THE IMPACT OF DIGITALISATION ON MARITIME SAFETY AND THE CREW'S WORK ENVIRONMENT

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We who have done the work

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Reference group

- **Shipping companies:** ForeSea reference group, with representatives from e.g. Rederi AB Eckerö, Stena Line, BRP, Viking Line, Thun, Sirius, Furetank, Finnlines, Destination Gotland, Wallenius, Forsea Ferries
- **Swedish Transport Agency:** Henrik Tunfors, Senior advisor, Chair of the IMO MASS Working Group
- **Swedish Maritime Administration:** Fredrik Karlsson, Innovation Coordinator and responsible for simulations at the Swedish Maritime Administration's Research and Innovation Unit
- **RISE:** Mikael Hägg, Head of Maritime Department
- **Åland University:** Bengt Malmberg, Senior Lecturer in Nautical Sciences
- **IRIS:** Björn Jakobsson, Head Developer

ForeSea

ForeSea is an information system for accidents, "near-accidents" and anomalies whose primary purpose is to prevent maritime accidents and improve maritime safety.

The system offers ships and shipping companies a concrete and effective tool to be able to proactively work with maritime safety issues. By collecting, analysing and sharing information from the ships' incident reports in a common experience bank, shipping companies can make decisions about actions and improvements based on a broad base of real data from an entire industry.

Purpose and goal

The purpose of this pre-study is therefore to contribute to the increased understanding of the scope, nature and consequences of incidents and problems that the introduction of digitalization has entailed, as called for by the industry, IMO and other research.

Goal 1: Understand the consequences of digitalization

Goal 2: Formulate proposals for targeted measures, tools, continued research and development

Research questions

Through a qualitative approach, investigate how digitalization and ICT affect the work environment of land-based and seafarers and how it can be improved.

1. How do you work with the systems?
2. What problems are encountering?
3. How frequent are these problems?
4. How to prevent and solve them?
5. What targeted measures need to be developed and implemented?

Results!

Demographics

- A total of 10 interviews have been conducted
  - The participants in the interviews have been:
  - 2 Technical Managers, 3 Captains, 2 Second mates , 2 Shore-based commanders and1 Land employee
- The mean age was 46 years (62/24) and the average age in the current position was 7 years (24/1).
- 8 men and 2 women participated
- After 10 interviews, "theoretical saturation" is experienced in the material
- In addition to this, two focus groups have also been conducted

What problems occur?

- *"... And that's how it should be, when you have when it works, it should be updated and every time we are updated, yes then there are new problems..."*

Questions	Main Themes	Sub-themes
What problems occur?	1 ”Hassles”	1.1 Bugs
		1.2 Updates
		1.3 Internet Connection
	2 Complexity	2.1 Many systems
		2.2 Interface
		2.3 Too much information
	3 Distraktions	3.1 Alarms
		3.2 Interface
	4 Support	4.1 Larger/smaller companies
		4.2 “Personal” contacts

How to prevent and solve them?

Questions	Main Themes	Sub-themes
How do you prevent and solve the problems occurring?	5 Adjusting	
	6 Colleagues	
	7 Creativity	7.1 “Work around” the problems

"... I mean our crews are a bit like MacGyver, they can fix anything with cones and wire if needed..."

How frequent are these problems?

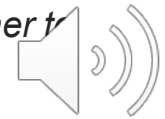
Questions	Main Themes	Sub-themes
How frequent are these problems?	8 Maturity of the programs/systems	

- *"... Yes problems and more problems Yes...*
  There are far too many..."

What targeted measures need to be developed and implemented?

Questions	Main Themes	Sub-themes
What targeted measures need to be developed?	9 Support	
	10 Standardization	10.1 Advantages
		10.2 Disadvantages
	11 User centered design	11.1 Structure
	12 Interconnected systems/programs	

"... The downside may be that you need to use several systems for the "same thing", e.g. coding an invoice, which means duplication of work. Then you need to code in one system and go into another t let them know that you have coded..."



Focus Group 1- What are the major problems?

Problems: (Ranked from 1 to 5 whereas No 1 is the most serious)	Description:	Consequencies:
1. Support	• This was regarded as the most serious problem. The participant saw a “concentration of power” into larger companies which tend to make support less available. • It is difficult to get feed-back. • Long waiting time for reply and the answers are not always helpful.	This is not only a risk to safety when the systmes onboard fail but is also a risk to finacial consequencies as the ship can be classified as not being sea worthy and stopped from leaving port. Often are the faults minor but requires help from the support.
2. Complexity	• Many systems are too complex. • Seems like there is an ambition to add as many functions as possible into one system. • Too many alarms. • interfaces are not thought through.	There is a risk to misinterpret information and a risk of information overload. Also, a risk to focus on “wrong things”, eg. on acknowledge alarms and/or fault messages and thus taking the attention away from the operation of the vessel.

Focus group 1 continued

Problems: (Ranked from 1 to 5 whereas No 1 is the most serious)	Description:	Consequencies:
3. Small problems – large consequences	• Relatively ”small” faults eg. bugs in the system can lead to major consequences. • It often difficult to understand the cause and why it went wrong. • Service engineers is changing “something” and cannot really explain why and what went wrong. • You need to ”hope” it will work again.	It is easy to loose trust in the technology, you dare not to trust it. Especially when an explanation and understanding what went wrong and why is lacking.
4. Standardizing	• Every manufacturer has their own design and their own solutions. • The crew members frequently need to learn and re-learn. • Certain equipment would benefit from some kind of standard solutions.	This means that all too often the crews are facing a learning situation which cannot be solved by generic training courses as all manufacturers are allowed to create their own solutions.
5. Immature technology	• Unfinished, not completely thought through solutions are fitted on board. • Looks good ashore but is not tested for the maritime environment.	This is frustrating for the crews as they feel like they are being used as “testbeds”. This leading to possibly dangerous situations.

Focus group 2 –
What does research need to focus on?

Problem:	Notes:
1 Support	• The participants agreed that a functioning support is the most important area to solve. The ships are in operation around the clock and all over the world in different time zones. It is not possible to stop operations and wait for a support function on the other side of the world to open and start working. • Online support can also be problematic as the ships do not always have a sufficiently stable internet connection. A concern was also raised about data breaches when the ship is online. • A special case is also when new systems and/or major system updates have been implemented on board, that there are routines that ensure functioning systems before the supplier can leave the ship.
2 User friendliness	• Not all systems are user-friendly from the perspective of end users. • They are difficult to navigate, not intuitive, complex and often contain too much information on one single interface.
3 ”Right” information	• If the interfaces are to be developed, we need to understand what information needs to be prioritized, is necessary and what is "good to have". It is important to understand what is "Critical Information in ”Tactical Navigation". • If not a standardization of interfaces can be agreed, then a common design strategy that includes safety critical systems should be developed to minimize the risk of mistakes, "information overload", risk of being distracted and lessen the demand of learning and re-learning.

Focus Group 1 What are the main problems?	Focus group 2 What does the research need to focus on?
1 Support	1 Support
2 Complexity	2 User-friendliness
3 Small problems – big consequences	3 The "right" information
4 Standardisation	
5 Immature technology	

“What to learn from the support functions to improve maritime safety?”

Was granted funding from the Swedish Transport Administration and is now up and running.

The purpose of this project is to investigate how different strategies within Knowledge Management can be applied to gather and structure information within and outside the organization and how to make it available for the operators to increase organizational knowledge thus reducing the number of incidents related to digitalized and automated systems.

Thank you for your attention!

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