Work package 6
Dynamic risk management

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Agenda

1. Orientation
2. Dynamic risk management – what is it all about?
3. The results
Risk...

.. is the potential that a chosen action or activity (including the choice of inaction) will lead to a loss

.. to predict it..
Dynamic risk management

What is it all about?

- Continuous work on
  - identification accident and economic risks,
  - assessing risk levels
  - propose and perform risk treatment and
  - communication of risks

- Ships may encounter dynamic risks throughout its journey:
  - Weather
  - Traffic situations / congestions in fairways
  - Technical or human behaviour / error
  - Threat/warfare
  - Route
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*What is it all about?*

- **EfficienSea WP6 aim**
  - the accident risk to be visible, time dependent, in terms of parameters identified by people who are related to maritime traffic.
- **Create new modellings and improve modelling**
- **Improve proactiveness**
- **User need point of view**
- **Risk reduction effects**
- **Why?**
  - Complex situation awareness
  - Strong human orientation
  - Data available, modelling needed
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*Thematic content and results*
Dynamic risk management

*thematic content*

<table>
<thead>
<tr>
<th>Activity 1</th>
<th>Activity 2</th>
<th>Activity 3</th>
<th>Activity 4</th>
<th>Activity 5</th>
<th>Activity 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identification of user needs and system specification</td>
<td>Risk analysis algorithm development</td>
<td>Dynamic algorithm for analyzing online situations</td>
<td>Framework on economic quantification of maritime accidents and risk control measures</td>
<td>Risk-based development of pilotage and Vessel Traffic Service</td>
<td>Risk reduction effect of Aids to Navigation</td>
</tr>
<tr>
<td>Chalmers Margareta Lützhöft</td>
<td>Aalto Uni. Pentti Kujala</td>
<td>SSPA Peter Grundevik</td>
<td>SSPA Joanne Ellis</td>
<td>SSPA</td>
<td>DAMSA Omar Frits Eriksson</td>
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</tbody>
</table>

Needs | Modelling risk | Conseq. | Risk reduction effect |
Dynamic risk management

*The user needs and system specifications*

<table>
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<tr>
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Dynamic risk management

The user needs and system specifications

- State of the art survey on decision support systems in the VTS domain
- Publications to the scientific community, where VTS work is under-researched
- eNavigation simulations - next generation of ship-shore-ship communication
- Dissemination to societal stakeholders and popular presentations
- Groundwork for recommendations to regulators, in particular IALA
- System requirements for dynamic risk management

* VTS=Vessel Traffic Service
3. Rank the following tools according to their importance for your daily work! Which one is most important, which one least? (scale 1-10, 1 most important)

<table>
<thead>
<tr>
<th>Tool</th>
<th>Importance</th>
<th>Importance</th>
<th>Importance</th>
<th>Importance</th>
<th>Importance</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>VHI</td>
<td>1.4</td>
<td>3.1</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
</tr>
<tr>
<td>RADAR</td>
<td>1.9</td>
<td>4.2</td>
<td>5.5</td>
<td>5.6</td>
<td>6.5</td>
<td>7.2</td>
</tr>
<tr>
<td>AIS</td>
<td>4.2</td>
<td>3.1</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
</tr>
<tr>
<td>ECDIS</td>
<td>3.1</td>
<td>4.2</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
</tr>
<tr>
<td>Hydrograph. &amp; meteorolog. Info</td>
<td>4.2</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>7.2</td>
</tr>
<tr>
<td>GPS/DGPS</td>
<td>4.2</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Telephone/ Mobile</td>
<td>4.2</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Databases (PortNet, PilotNet, Lloyds)</td>
<td>4.2</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Cameras (Closed-circuit television/ CCTV)</td>
<td>4.2</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Internet</td>
<td>4.2</td>
<td>5.2</td>
<td>5.5</td>
<td>6.5</td>
<td>7.5</td>
<td>7.2</td>
</tr>
</tbody>
</table>

7.4 Summary of needs

1. Support familiarity in the information presentation to facilitate pattern matching for quick and effective decision making
2. Support of communication to facilitate the interaction of the different players in the maritime sector.
3. Support the building of trust through better and more effective communication between shore and ship (content is more important than quantity)
4. Re-evaluating and defining the role and tasks of the VTS as service for the maritime community with safety as the main goal
5. Need for a common “situation picture” so that bridge team and VTS operators can perceive the same representations
6. Remember the non-technical resources such as experience, training, co-workers and procedures
7. The validity and integrity of the data presented in the system must be guaranteed
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*Risk analysis algorithm development*

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EfficienSea
Efficient, Safe and Sustainable Traffic at Sea
Dynamic risk management

Risk analysis algorithm development

- Scientifically oriented thematic activity
- Background
  - State of the art in maritime risk modeling
  - Analysis of data sources
- Completely new statistical maritime traffic risk model – scientifically approved
- Cases
  - Kattegat traffic analysis
  - Modeling maritime traffic using AIS-data (GOF)
  - Simulation of maritime traffic – analysis of ship trajectories and risk maps from the Gulf of Finland
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Risk analysis algorithm development

![Flowchart diagram]

![Map of ship collision probability]

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<tr>
<th>Ship type</th>
<th>Number of near collisions per 1000 sailing hours</th>
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<tr>
<td>Cargo vessel</td>
<td>3.03</td>
</tr>
<tr>
<td>Tanker</td>
<td>3.04</td>
</tr>
<tr>
<td>Passenger vessel</td>
<td>2.55</td>
</tr>
<tr>
<td>High Speed Light Craft</td>
<td>7.64</td>
</tr>
<tr>
<td>Other vessel type</td>
<td>2.32</td>
</tr>
</tbody>
</table>

\( N_{tot} = 1.294 \)

![Table 2: Number of near collisions per 1000 sailing hours]
Figure 8. Collision and grounding pattern for the model "Kattegat 2007 simplified incl. 7SS".

Figure 9. Collision and grounding pattern for the model "Kattegat 2007 simplified" with future traffic intensity based on a ship traffic increase by a factor of 2.5.
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*Dynamic algorithm for analyzing online situations*

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*Dynamic algorithm for analyzing online situations*

- To enhance decision making in Vessel Traffic Service – estimate, warn and visualize risk for ship collisions – **proactiveness**!
- Two demonstrators
  - Open water tool: estimate ship-ship collision probability
  - Restricted water tool: detection of ship un-normal behaviour leading to collision
- Documented modeling of tools which can be used in developing VTS-systems
- Field user-testing and uncertainty analysis
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*Framework on economic quantification of maritime accidents and risk control measures*

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*Framework on economic quantification of maritime accidents and risk control measures*

- Mapping of vessel traffic accident costs
- Mapping of costs for risk control measures (VTS, pilotage..) from Finland and Sweden
- Collection of pilotage rates
- List of accidents and accident cost modeling
- Collection of risk analyses around the Baltic Sea – input to HELCOM Maritime
Mapping of risk control options
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Risk based development of pilotage and Vessel Traffic service

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*Risk based development of pilotage and Vessel Traffic service*

- Background report of VTS risk reduction effect
- Pilotage risk reduction effect analysis
- Analysis of VTS as risk control option, in Finland and Sweden
- Decision supporting framework for establishing pilot and VTS services

*Risk reduction effect of VTS in Finland*
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*Risk reduction effect of aids to navigation*

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*Risk reduction effect of aids to navigation*

- Effect of causation factor for fairway safety (probability that the navigator does not act as should)
- Probability network modeling
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At glance
Dynamic risk management

Questions?

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