Activity 3 - MONALISA 2.0

Increased Maritime safety
- Safer Ships
Increased Maritime safety - Safer Ships

This activity, lead by the Italian Ministry of Infrastructure and Transport (MIT) has focused on how to improve maritime safety by implementing services, based on available technology. The target has been to provide services to large passenger vessels without modifying existing rules and regulations.

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A cost benefit analysis, considering both social and financial benefits, is performed on all the suggested services. It uses a calculative approach and will provide shipping companies and public administration with figures that will assist them in making good investments.

"Just like you would attract investors to the construction of new railway tracks by providing information about future revenue, it is important that we present our solutions in economic terms in order to allow shipowners to make informed decisions. And just like the railway also generates other positive effects, on both safety and the environment, so will these services", says Flavio Marangon, activity leader on behalf of the Italian Ministry of Infrastructure and Transport.

**Information and Communications Tool for Search and Rescue**

Currently the information used to manage the SAR operations comes from different systems of different brands on the market, and integrating this information is difficult. This activity has developed an ICT tool that integrates information from different sources. It provides the SAR coordinators with all the available information and the ability to communicate simultaneously with all parties.

As of September 2015 the new system, including new hardware and algorithms, has been implemented by the Swedish Maritime Administration (SMA) and is used in parallel with the old system.

"The idea is to provide an interface that will make all information available on one screen. The solution will also facilitate communication as messages can be written in a box on the screen and instantly shared with all", says Flavio.

![Flavio Marangon](image)

Flavio Marangon
Activity leader on behalf of the Italian Ministry of Infrastructure and Transport

The new tool makes it possible to integrate different layers of information and to present it on one screen. This makes it easy to add information about ships in the vicinity, sea conditions, temperature and so forth.
Cost Benefit Analysis
Reduced number of fatalities and serious injuries are the main benefits of the information and communications tool for search and rescue. The estimated value of the savings is based on the official statistics for Swedish SAR operations for 2014 from SMA. Other results that are not as easily quantifiable, but that nonetheless have a positive impact are energy saving and reduction of major damage.

Human Safety Quality and Environment (HSQE) Behaviour-Based Safety

Behaviour-Based Safety is the application of the science of applied behaviour analysis to issues of safety in the workplace. The issues include all employees from the front-line to the boardroom and involve architecture, equipment, management systems, work processes and management and employee behaviours. Well over 80% of all accidents occur because of inappropriate behaviour and not due to lack of equipment or unsafe conditions. There is an enormous potential in applying a methodology that is designed to bring about constant, safe behaviour.

Behaviour-Based Safety has previously been applied with great success in other fields and the goal of this activity was to transfer and adapt Behaviour-Based Safety to the maritime sector.

“Looking at and modifying behaviours in order to increase safety is already applied for example in the building, pharmaceutical and process industries. All participating plants have seen the number of injuries decrease”, says Flavio.

Behaviour-Based Safety faces some specific challenges in the maritime industry, as the nature of the work is more dynamic than compared to for example in a factory. Weather conditions change, people perform a multitude of tasks, and work groups are constantly changing. People also have different cultural backgrounds and speak different languages. Also unique to the maritime industry is that there rarely are people present to observe, or to give positive or negative feedback, on the operations. To remedy this, a major adjustment of the Behaviour-Based Safety methodology has been made, and a ‘self observation’ component has been added.

“During the development of the Behaviour-Based Safety tool for describing, recording and analysing events in the maritime industry, there were some challenges and a concern that the application only would work well in theory. Now the pilot application has been tested and modified, and we have a prototype of an ICT tool with good usability”, says Flavio.

Personal Protective Equipment

A Behaviour-Based Safety protocol could for example be used to promote an increased use of Personal Protective Equipment.

“Paintwork on one of the vessels in the pilot study required protective glasses. In discussions with the crew we identified that wearing protective glasses sometimes could be uncomfortable. In order to change the behaviour, that could be unsafe and generate incidents, the safety leader suggested actions for both the long- and the short-term. The workers wearing glasses were instructed that they should show the others what measures they had taken to make the glasses more comfortable. For the long-term solution they should indicate the reasons for why the glasses are uncomfortable, such as weight, fit and vision distortion, sweating during the job in the external area, in order to be able to buy better glasses in the future. Both actions added motivation to all the people doing paintwork and the use of protective glasses increased dramatically.”, says Flavio.

Observed user interaction

The graphical user interface of the Behaviour-Based Safety tool has been reviewed from an ergonomic viewpoint to verify the usability. Six professional seafarers between the ages 29 and 57 years old were a part of the tests.

“The results of the user interaction tests with the ICT tool provided important insights to the analysis. Changes to the ergonomic aspects were made such as a reorganisation of the graphical user interface by pressing the menu button and highlighting the section where the user is located”, says Flavio.

Cost Benefit Analysis

Implementation of Behaviour-Based Safety is likely to significantly reduce the number of minor injuries each year. This generates benefits in terms of safety, time and resources.

“The information that has been gathered by observing people’s behaviours on board while on the job can be used to create guidelines that will promote safety. It’s important for the workers to become aware that behaviours that in their experience are harmless, such as not wearing a helmet in a particular location, actually may be hazardous. We need to communicate the true facts regarding the risks in order to motivate behavioural change”, says Flavio.
A pilot application that can locate persons on board a vessel in real time has been designed, implemented and installed on the cruise ship the Ruby Princess and is used by the crew. It is based on RFID technology and requires each individual to carry a smart card in order for the system to locate them.

**Real time observation**
Upon the initial installation on the Ruby Princess there were some calibration problems with the sensors on the ship, but once those problems were solved the tests have been highly successful. A test was performed in July when the Ruby Princess was in Alaska and the Milan based team observed the people on board the vessel in real time.

“We communicated instructions such as ‘leave this room’ and we observed how the individual moved on the screen. Based also on the outcome of MONALISA 2.0, the Italian Ministry of Defence decided to install an evolution of the system on the ships that are being built for the Italian navy. It feels like a great success”, says Flavio.

**Cost benefit analysis**
The pilot application of the RFID-technology for indoor positioning of crew and passengers, and emergency guidance has indicated that it can reduce the number of fatalities and injuries as well as damages. The monetisation of the benefits has been done with a precautionary approach according to the following:

- The value of a human life as established by an Italian insurance company;
- The damage evaluation has been done considering the economic damage caused in similar fire events.

The probability of fatalities has been calculated according the EMSA report on the Risk Level and Acceptance Criteria for Passenger Ships and the cost benefit analysis indicates that the payback period should be between 3-5 years.

“*For example, the indoor positioning system is highly useful in case of a fire. If you know that no one is in a specific location you can seal off the area and use CO2 to extinguish the fire*”, says Flavio.
In case of an emergency during which the passengers need to be evacuated, a significant incline of the ship may cause the mechanical arm to malfunction and prevent the lifeboats from being lowered into the water.

**Safe evacuation at an incline**
Most existing lifeboats cannot be launched safely if the vessel is sinking with the heel of over 20 degrees to the opposite side. In most conditions the boat would fall on the deck and not out to the shipside.

The solution is based on existing technologies and materials, and the innovation consists of the design of accessories that can be installed to improve the functionality of the equipment that is already in use.

“Our design partner spent a lot of time finding the right material since the application had to be very cost effective. Now we have a solution that can be used to retrofit the existing equipment at a limited cost”, says Flavio.

**Cost Benefit Analysis**
The aim of the Safe Evacuation System is primarily to reduce fatalities and serious injuries. The probability has been calculated according to the EMSA report on the risk level and acceptance criteria for passenger ships, and an investment is estimated to have a positive social economic impact. Economic indicators such as the Economic Rate of Return and Economic Net Present Value are very positive. The payback time should be five years.

“We have created a prototype that will allow lifeboats to be launched at a greater incline than before. Straps fitted at the deck recess aligned with the ship’s side guide the boat to the proper position and to continue slipping down along the vessel’s haul. Teflon or rubber on the side of the lifeboat also contributes to a smooth lowering”, says Flavio.

Most existing lifeboats cannot be launched safely if the vessel is sinking with the heel of over 20 degrees to the opposite side. Now a solution that can be used to retrofit existing equipment at a limited cost is available.
“Just like you would attract investors to the construction of new railway tracks by providing information about future revenue, it is important that we present our solutions in economic terms in order to allow shipowners to make informed decisions.”

MONALISA 2.0
10 countries and 39 partners

Partners participating in Activity 3

- MIT, Italy
- SMA, Sweden
- Ferri, Spain
- CIMNE, Spain
- Carnival, UK
- IB, Italy
- Ergoproject, Italy
- Rina Services, Italy
- D’Appolonia, Italy