PROJECT REPORT

Incident-reporting system ForeSea. Development of a Maritime safety system.

ForeSea

Final Report

Authors: **Tryggve Ahlman, Swedish Shipowners' Association**
Christina Palmén, Swedish Shipowners' Association
Johannes Hüffmeier, RISE Research Institutes of Sweden
Karl-Johan Raggl, Kamahura Teknik AB
Björn Jakobsen, YouKnowWhat AB

Project No: **TRV 2017/63311**

Swedish Transport Administration **SjöV 150570 Swedish Maritime Administration**

SUMMARY

The safe operation of ships and the safe handling of cargo are core principles for shipping companies. In addition to focusing on the safety of their own operations, shipping companies take steps to protect the public health and safety in the countries they transit. Safety in shipping has improved significantly in the last decade with shipping losses declining by more than 50% since 2005. While ship owners might only work reactively with safety, the Scandinavian approach has been to establish pro-active methods of working with safety involving humans and learning from each other.

SvenskSjöfart, together with the Swedish Transport Agency, has made a joint effort and created ForeSea – an information system on accidents, incidents and near misses at sea. The common incident database transparency, knowledge transfer and shared knowledge is prevailing. What distinguishes ForeSea from other systems is that the information in the database can be used for identification of safety analyzes of specific events, thus contributing to preventive maritime safety.

The main goal of the ForeSea system is to reduce risks of maritime accidents, by sharing and transferring safety information between operators and management. Allowing formulation of safety analyses, assessments and safety reports. The main objective of the project has been to perform quality assurance of the system, analyze methods, ensure availability for research project and software training modules, make adaption; technical interface and system customization as well as IT improvements, training materials and dissemination.

This report outlines the work and findings of the ForeSea 2.0 - Development of a Maritime safety system project as performed during the year of 2017 and 2018.

Humans, especially the crews have an important role in the safe operation of ships. The crews, given the right circumstances are able to safely maneuver, navigate, maintain and operate the vessel. The crews are dependent on many factors that enable this work, from the design of the vessel and work place, the procedures, processes given by the ship management and the business approach the ship owner applies to the vessel.

The introduction of more automation requires a systems perspective and will not be a straight forward development. Total autonomy as proposed by some technology developers is often neglecting the functions and roles that humans have on maritime safety and the business case for increased automation neglects the full contribution of humans onboard. Total autonomy will therefore require high-end products that are built on standardized complex systems. Controlling and monitoring these systems will set new requirements on operators to uphold situated understanding in these complex systems.

Many aspects will be affected by increased automation towards smart shipping - regulations, organization, workplace, working methods, HMI, roles and skills. To cope with the foreseen changes, it is important to develop further training, skills, experience, openness in the organization and familiarization giving the future crews the right pre-conditions to succeed in the future, as well as mindful design and integration of newly automated systems

In the future, the ISM code will likely have to change to improve the interaction between land organisations and crews in order to facilitate better integration of split responsibilities and split physical locations by the management system which in the long run allows for an increased land-based monitoring and control of vessels' systems and move certain tasks to shore to lower workload onboard, which should be one of the main drivers for automation.

The results from this project ensure the quality of the tools and the output and the communication via the new homepage (https://foresea.org/), folders and roll-ups ensures a smooth dissemination and spreading.

Rev	Date	Revision	Issued by	Checked by	Approved by
02	2019-06-22	For Information	Tryggve Ahlman		
01	2019-06-13	For Information	Tryggve Ahlman		
00	2018-11-30	For Information	Tryggve Ahlman		

DOCUMENT REVISION RECORD

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the Swedish Maritime Administration and the Swedish Transport Agency for granting financial support to the project as outlined herein.

0 OVERALL CONCLUSIONS AND FINDINGS

0.1 Establishment of State of Play

The results and goals according to the project application are listed below. In addition, the relevant chapters describing the work performed are linked to these bullet points:

- Develop training modules and technical interfaces for the shipping schools in order to enable practical application of incident reporting, for example. at simulator runs. (chapter 3 and 6)

- Further quality assure the analytical methodology for safety reports and risk assessments for advanced research purposes and in the regulatory development work. (chapter 4)

- Increase the motivation for reporting in the system through the development of effective user-friendly analysis tools. (chapter 3)

- Through information and targeted marketing of the system spread knowledge about the system's benefit. (chapter 6)

- Develop technical interfaces with existing systems in the shipping companies. (chapter 3 and 6)

- Through continuous reconciliation maintain a technical and operational standard that is well in line with the level that authorities, vetting and classification societies require. (chapter 3 and 4)

- Create the conditions for more efficiently drawing operational experience from the ForeSea database. (chapter 3 to 6)

- Spread knowledge about and market the system. (chapter 3 to 6)

- Contribute to reducing shipping accident risks by creating better conditions for transfer of experience between shipping companies. (chapter 6)

- Enable decision-making on measures and improvements based on facts and quality-assured analyzes and disseminate information on dangerous conditions in the form of safety reports and individual events such as safety alerts. (chapter 3 to 6)

0.2 Improvements of the system

Here's a brief summary of actions to improve Foresea, performed within the project:

a) The search function has been updated. The method implemented is that instead of each background report being filled in at a time with searchable content, complete lists have been retrieved in a single call and then linked to each other in the program code. The search is done internally in 6 steps and reduces the volume to avoid unnecessary retrieval. In summary: minimize the number of calls to the database to construct a search result. (2018)
b) Improvement of what is included in bar charts and results of searching for the corresponding group. In short, lists of keywords representing grouped consequences (ship, third party, environment, individual) had different content depending on whether you went through bar charts and clicked on a stack, respectively, or if you clicked on a link in the predefined search list. (2018)
c) Explain how the Ichikawa diagram works, especially why the sum of the numbers in the respective "bubble" is not the same as the number of reports. The explanation is that each report may have more than one keyword selected from the same category as, for example, to cross in human cause in both "Mental Stress" and "Education / Training". (2018)

d) Installation of an easy-to-encrypt solution for automatic renewal of https://www.foresea.net/. Earlier, ForeSea has had no certificate, but since web browsers have begun to pay attention to visitors in the past years, the certificate has not been updated. This has been fixed. (2018)
e) Fixed a bug that caused "similar reports" links that were sent out, to display too many reports. This was caused by a template page showing search result. (2018)
f) Change as supplier from Interlan to iPeer (New server provider). Databases and systems restored from backups for new installation. Other changes, for example, have been made with the configuration of outbound mail server. Local SMTP has been installed on the server. (January 2017)
g) Started the opportunity to print risk analyzes as a PDF file. Each scenario gets its own subsequent page to a first summary page with description. (January 2017)
h) Replaced previous PDF Generator Service (PDF service that queued pfds which can be produced if needed) with new PDF generator. (May 2017)
i) Troubleshooting Ichikawa and all links to it (related to that all features have addresses for different services that generate images) (September 2017)
j) Search using the Ischikawa graphics has been improved (click and immerse in the background) (September 2017)
k) Exposure and Severity values from risk analysis were not used as intended to create risk analyzes. This has been modified. (September 2017)
l) Risk assessment - Order on 2nd assessment values changed and editing box with designable content has been fixed(September 2017)
m) Implemented Ischikawa Diagram for Individual Report (Not Archived) (October 2017)
n) Improvements to search functionality and search results (November 2017)

Other.

F.1. The system will notify when new reports arrive (as ICC receives them) and look at them so everything seems to work as intended.

F.2. The keystroke page (the one with stacks) can be speeded up slightly by keeping track of whether the underlying data has changed since the previous time the bars were created. However, this is not yet implemented.

F.3. General support when questions have been raised about ICC system features.

0.3 Quality Survey of the Foresea process

The ForeSea system is working well and supports the Swedish ship-owners lead by SvenskSjöfart in pro-active safety work. It is an operational system and database that gives fast feedback to the users. It works efficiently and follows the main applicable standards. The filling of the database with new cases by a single person has resulted in a stringent categorization which is an advantage. At the same time the single person handling allows for biases in the database. The quality of the process is judged to be efficient and the process fulfills its target. The input is processed following a clear strategy and the confidentiality and anonymous character of the use of information is given. The search functionality works well and is supported by the Ishikawa diagrams that allows for a fast selection of relevant cases. The content of the database provides a significant knowledgebase of operating ships in the marine environment. The database reflects typical occupations onboard. The hazards, causes and consequences that are to be expected connected to these occupations can be found as well. This deviates quite a bit from what can be found in the typical accident databases and statistics that are published by maritime organizations such as EMSA or national as well as commercial one’s (Lloyd´s Register Fairplay, now IHS Markit, etc.). This deviation is reflected for instance by the share of cases that is connected to human factors. The content and search results as such are similar to a "same purpose" database such as nearmiss.dk. The derived requirements on well-functioning and user-friendly incident reporting systems have been checked and are judged to be fulfilled by the ForeSea system.

The following recommendations are made based on the analysis:

1) Increase reporting and usage
   - Educate DP's that are new and possibly not aware of the advantages of the system, Training for users
   - Set a target or expectation for incident reports received per vessel/ ship owner and tries to motivate the DPs to report accordingly.
   - Have regular meetings/ workshops with all DPs in order to find focus areas and analyses these/ report on these - Regular meetings in order to derive trends and discuss development

2) Data process quality improvements
   - Quality check of all reports provided (procedure for review),
   - Improve grammar and clear/ stringent terminology (example: Some categories are not spelled correctly)
   - Judge on quality of report handed in (quality of what is put in will improve analysis)
   - Add certain logics on what can be compared and what not in order to ensure right search functions.

3) Documentation
   - Document significant changes made to the database which could affect the outcome of searches - History of data (change in categories, new categories, changed methods, etc.)
   - Provide information that impacted the shipping as such (new rules, new techniques) which might impact the content of what is reported - History of changed legal requirements impacting the database
   - Define most important expressions in order to avoid misunderstandings based on established definitions
   - Describe in more detail the methods and processes used in the ForeSea system

4) Safety assessment methodology
   - Use more established risk matrices and definitions
   - Use established methods for assessments
   - Describe in more detail the methods and processes used in the ForeSea system as done by the process chart

5) Safety assessment tool
   - Make a standard methodology description that can be referred to in the risk assessment.
   - A workshop discussing the outcome of such a risk assessment is recommended in order to increase the relevance and quality of the output.
   - Risk assessment is not filled in per standard; the aim is that the shipping company should do this, which does not happen. Therefore, this should probably be done by the administrator as well.

A further recommendation is to create a public side that presents relevant findings and allows external people to understand the pro-active safety work of SvenskSjöfart and its members as well as give an understanding of safety at sea.

0.4 In-depth Assessments : Human impact on shipping safety

Humans, especially the crews have an important role in the safe operation of ships. The crews, given the right circumstances are able to safely maneuver, navigate, maintain and operate the vessel. The crews are dependent on many factors that enable this work, from the design of the vessel and work place, the procedures, processes given by the ship management and the business approach the ship owner applies to the vessel.

The traffic to and from Åland is an advanced transport system that enables safe ferry services in shipping fairways with narrow passages, meeting and crossing traffic as well as winter navigation - a shipping system combining people and technology to create safe transport.

The introduction of more automation requires a systems perspective and will not be a straight forward development. Total autonomy as proposed by some technology developers is often neglecting the functions and roles that humans have on maritime safety and the business case for increased automation neglects the full contribution of humans onboard. Total autonomy will therefore require high-end products that are built on standardized complex systems. Controlling and monitoring these systems will set new requirements on operators to uphold situated understanding in these complex systems.

Many aspects will be affected by increased automation towards smart shipping - regulations, organization, workplace, working methods, HMI, roles and skills. To cope with the foreseen changes, it is important to develop further training, skills, experience, openness in the organization and familiarization giving the future crews the right pre-conditions to succeed in the future, as well as mindful design and integration of newly automated systems

In the future, the ISM code will likely have to change to improve the interaction between land organisations and crews in order to facilitate better integration of split responsibilities and split physical locations by the management system which in the long run allows for an increased land-based monitoring and control of vessels' systems and move certain tasks to shore to lower workload onboard, which should be one of the main drivers for automation.

0.5 Quality Survey of the Foresea safety assessments

The safety assessments so far available in the system have been reviewed, standardized and updated according to the required format, increasing quality and understanding of the content by the end-users.

0.6 Dissemination

The Project has been represented during and has actively participated in the following activities:

2017-02-23	IRIS User Meeting, Göteborg
2017-03-17	Intermediate Reporting
2017-09-24	Suggestion for quality improvments
2017-10-16	Final report presentation quality survey
2018-05-20	Genomförande HAZID
2018-09-20	Resultatspridning Expertgrupper Säkerhet och Miljö
2018-10-31	Presentation Final report Safety and humans in shipping

2017-12-20	Intermediate Reporting
2019-02-19	User information and user meet in conjunction with Chalmers Sjölog
2019-06-25	Launch of new homepage (https://foresea.org/), folders and roll-ups
2019-05+06	Visits to several ship owners and meeting with Transportstyrelsen
2019-06-26	Kick-off ForeSea reference group at SvenskSjöfart

CONTENTS

SUMMARY

ACKNOWLEDGEMENTS

1. 1 PREAMBLE

1.1 Background

ForeSea has been created to improve maritime safety and is an information system based on a database where reports of accidents, near misses and deviations from the ships are collected. The system offers the vessels and shipping companies a concrete and effective tool for proactively working with maritime safety issues. The system has been developed by and for the shipping industry in Sweden and is a further development of the Swedish information system INSJÖ.

ForeSea's ambition is to capture conditions that are not normally reported to regulatory authorities in addition to compulsory accident reporting.

ForeSea collects reports from the vessels through the shipping company's ISM responsible, designated person (DP). The reports are anonymously recorded in the ForeSea database. After a registered report, users can perform a full risk analysis by benchmarking / comparisons of similar reports in the database.

ForeSea can be said to be the Swedish Maritime Accident and Incident Database.

Analysis methodology and risk assessments are an area developed in recent years. The FSA, formal safety assessment today forms the basis for a number of regulatory development decisions within the IMO and the EU. Also, the Swedish Maritime Safety Authority will transfer to risk-based supervisory work. Within IMO, a special expert group with only risk assessments, according to a defined methodology, often uses theoretical assessments.

What is often missing in this work are available and useful databases and safety systems just as ForeSea represents.

The events reported in ForeSea constitute truth data. Nothing can be more relevant as a starting point in a security analysis. Reports are rather uninteresting if they are not sorted and categorized ie. made useful for analysis. Within ForeSea's first research section, a lot of work was done with translations into the common language (English) and sorting the reports.

1.2 Objectives

The main goal of the ForeSea project is reduce risks of Maritime accidents, by sharing and transferring safety information between operators and management. Allowing formulation of safety analyses, assessments and safety reports.

The existing database ForeSea collects incidents reports, contributing to the shipping industry with a reliable and credible base for making safety analyses, safety assessments and safety reports. To make the data usable the reports need to be marked, sorted and categorized.

The purpose of ForeSea is to reduce risks and prevent accidents through shared knowledge, continuous development of models for analytical methods and systems/IT, technical upgrades as well as through relevant and immediate feedback. In order to achieve this, an efficient software system needs to be added to the data base as well as human intellectual assessment.

In this continuation and second part of the ForeSea project specific objectives and focus will put on areas as:

- Quality assurance of the system and analyze methods to an ISO standard.
- Availability; research project and software training modules, user friendly system
- Adaption; technical interface and system customization
- Development of functions, linking processes between ForeSea and existing systems
- Analyses and analytical methods, development of safety report methods and assessments

- IT-structure, new public homepage linked to the report module.
- Marketing, users-workshop, industry-seminars
- Information, public presentations, information film, training materials.

This project is an extension of the project "Incident Reporting System ForeSea, Development of a Maritime Safety System", which ended on December 31, 2015.

1.3 Project Organization

The Project has been performed as a Triple-Helix project, involving Authority, Academia and Industry representatives. The following partners have actively participated in the execution of the scope:

Ship Owners:	Svensk Rederiservice AB	*(Tryggve Ahlman)*
	Furutank AB	
	Rederi AB Eckerö	*(Sten Rosenqvist)*
	Viking Line AB	*(Dan Roberts)*
Industry Partners:	IRIS AB	*(Karl-Johan Raggl)*
Academia:	Research Institutes of Sweden	*(Johannes Hüffmeier)*
	Chalmers University of Technology	
	Linné Universitetet	

1.4 Project Execution

The continued implementation was divided into thematical work packages (resource allocation):

WP 1. Project management, project organization, governance and administration. (15%)

Reporting and convening meetings and other gatherings.

Organizationally, the project essentially worked within existing ForeSea structure, but a clearer focus was set on users, including the inclusion of nautical schools. A widening of system users requires special training efforts aimed primarily at maritime and marine reporting agencies. The project requires a broad commitment from both system administrators and users, which will lead to a greatly increased need for communication and information dissemination. A widening of system users requires special training efforts aimed primarily at the rapporteurs aboard the ships and academia. Likewise, quality assurance will be important as the database will be more clearly opened to research.

WP 2. Specification. (5%)

The areas mentioned above were coordinated and ranked, which lead to specific activities to which a clear goal was specified.

WP 3. Implementation. (50%)

The activities were packaged in separate subprojects and responsibility with continuous reporting. Timelines were listed in the order that were seen as having the best effect and results.

WP 4. Spread of results. (25%)

The project was reported partly in the form of sub-reports and finally in the form of this final report. In addition to project meetings, user meetings were held, one reference group meetings and several shorter workshops with ship owners. A seminar was performed in early 2019.

2 ESTABLISHMENT OF STATE OF PLAY

The Swedish Ship-owners Association was founded in 1906 as an industry and employers' association. Since 2001, all employment issues have been handled by the ship-owners Employers' Association, SARF. Consequently, the Swedish ship-owners Association is strictly an industry association representing around 60 Swedish shipping companies operating worldwide.

The Swedish shipping industry is important in keeping Swedish industry competitive. The mission of the association is to increase knowledge of the Swedish shipping industry and promote issues nationally as well as internationally. The member shipping companies are at the forefront of environmental and safety issues representing an attractive future field of business sector.

The association has published in 2016 a "Code of Conduct" to be adopted for its members. The clause regarding the "Safety at sea duty of care" states:

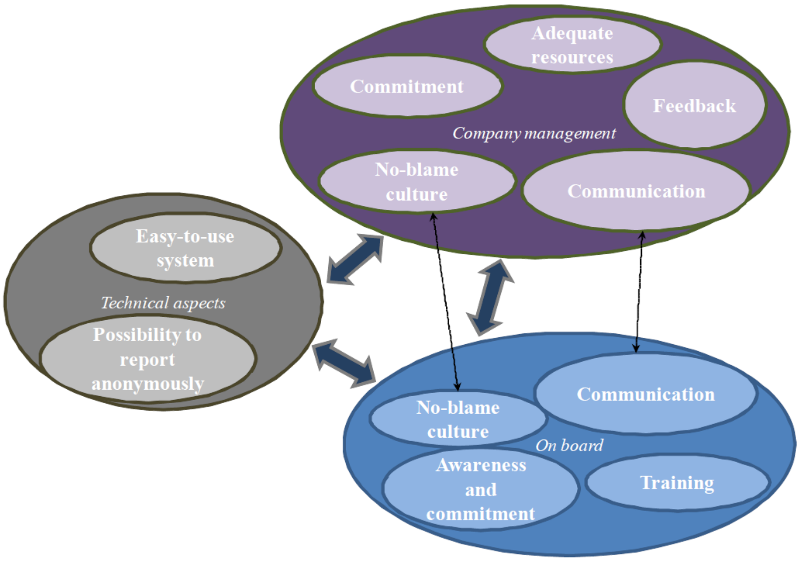
- "Compliance with safety regulations, legislation and directions
- Members of the Swedish ship-owners Association strive to achieve mutual strategies and action plans with regard to safety at sea. The association has set high mutual goals with regards to safety at sea, actively influencing such issues positively internationally, nationally and with member organizations.
- It is the aim of the association to continuously improve its safety activities through preventative measures.
- Members are obliged to maintain its fleet and to develop the operation of its vessels.
- Insofar possible, share knowledge and utilize available resources within the organization to learn from our mistakes (ForeSea) in order to collectively continuously improve safety at sea."

[Code of Conduct for Members of the Swedish Ship-owners Association, Svensk Sjöfart, 2016-10-13]

In the context of ISO 9001 and ISO 18001, it can be stated that the pro-active work with regards to safety, in which ForeSea has an important role, is part of the management system. The implementation and continuous work with the system is highlighted towards the members of the association demanding an active role in pro-active safety work. Based on the ISM code, near-miss reporting is handled by the DPs that have direct access to the management of each ship owner. This again allows for direct linkage to the management system.

2.1 Typical requirements on incident databases

Finnish researchers have derived drivers for people using near-miss reporting. These relate to technical aspects, company management and management onboard. (Storgård, Erdogan, & Tapaninen, 2012). The authors summarie the outcome of two workshop sessions by the following pictures and requirements on incident reporting:



1. Management commitment. The management should promote reporting by setting targets for reporting and motivating and encouraging personnel to submit reports.

2. Feedback and rewards. The management has to give feedback without delay and could consider some rewards for reporting, which do not necessarily have to be monetary rewards. Feedback should be given by interacting with personnel, and the results and conclusions of reports should be published regularly e.g. as graphics or statistics.

3. Corrective actions. The management should ensure that corrective actions are taken and that all employees are aware of them.

4. Training. Both the functionality of the reporting system and corrective actions require training in order to emphasize the importance of reporting and to implement corrective actions properly.

5. A no-blame culture must be promoted with exemplary behavior of the management.

All these issues are important for a reporting system, and they serve to reinforce each other. The group also specified the requirements for the reporting system to be the following: The threshold for initiating a report should be very low. All members of the crew should have access to reporting system and they should be allowed to make reports. The reporting application should be easy to use and the reporting forms should be simple.

1. Creating a no-blame culture. The participants were in the opinion that a blame culture is a main factor that restricts reporting.

2. Feedback. Reports should be analyzed by the authorities and safety related issues should be highlighted.

3. Training. Training of new crew and revision trainings for existing ones were specified with regard to creating a reporting culture. Improved selection procedures should be applied for crew selection. Education system for seafarers should also be updated all the time, such as bringing up issues like incident reporting during the courses in which the seafarers participate.

4. Sharing information and cooperation. Communication between the company and the ship is seen as an important factor and companies should describe the benefits of reporting to their employees to encourage them to make more reports.

5. Sharing experiences and benefits of reporting.

6. Anonymous reporting.

7. Mandatory reporting. Mandatory reporting was mentioned in terms of both having a standardized reporting system and creating a more serious approach to reporting.

8. The definition of incident and near miss.

The measures above have been taken in the evaluation as a guidance and checklist that ensure a good incident reporting system.

2.2 The national Swedish Maritime Safety Incident Reporting System - ForeSea

The DP shall gather and analyses data from hazardous occurrences, hazardous situations, near misses, incidents and accidents and apply the lessons learnt to improve the safety management system within the Company and its ships. [MSC_MEPC_7_Circ6, GUIDANCE ON THE QUALIFICATIONS, TRAINING AND EXPERIENCE NECESSARY FOR UNDERTAKING THE ROLE OF THE DESIGNATED PERSON UNDER THE PROVISIONS OF THE INTERNATIONAL SAFETY MANAGEMENT (ISM) CODE]

ForeSea is an information system for accidents, incidents / "near misses" and non-conformities at sea. The system is designed and used of the shipping industry in Sweden and Finland and is a developed version of the Swedish information system INSJÖ/ IRIS.

The purpose of the database is described as a pro-active safety tool that supports the share of experience over organizational borders.

By analyzing the information in ForeSea Experience Data Bank the shipping industry may:

- decide on actions and improvements based on facts.
- disseminating information about dangerous conditions in the form of "Safety Alerts".
- compile lessons learned in the form of "Lessons Learned".

ForeSea has the ambition to capture the conditions that are normally not reported to the authorities. To make this possible ForeSea is administered by a third-party body and the reporter is protected by anonymity.

ForeSea will also make it easier for member companies to comply with the ISM Code requirements for internal reporting.

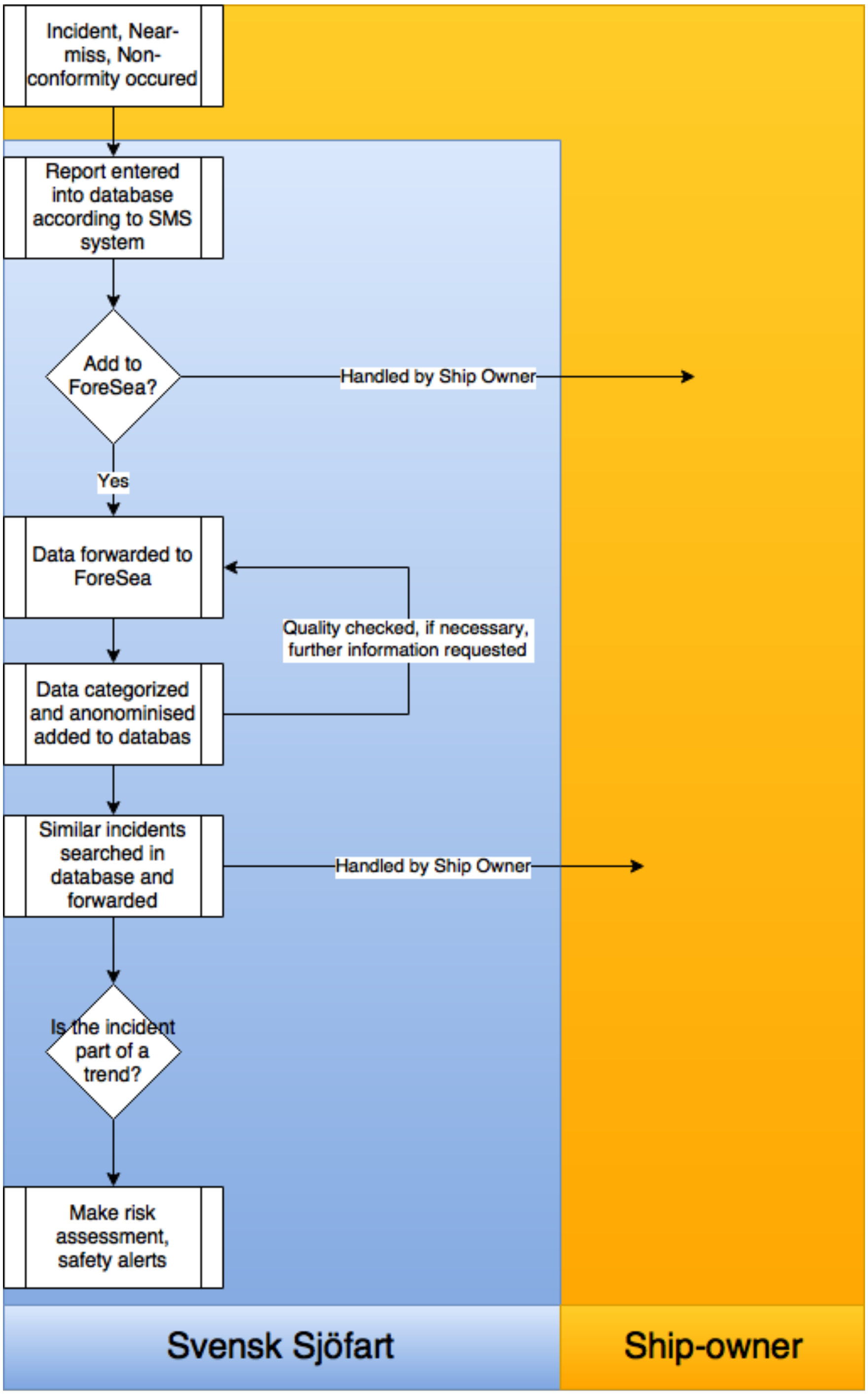
2.3 History of the work establishing ForeSea

After the disaster in the Baltic Sea of the passenger ship Estonia a Swedish parliamentary committee was set up in 1994. In the year 1996 the committee put forward an "Action program for greater maritime safety". The program pointed out a variety of actions to be taken by the government and the shipping industry. The suggested actions and measures covered different areas like, port state control, allocation of roles and co-operation with the classification societies, implementation of the ISM-code, stability and design, fire safety, life-saving equipment and investigatory work and accident/incident reporting.

Concerning accident/incident reporting the committee is quoted as follows; "We welcome the discussion which has been started between the National Maritime Administration and the shipping sector with a view to jointly improve the analytical process. We propose that, during an introductory phase at least, the National Maritime Administration agree to the shipping companies setting up incident reporting system in which the informant can remain anonymous. The results should be evaluated, so as to establish whether anonymity safeguards are conductive to the desirable improvement in the supportive documentation for investigation and analysis."

Accordingly, the committee recognizes the need for confidentiality and release from liability prosecution for the reporting individuals and organizations. Without it, informants will be highly reluctant to provide incident reports because of fear of retribution as result of identifying information being released to investigators or by the court system through its discovery process.

The Swedish Ship-owners Association has together with the National Maritime Administration designed a system that shall be introduced at the beginning of year 1999. The project shall in three years' time be tested, developed and implemented.



The goals are to reduce the frequency of marine casualties, the extent of injuries and property damage including environmental damage and to create a safer and more efficient shipping transportation system and mariner work environment.

The system would receive, analyze and disseminate information about unsafe occurrences. These non-accidents or problem events are an untapped source of data that can provide the information necessary to prevent accidents before they happen rather than wait for them to occur and then addressing prevention. The system is to be broad enough to capture precursor safety aspects over the full spectrum of accidents, incidents and hazards. Any member of the crew that come across a safety issue that he/ she feels important to advise the rest of the maritime community, completes a report form, preferably together with the ship's safety committee and the company.

The reports are forwarded to ICC, IPSO Classification & Control AB, which is a private consulting company in the field of safety, reliability and quality. ICC is contracted by the owners of the system, the Swedish Ship-owners Association and the National Maritime Administration and enters the information into a database, analyses and distributes the information in a useful form back to the users of the information. The information will in the registration process be de-identified to ensure a confidential status to everybody that contributes to this voluntary system.

3 Improvements of the system

3.1 Purpose of Assessments

The purpose of the work package was based on the operation of the system, end-user needs for improvements and development. The following tasks have been performed:

1. Collection of end-user needs
2. Feedback loops on end-user experience and improvements
3. Bug fixing from a technical side.

3.2 Outcome of the work

Here's a brief summary of actions to improve Foresea, performed within the project:

a) The search function has been updated. The method implemented is that instead of each background report being filled in at a time with searchable content, complete lists have been retrieved in a single call and then linked to each other in the program code. The search is done internally in 6 steps and reduces the volume to avoid unnecessary retrieval. In summary: minimize the number of calls to the database to construct a search result. (2018)

b) Improvement of what is included in bar charts and results of searching for the corresponding group. In short, lists of keywords representing grouped consequences (ship, third party, environment, individual) had different content depending on whether you went through bar charts and clicked on a stack, respectively, or if you clicked on a link in the predefined search list. (2018)

c) Explain how the Ichikawa diagram works, especially why the sum of the numbers in the respective "bubble" is not the same as the number of reports. The explanation is that each report may have more than one keyword selected from the same category as, for example, to cross in human cause in both "Mental Stress" and "Education / Training". (2018)

d) Installation of an easy-to-encrypt solution for automatic renewal of https://www.foresea.net/. Earlier, ForeSea has had no certificate, but since web browsers have begun to pay attention to visitors in the past years, the certificate has not been updated. This has been fixed. (2018)

e) Fixed a bug that caused "similar reports" links that were sent out, to display too many reports. This was caused by a template page showing search result. (2018)

f) Change as supplier from Interlan to iPeer (New server provider). Databases and systems restored from backups for new installation. Other changes, for example, have been made with the configuration of outbound mail server. Local SMTP has been installed on the server. (January 2017)

g) Started the opportunity to print risk analyzes as a PDF file. Each scenario gets its own subsequent page to a first summary page with description. (January 2017)

h) Replaced previous PDF Generator Service (PDF service that queued pfds which can be produced if needed) with new PDF generator. (May 2017)

i) Troubleshooting Ichikawa and all links to it (related to that all features have addresses for different services that generate images) (September 2017)

j) Search using the Ischikawa graphics has been improved (click and immerse in the background) (September 2017)

k) Exposure and Severity values from risk analysis were not used as intended to create risk analyzes. This has been modified. (September 2017)

l) Risk assessment - Order on 2nd assessment values changed and editing box with designable content has been fixed(September 2017)

m) Implemented Ischikawa Diagram for Individual Report (Not Archived) (October 2017)

n) Improvements to search functionality and search results (November 2017)

Other.

F.1. The system will notify when new reports arrive (as ICC receives them) and look at them so everything seems to work as intended.

F.2. The keystroke page (the one with stacks) can be speeded up slightly by keeping track of whether the underlying data has changed since the previous time the bars were created. However, this is not yet implemented.

F.3. General support when questions have been raised about ICC system features.

4 QUALITY ASSESSMENT OF THE FORESEA methodology and Database

4.1 Scope

MRMS has performed on behalf of the Swedish Ship-owner association SvenskSjöfart a survey on the quality of the ForeSea reporting system. The work is part of the ongoing research and development project. The purpose of ForeSea is to reduce risks and prevent accidents through shared knowledge, continuous development of models for analytical methods and systems/ IT, technical upgrades as well as through relevant and immediate feedback. The existing database ForeSea collects incident reports, contributing to the shipping industry with a reliable and credible base for making safety analyses, safety assessments and safety reports. The work included the following steps:

- Description of Svensk Sjöfarts mission and work to derive the context of ForeSea
- Aim of the ForeSea database and its purpose description in the code of conduct
- Customer satisfaction – interviews with end-users
- Process work-through with the developers and operators of the system including processes for continuous improvement
- Test of categorization of "dummy" accidents by various experts in order to derive uncertainty of the system
- Analysis of content in the database and comparison to other databases in order to derive quality of content
- Perform risk analyses based on the safety assessment tool in the database.

The purpose of ForeSea is to reduce risks and prevent accidents through shared knowledge, continuous development of models for analytical methods and systems/ IT, technical upgrades as well as through relevant and immediate feedback.

The existing database ForeSea collects incident reports, contributing to the shipping industry with a reliable and credible base for making safety analyses, safety assessments and safety reports.

The aim with the study is to identify the processes and the quality procedures applied when working with ForeSea in order to ensure the quality of the system

Ensuring the quality of the data added to the database and the risk assessment methodology that allow for the production of the risk studies will ensure that the data used can be even better deployed for various purposes.

Collection of information and literature study were used for scientific validation, source descriptions and definitions as well as a detailed checklist based on the ISO standards. Meetings and structured interviews that followed relevant ISO standards were used as the main method.

In order to validate assumptions, tests have been performed with the database interface. Furthermore, the ForeSea database and its user-interface have been used widely in order to describe the strength and weaknesses and to enable the author to describe the methodology used for ForeSea.

The database as such has been analyzed statistically in order to get a deeper understanding on the relevance and quality of the content.

The ISO 9001 standard is usually applied to whole organizations. In this study the relevant parts are picked and studied further. In this context, the customers are the ship owners, the product is seen as the ForeSea database and system, the leadership is the people in Svensk Sjöfart having responsibility for the system.

The different clauses of the ISO standard are shown below and in Figure 1 (application here in brackets)

0. Introduction
1. Scope (ForeSea)
2. Normative References
3. Terms and Definitions
4. Context of the Organization (SvenskSjöfart)
5. Leadership (SvenskSjöfart)
6. Planning
7. Support (Interviews)
8. Operations (Interviews)
9. Performance Evaluations (Interviews & Testing)
10. Improvement (survey and study)

4.2 Methods

A couple of different methods has been used to check the quality of the system, its embedding in the management system and continuous improvements based on end-user experience.

- Study Relevant Standards
- Typical requirements on incident databases
- Process and System Design Foresea
- Evaluation of the process of reporting
- Interview with users
- Comparison of data input by various users and administrators
- Comparison to other databases (nearmiss.dk, EMCIP, CHIRP, REPCON, SECURITAS)
- Safety assessment tool analysis and use case
- Sources of mistakes and Uncertainties

4.3 Conclusions

The ForeSea system is working well and supports the Swedish ship-owners lead by SvenskSjöfart in pro-active safety work. It is an operational system and database that gives fast feedback to the users. It works efficiently and follows the main applicable standards. The filling of the database with new cases by a single person has resulted in a stringent categorization which is an advantage. At the same time the single person handling allows for biases in the database. The quality of the process is judged to be efficient and the process fulfills its target. The input is processed following a clear strategy and the confidentiality and anonymous character of the use of information is given. The search functionality works well and is supported by the Ishikawa diagrams that allows for a fast selection of relevant cases. The content of the database provides a significant knowledgebase of operating ships in the marine environment. The database reflects typical occupations onboard. The hazards, causes and consequences that are to be expected connected to these occupations can be found as well. This deviates quite a bit from what can be found in the typical accident databases and statistics that are published by maritime organizations such as EMSA or national as well as commercial one's (Lloyd´s Register Fairplay, now IHS Markit, etc.). This deviation is reflected for instance by the share of cases that is connected to human factors. The content and search results as such are similar to a "same purpose" database such as nearmiss.dk. The derived requirements on well-functioning and user-friendly incident reporting systems have been checked and are judged to be fulfilled by the ForeSea system.

The following recommendations are made based on the analysis:

1) Increase reporting and usage

- Educate DP's that are new and possibly not aware of the advantages of the system, Training for users

- Set a target or expectation for incident reports received per vessel/ ship owner and tries to motivate the DPs to report accordingly.
- Have regular meetings/ workshops with all DPs in order to find focus areas and analyses these/ report on these - Regular meetings in order to derive trends and discuss development

2) Data process quality improvements

- Quality check of all reports provided (procedure for review),
- Improve grammar and clear/ stringent terminology (example: Some categories are not spelled correctly)
- Judge on quality of report handed in (quality of what is put in will improve analysis)
- Add certain logics on what can be compared and what not in order to ensure right search functions.

3) Documentation

- Document significant changes made to the database which could affect the outcome of searches - History of data (change in categories, new categories, changed methods, etc.)
- Provide information that impacted the shipping as such (new rules, new techniques) which might impact the content of what is reported - History of changed legal requirements impacting the database
- Define most important expressions in order to avoid misunderstandings based on established definitions
- Describe in more detail the methods and processes used in the ForeSea system

4) Safety assessment methodology

- Use more established risk matrices and definitions
- Use established methods for assessments
- Describe in more detail the methods and processes used in the ForeSea system as done by the process chart

5) Safety assessment tool

- Make a standard methodology description that can be referred to in the risk assessment.
- A workshop discussing the outcome of such a risk assessment is recommended in order to increase the relevance and quality of the output.
- Risk assessment is not filled in per standard; the aim is that the shipping company should do this, which does not happen. Therefore, this should probably be done by the administrator as well.

A further recommendation is to create a public side that presents relevant findings and allows external people to understand the pro-active safety work of Svensk Sjöfart and its members as well as give an understanding of safety at sea.

5 In-depth Assessments : Human impact on shipping safety

5.1 Introduction

The human role and contribution in the management and operation of ships is large. Many studies show that the human factor has a share of the causes of accidents, but there are few studies that focus on all the accidents that are avoided due to of the human factor. Research funds are now being invested on autonomous vessels and higher degrees of automation in shipping. Automation is a process that has been going on for a long time, often with arguments for increased safety and efficiency. But the effects of automating are not always obviously positive. When some of the systems are automated, the working conditions of the people still in attendance change. Such system changes, which should increase safety, can in fact undermine people's ability to understand the situation and make decisions and thereby weaken safety. To conclude that the frequency of accidents will be reduced proportionally to the amount of people removed from the system neglects the importance of the human contribution to maritime safety. Although Åland's shipping is not free of accidents and incidents like any activity, there is a very well-functioning safety system in place that works across country and company borders. The traffic has three main players (Eckerö Lines, Viking Line and Tallink Silja) who operate in vulnerable waters with ice and dark in the winter months and crowded waters with many leisure boats in the summer.

5.2 Aim and Scope

The main purpose of the study is to analyze the human impact on safe operation and performance of the vessels travelling regularly around Åland.

The aim of the work is to carry out a systems analysis of the ship traffic in an area to investigate the impact of humans on the overall system. The work is done through an in-depth risk identification with action proposals linked to identified risks in which the role of man is clearly described together with the influence of automation. Thus, an investigation of the human contribution to safety and common risks in traffic is made and analyzed in relation to possible automation scenarios.

The analysis includes:

- Literature study and data analysis of ships operating in RoPax traffic, especially around the islands of Åland
- Description of the operations and the overall system that includes the fairway, the marine operation and the vessels.
- Accidents and incidents in the fairway (statistics) and how they have been handled
- Risk identification via an RISE internal workshop supported by literature from eg. SAFEDOR project
- Safety-related risks resulting from operations and risk mitigation measures (human-technology-related, such as the pilot-copilot system)
- Interviews that show comparisons of how safety work is conducted in Åland's shipping and how it differs from other similar activities
- A comparison between today's ship traffic and expected automation of ship traffic and the role that people will play in a more automated system

5.3 Use cases for functions and impact of humans on marine safety

A risk identification workshop has been conducted focusing on nautical aspects in the form of a so-called HAZID, or Hazard Identification, which is the first step in a Formal Safety Assessment (FSA). FSA is a risk assessment methodology recommended by IMO for maritime-related risk analyses, and is the method recommended by the Transport Agency and the Swedish Maritime Administration.

Risk identification aims at creating an overview of possible accident scenarios based on a description of a given operation. This usually happens by conducting a meeting with all stakeholders involved having a structured discussion of the various possible risks in the studied operation. The HAZID was kept simple and focused on certain scenarios as the risks as such are mainly known and the focus of the study is on the human impact and conditions for human performance. Based on the HAZID, some additional interviews were held to describe the human role in the system, which is subsequently analyzed based on various potential automation strategies.

Based on three different scenarios, a couple of questions were discussed in a structured way:

- What difficulties are there in your perspective?
- How do you meet these currently?
- Which strengths does it point towards to? What are the success factors?
- How has the task changed over time? Procedure, technology, environment, etc.
- What support and which improvements are needed?

The tables derived in the HAZID workshop are attached in the appendix.

The study focuses on three use cases. In the HazID exercise, the different scenarios where discussed in small groups and in the audience with the following main questions:

What difficulties are of the scenario in your perspective? How do you meet these now? What strength does it point towards? What are the success factors? How has the task changed over time (Procedure, technology, environment, etc.)? What support and improvements are needed to develop further?

Scenario 1: Meeting vessels

The first use case discussed was based on a day-to-day operation of meeting ships in the congested fairway. Fundamentally in this scenario is the situational awareness required and based on communication internally and externally the subsequent required actions.

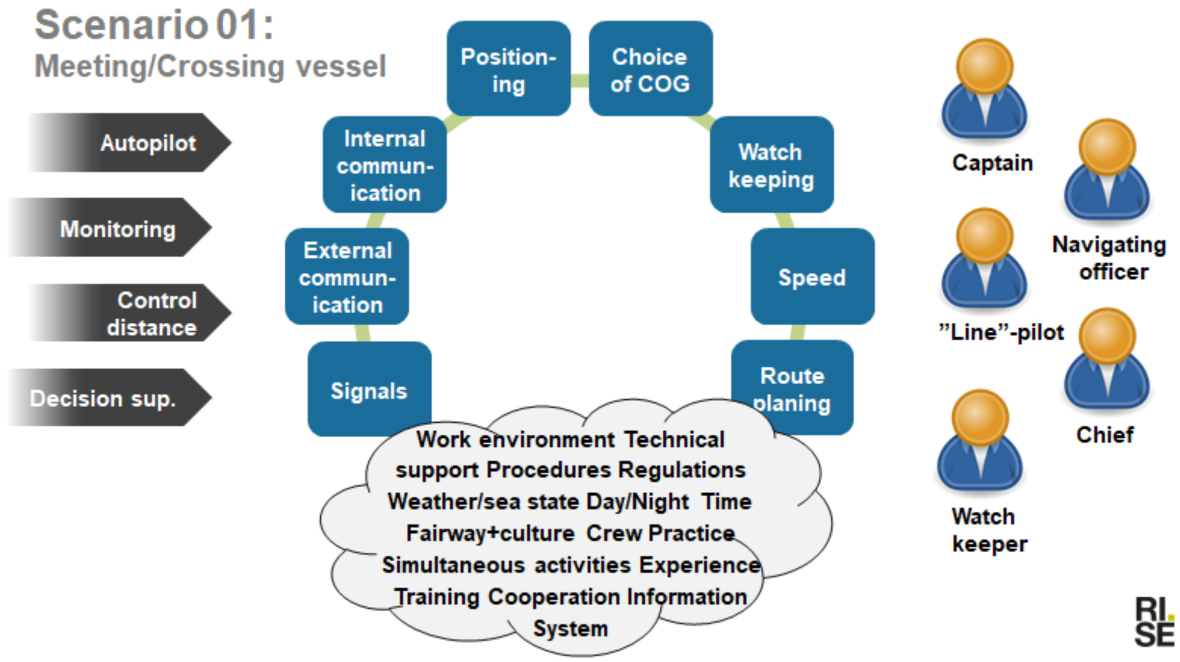


Figure 1: Scenario 1 Meeting or crossing vessels with the technical support (black), the main tasks to be performed (blue), the underlying factors influencing the tasks (in the cloud) and the main personal involved

Different challenges were identified, ranging from technical to operational, human and external factors. The success factors identified to the various challenges relate to:

1. Proper planning

The proper planning of maintenance, avoiding maintenance of critical components reducing redundancy of the systems and ensuring that no failures like black-outs are initiated by maintenance activities. This requires close communication between engine room and bridge which basically works as a team.

Proper planning of the various time schedules from the ferries sailing in the region. This allows the vessels to meet in less congested parts of the fairway due to the timing of the ferries and minimizes the risk of close-quarter situations to happen.

2. Regular training and competence

ERM is an essential part of the training. Based on simulator training and based on detailed exercises onboard, the crew is challenged on a regular basis and there is a constant need to develop the content of the training and the skills further. The crews underlined the importance of knowing where to go and what to do in case of emergency and having done the actions required.

Parts of the crew are overqualified compared to the legal requirements. The navigational officers have the competence level of the captain which ensures a high level of experience throughout the working shifts. Typically, the crew members make a career in ranking slowly on the vessel, which ensure thorough knowledge of the vessels, the crews and the fairways.

Coming new to a vessel is no more the same as in earlier times. Due to the ISM code the new crew members are introduced based on procedures and it does not happen anymore that people need to steer or control a vessel without having the required skills, knowing the technical details and specific designs. This was particularly highlighted in the context of the unique challenges on each vessel with respect the its systems, which often cannot simply be understood by looking at drawings or switching diagrams.

3. Organisational changes and adjustments, human interaction

One of the big advantages in the region is the close communication link between crews, as many live on the same island and important news and changes are communicated easily, even over company borders. Knowledge of the individuals on the ferries sailing for competing lines is also an advantage as experience can be exchanged literally with your neighbor.

Most of the crews have worked for a long time on the same vessels or at least for the same ship owner which results in people knowing each other, relying on each other and knowing the “fairway culture”. “Fairway culture” can be defined by the written and unwritten rules that are applied in certain fairways by the crews, VTS personnel and pilots.

There is a short link to the DP and the land organization whenever required. Deviations can be reported, and measures implemented together. There is quite a level of independence and responsibility for the day-to-day business but the back-up from shore is there whenever required, as there is trust and faith in the overall organisation.

The borders between the bridge team and the engine room team are gone and the whole crew works as a team, so the crews can testify on a change in culture on the bridge. While earlier there was a drive towards the accomplishments and performance of an individual on the bridge the crews are now enabled to object, gainsay, reprimand and there is no fear of admitting mistakes. While there is a clear trend towards this culture, the contributing crew members still admitted differences from captain to captain, sometimes based on cultural differences.

The BRM system is seen as essential and quite a bit was already in place prior to the introduction of the ISM code. It is even judged now that the BRM system on the lines is more advanced than the average BRMs available.

The incident reporting system is a part of the pro-active safety work. It is supported by the Foresea voluntary reporting system run by the Swedish Shipowners Association. Learning from each other and transferring the knowledge between organizations contributes to continuous improvements.

4. Human behavior and performance

There is a knowledge in the crews on how important situational awareness is. The crews need to remind each other on the risks and situations that could occur regularly to keep up awareness. This is supported by regular training to ensure that routine work is still done with high situational awareness.

The critical passages are known to the crews and meetings with other ships are avoided and detailed planned if required. Communication internally but even externally is a corner stone, e.g. to get a visual impression confirmed by others (thinking aloud).

5. Technical development supporting functions and tasks

The performance of the crews has improved by means of technical advancements and automations. The mentioned techniques include the gyro-stabilised radar, the AIS combined with the ECDIS. Autopilots are used to a certain level, but the more advanced the autopilot is, the more it relays on sensors which make it more sensitive to technical failures. Technical development can also be negative and need to be compensated for. An example mentioned relates to windows-based radar systems, where the radar is working with a high reliability while the underlying system fails without warning (freezing screen)

Increased automation in the activation of redundant systems in case of emergency and compatibility/ interconnection of systems allows a faster response and avoids safety-critical situations. The importance of knowing these systems and testing them regularly was mentioned.

By all these success factors the best is achieved when it comes to external factors that cannot be influenced like military vessels hidden in the archipelagoes without AIS, meeting commercial vessels with small crews and high work load and congested fairways in adverse weather situations.

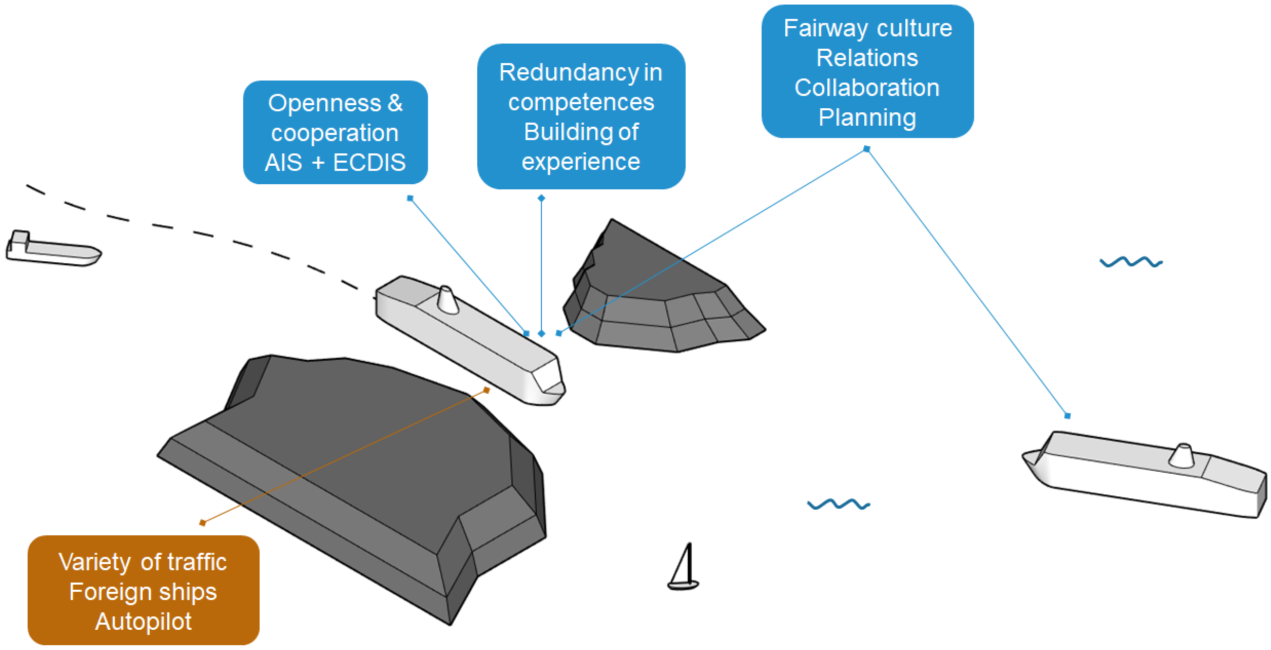


Figure 2: Success factors (blue) for the first scenario and challenges (orange)

Scenario 2: Black-out or rudder failure

The scenario is described by a black-out / electric fault or a rudder failure scenario aboard a ship in a narrow passage involving encountering and crossing traffic. Expected actions include external and internal communication, measures on the bridge, in the engine room and on deck. A lot of work is demanded in the aftermath to prevent similar events in the short and long term (country organization, etc.) so the scenario is expected to involve the land organizations.

When it comes to a black-out situation, the vessels have such a high degree of redundancy, that these were not seen as critical failures. There was nevertheless an incident earlier of a partial black-out, were the systems did not react as expected as the black-out was not affecting all systems. The emergency steering was affected. Experience from other incidents reported in the interviews referred to the classical case of many alarms ringing at the same time resulting in a bad working environment and making decision making more difficult than needed.

As black-out was identified as less safety-critical, the discussions were shifted towards the rudder failure scenario, as there was a direct impact on the course keeping and positioning in the fairway.

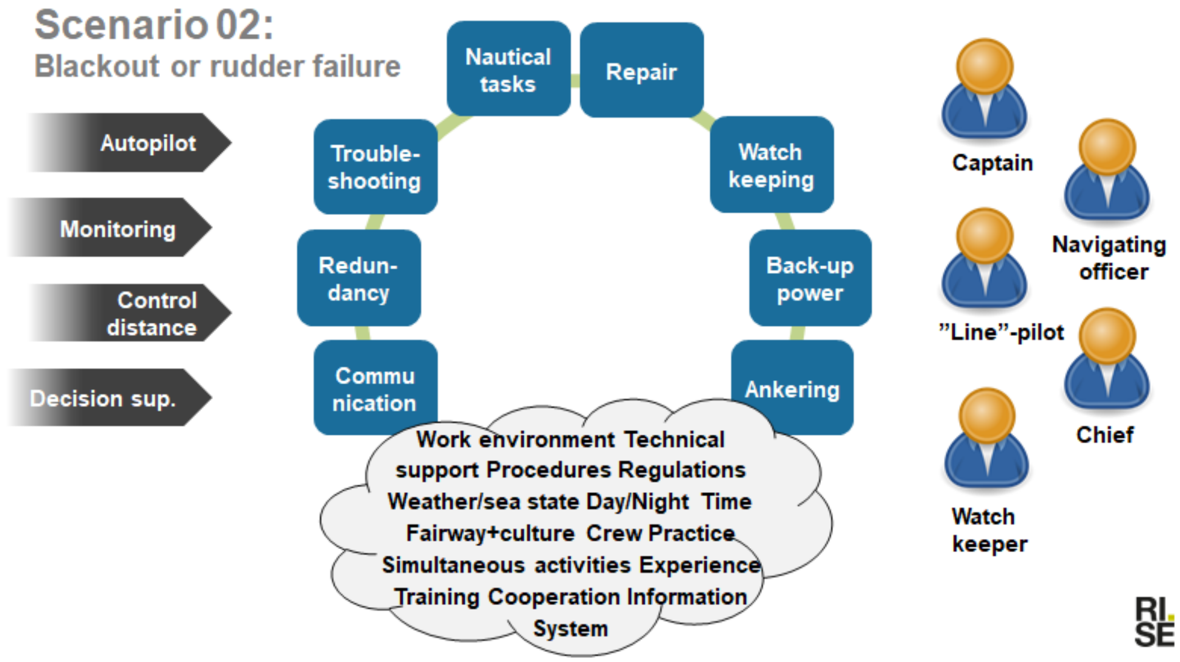


Figure 3: Scenario 2 Black-out or rudder failure during voyage with the technical support (black), the main tasks to be performed (blue), the underlying factors influencing the tasks (in the cloud) and the main personal involved

Difficulties in this scenario related mainly to understanding the sources and causes and the subsequent effects on safe navigation. To understand what really happens to the rudder, if it is a failure of the feedback on the steering motor rather than a failure of the rudder or vice versa. The cause identification requires a manual inspection of the rudder steering and the steering room is often difficult to reach. To minimize the risk and time needed to get feedback, personal is on the car deck close to the steering room during the first 30 min and last 30 min of a journey. The challenges in scenarios like the rudder failure relates to complex situations requiring many decisions and actions in parallel with people working in noisy environments making communication more difficult.

Success factors have been summarized by regular training of critical operations (according to ISM requirements). There is a certain frequency of trainings based on a methodology and system. The standard exercises are followed up by the DP and the land organization. The weekly trainings keep up the awareness and procedures support the decision making, but there are still possibilities to bypass the system if judged required. The long employment and high education requirements, together with the low turnover in crew members and an exciting workplace result in motivated crews and provides redundancy in staff.

Over time, the vessels have had the same equipment, not so much development or refitting has been done, so the hardware is basically the same. Instruments have evolved though, today there are controls on e.g. electric motors allowing for frequency control making the systems more sensitive to failures. The general view was that the more automation one has, the more sources of error there are, and a single small sensor can shut down the entire system.

As human behavior and mindset change, rules are adjusted, new focus areas arise, and risk acceptance levels increase. This has impacted the work onboard the ships and the way the crews collaborate in critical situations like the rudder failure, the acceptance of incidents, the response time of systems and the acceptance level to frequency of failures.

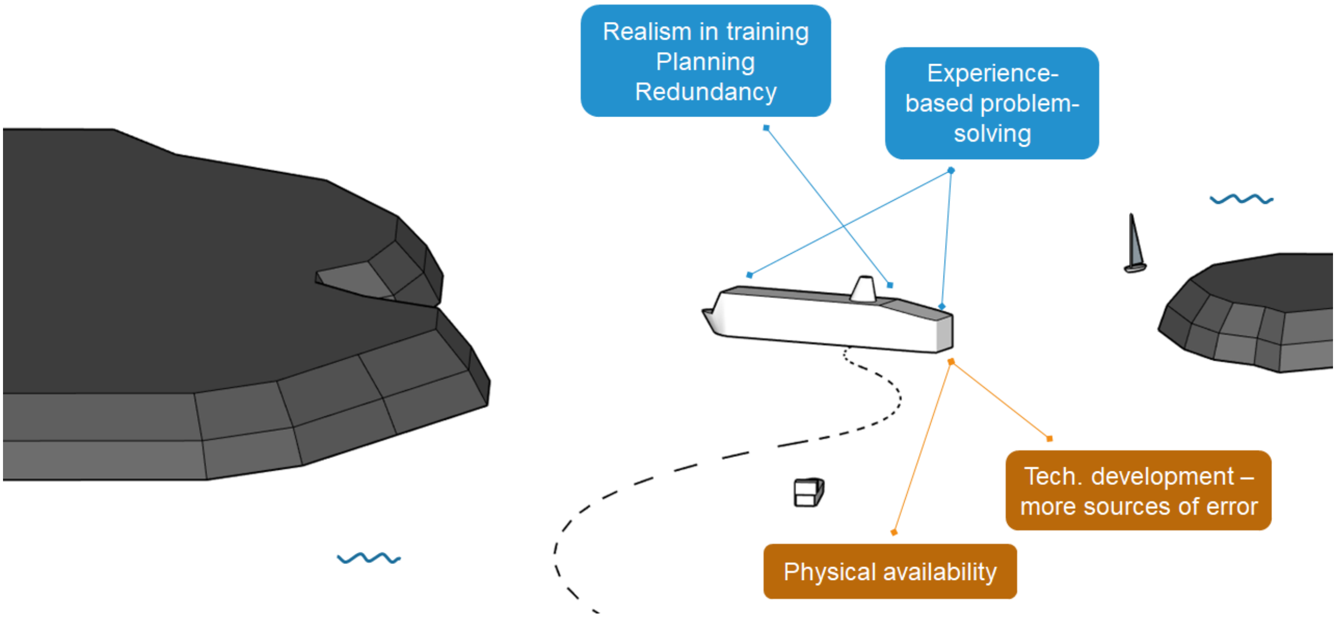


Figure 4: Success factors (blue) for the second scenario and challenges (orange)

Scenario 3: Fire scenario on deck

The fire scenario on deck is described by the need of the first detect the fire, start the firefighting and handle a larger number of people involved, including passengers.

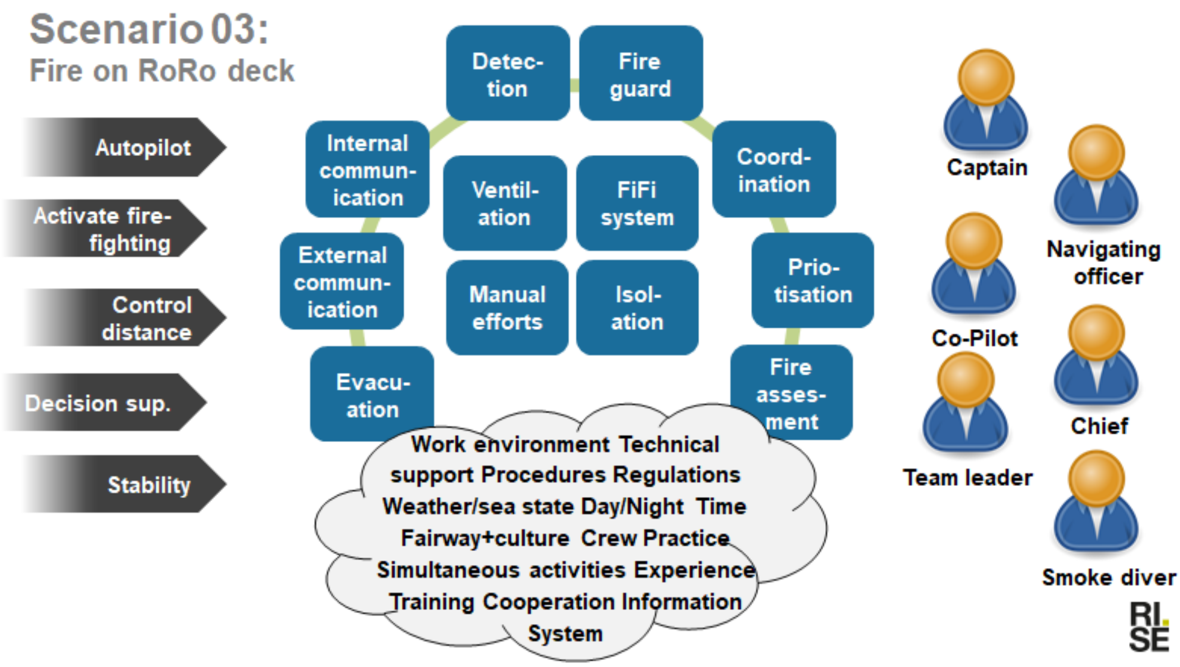


Figure 5: Scenario 3 Fire on the RoRo deck with the technical support (black), the main tasks to be performed (blue), the underlying factors influencing the tasks (in the cloud) and the main personal involved

Difficulties connected to the scenario are related to the determination of the magnitude of the fire, how much does it burn, is dangerous good affected or passenger car? The tight parking on the deck makes access to the source of fire difficult. There are no clear strategies on how to distinguish the fire in closed car decks, while on some ships the ventilation system is turned off to reduce the oxygen inflow, other ships have a strategy to turn them on maximum flow to reduce the smoke on car deck and ease identification of the origin of the fire. The fires often occur on arrival/ departure situation where the crew is occupied with various other tasks. A further challenge is the high workload if an evacuation would be required, as the crew is busy with firefighting and might be exhausted but still must go strong to take care of safe preparation of lifeboats.

The most important success factor identified relates to the fast response of the crew. Real fire alarms are occurring seldom, but due to the skilled and trained organization on board, the response time is short. This response time is further facilitated by the thermo-cameras and fire rounds, which makes the vessel independent from external support, as fires are kept small and extinguished quickly.

While the crew sizes have been reduced a bit, the members are more multi-skilled allowing a more flexible handling of safety-critical situations and adjust to these complex challenges in a best possible manner.

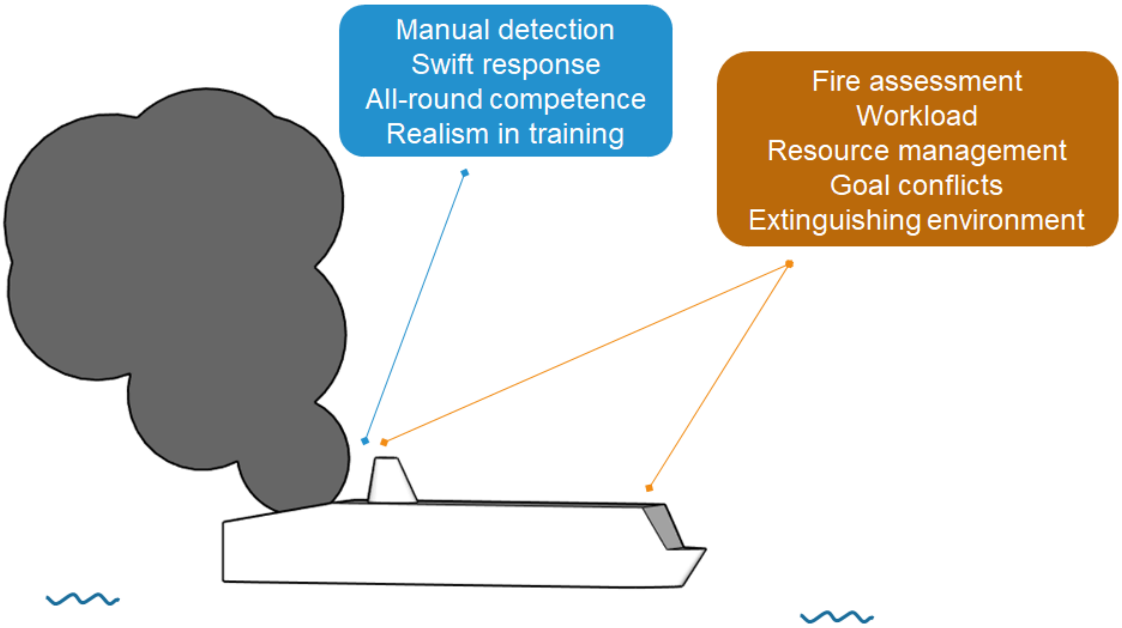


Figure 6: Success factors (blue) for the third scenario and challenges (orange)

5.3 Discussion/conclusions

The ferries in the Åland traffic have significantly lower accident rates than ferry traffic in general and other shipping in the region. Success factors for shipping in the seas around Åland are based on shipping companies working on a day-to-day basis on safety involving the whole organisation. People in the organisation have an open-minded relation to making mistakes and working as a team to solve arising issues. The organisations try constantly to adjust to technical and legal changes and train for emergency situations. Proper planning on various levels, regular training and competence development, organisational changes and adjustments, human interaction, behaviour and performance as well as technical development have made transport in the area safer and more reliable.

There is a clear statistically significant correlation between a large range of factors and shipping safety that do not belong to the typical category of "human factor", but that are still categorised as human error in the accident databases. Correlations to the ship yard building the ships, insurance companies and classification societies as well as the ownership and management of the ships and crews show statistical significance and several other factors. Port state controls reveal deficiencies on ISM compliance and overall care-taking of the vessel. These factors have statistical impacts on ship safety, but follow-up and consistency in all regions does not seem to increase safety to the extent wanted.

A safe shipping system builds on cooperation and communication between humans. Allowing direct communication on various levels between land organisations and crews allows for solving day-to-day issues including safety-critical issues. These relations enable organisations to learn and to change their behaviours and based on experience. In this context it is vital to implement a structure for how to automate functions in ways that make the overall system more efficient and safer. Still it is important to keep in mind that the automation brings many new challenges to the shipping industry, as *"Designer errors can be a major source of operating problems."* And *"the designer, who tries to eliminate the operator, still leaves the operator to do the tasks which the designer cannot think how to automate."* (Bainbridge, 1983). Being able to cover all functions that an operator perform on a vessel are another difficult task for automation as well as how to safeguard the transfer of experience and hands-on knowledge.

Training for critical situations is an important corner stone of successful crew management. The role of the crew members has changed during the last decades. From the rather hierarchical structures on ships with fear for punishment, crews and ship management have achieved a higher level of collaboration where decisions can be questioned despite the assigned levels in a hierarchy. In safety-critical situations, the hierarchy is not questioned according to the HAZID and interview study. The mind-set required is still based often on the behaviour of the masters allowing/ not allowing for the organisation to create, capture, transfer, and mobilize knowledge to enable it to adapt to a changing environment.

There are quite a few underlying correlations between different factors indicating how probable a ship will be involved in an accident or incident. However, it is rather difficult to say whether increased automation will have a direct impact on these correlations. If a ship-owner wants to buy and run a vessel based on a certain business case, this vessel will give the crew certain chances to succeed with safe navigation and operation of a vessel. The further education and training for the crew, the bridge management system and the openness to work pro-actively on safety will affect the chances for success further.

The interviews in the study revealed that automation has brought advantages but also new sources of failure and sensitivity to systems. The crew needs a broader range of skills and competences such as electrical engineering and IT., demanding more regularly updated training. As automation spreads to more and more parts of the shipping sector, a clearer strategy should be established incorporating competence needs of the personnel involved.

In the automation process it is important to consider certain factors to maintain and increase safety levels in shipping:

- Safeguarding measures – do we create new risks?
- "Irony of Automation"
- Out-of-the-Run, Transparency
- Changed conditions for error management
- Experience, knowledge and skills
- Interplay and teamwork on board and externally
- Confidence in the system
- Responsibility, roles and functions

6 Quality check of safety assessments and homepage content

The homepage of the project (https://foresea.org/) was reworked entirely and the homepage relaunched. The safety assessments performed earlier were reworked and improved to match the quality standard derived in the project. For users of the ForeSea system, these will be made available in the system. A list of available safety assessments is shown below:

- Black-outs on Ships
- Broken Fuel Pipe
- Cargo Handling on RoRo Deck
- Confined Spaces
- Electrical Failures in Vital Systems for Ship´s Safety
- Failure of UPS
- Fire in Fryers
- Fire on RoRo Deck - Electrical Failure in Vehicles, Trailers and Reefer - and Heating Units
- Fire on RoRo Deck after 2015-10-31
- Hit by Mooring Line
- Launching of FFB
- Mooring Incidents - Environmental Causes
- Mooring Incidents - Operational Causes
- Mooring Incidents - Technical Causes
- Poor Bunker Quality
- Poor Pilot Assistance

The quality check implied several visits to ship owners to get feedback on the work and end-user needs. In order to ease spreading of the results, a roll-up and folders were designed and printed which can be made use of in the ongoing dissemination work.

The user information and user meet in conjunction with Chalmers Sjölog was visited by many end-users and included even participation of the relevant university personnel. Feedback was given on the usage of the results for educational purposes and for required teaching of students for incident reporting.

Based on the discussions the process of developing technical interfaces with existing incident reporting systems of the various ship-owners was initiated.

7 REFERENCES

Bainbridge, L. (1983). Ironies of Automation. *Automatica, Vol. 19, No. 6.*, 775-779.

Barnett, M. L., & Pekcan, C. H. (2017). The Human Element in Shipping. Encyclopedia of Maritime and Offshore Engineering.

IMO. (2008). GUIDANCE ON NEAR-MISS REPORTING. T2-HES/4.2 MSC-MEPC.7/Circ.7, T5-MEPC/1.01 10 October 2008.

Hüffmeier, J. (2013). ORGANISATIONAL IMPACT ON MARITIME SAFETY. Göteborg: SSPA Sweden AB.

Storgård, J., Erdogan, I., & Tapaninen, U. (2012). *INCIDENT REPORTING IN SHIPPING - Experiences and best practices for the Baltic Sea.* Kotka: University of Turku.

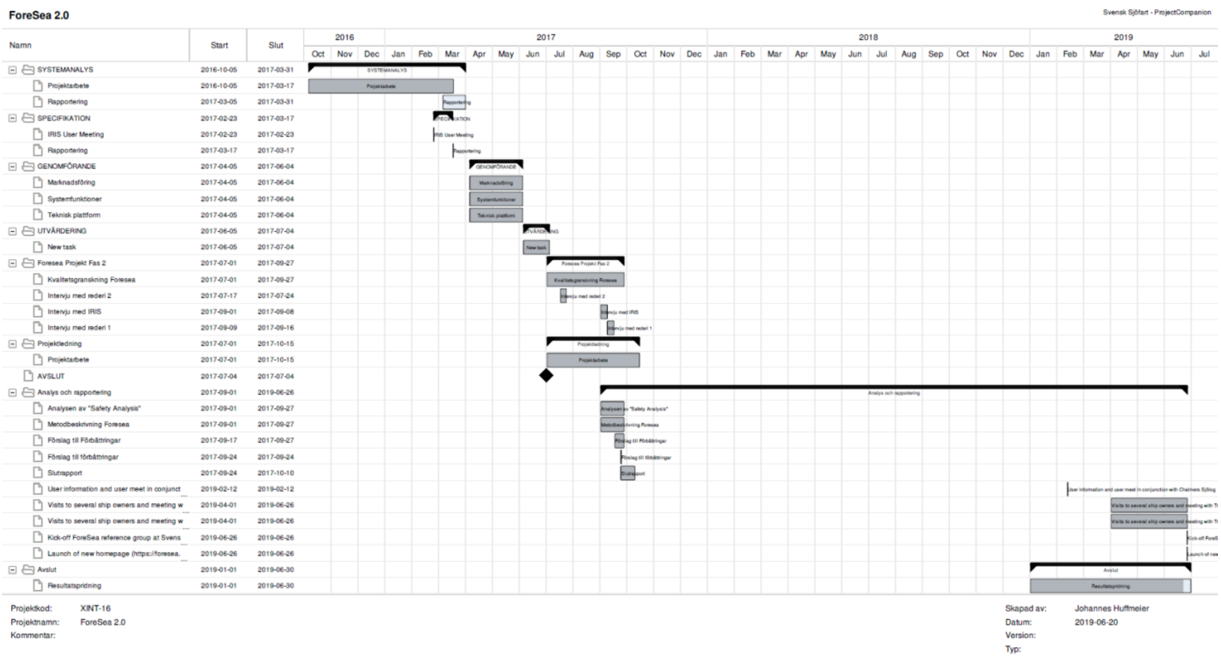
Vepsäläinen, A., & Lappalainen, J. (2010). Utilization of incident reporting in the Finnish maritime industry. Turku: Publications from the Centre for Maritime Studies, University of Turku.

Veysey, S. (den 09 08 2013). Businessinsurance. Hämtat från http://www.businessinsurance.com/article/20130908/NEWS07/309089991 den 12 09 2017

~-~-~-~-~-~-~-~-~-~-~-~-~-~-~ // ~-~-~-~-~-~-~-~-~-~-~-~-~-~-~

8 Time schedule

8.1 Foresea 2.0



8.2 In-depth analysis HUMAN IMPACT ON SHIPPING SAFETY