
  - Ministry of Transportation
  - Consequences

Regulators, associations
  - MoT, NCA
  - Consequences

Company
  - NCA (Department of Maritime Safety)
  - Consequences

Management
  - VTS Managers
  - Consequences

Staff
  - Individual VTS Centre
  - Consequences

Action
  - VTS operator
  - Consequences

Staff
  - Work

Regulators
  - Work

Operators, Krishna
  - Work

Legislation
  - Safety reviews, accident analysis

Legislation
  - Incident Report

Legislation
  - Operations

Legislation
  - Rules & duties

Legislation
  - Observations, 2019
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A human centred focus in the study

• A Human Perspective on Maritime Autonomy
• 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)