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Maritime Safety – Stakeholders in Information Exchange Process

P. Wołejsza
Maritime University of Szczecin, Poland

S. Thombre & R. Guinness
Finnish Geodetic Institute, Finland

ABSTRACT: This paper presents the methodology and research results on identification of potential users of the ESABALT system, which is targeted towards improving the situational awareness in the Baltic Sea region. We describe the technique of analysing the stakeholders involved in maritime sector processes, especially in maritime transport processes, while also taking into account their different classification criteria. The resulting list of stakeholders is used to identify system users and their classification into user profiles groups. This study will form the basis for the identification of user requirements of the ESABALT system.

1 INTRODUCTION

In 2010 the European Union launched a new research and development program to protect the Baltic Sea worth EUR 100 million over the period 2010-2017, called Baltic Organizations Network for Funding Sciences EEIG (BONUS). BONUS is considered as the first model case for the development of science-based management of the European regional seas by bringing together the research communities of marine, maritime, economical and societal research to address the major challenges faced by the Baltic Sea region (Bonus Portal, 2014).

The European Union e-Maritime initiative aims to promote the use of advanced information technologies for working and doing business in the maritime transport sector. The ESABALT is a research and development joined (Finnish Geodetic Institute, FURUNO Finland, SSPA Sweden and Maritime University of Szczecin, 2014) project studying the feasibility of a novel system for enhancing maritime safety. The aim of this paper is to present results of analysis and identification of stakeholders. Using created stakeholder lists, potential ESABALT system user were identified and user profiles groups were proposed.

2 MARITIME SAFETY

They are more than 77 thousands of merchant vessels registered [Equasis] and many times more sailing and motor boats. Every year those figures are increasing, which effects that our seas become more and more crowded.

According to the reports from the States in Baltic region there were 149 ship accidents in the HELCOM area in 2012 (Figure 1), which is 6 more than the year before (increase of 4%) and 19 more than in 2010 (increase of 15%).

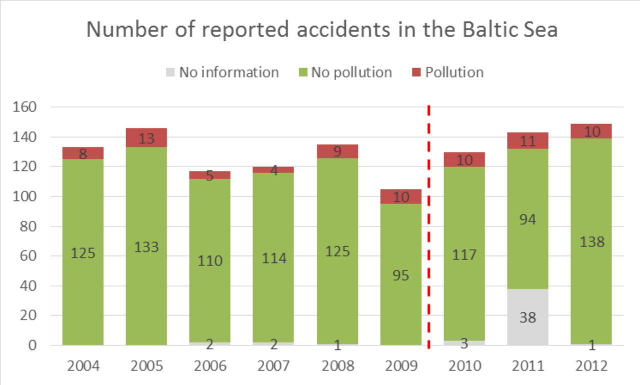

Figure 1. Accidents in Baltic region in the period 2004-2012[helcom].

Due to modification of the reporting format in 2012, the new category "contact" (Figure 2), as a type of accident, was included in the reporting, defined as striking any fixed or floating object other than ships or underwater objects (wrecks etc.).

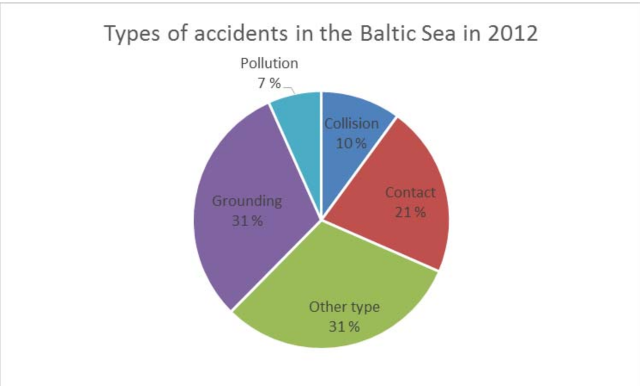

Figure 2. Types of accidents in Baltic region in 2012[helcom].

Collisions have been the most common type of shipping accidents in 2011 and 2010 while in 2006-2009 groundings were more common than collisions. In 2012 collisions accounted for 31% (47 cases) of all accidents which is the same percentage as for groundings and the collective category of other accidents.

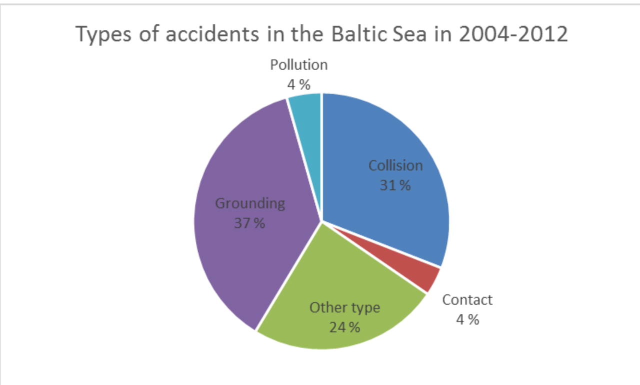

Figure 3. Types of accidents in Baltic region in the period 2004-2012 [helcom]

Amounting to 48 cases (32%) of all accidents; collisions were the most frequent type of shipping accidents in the Baltic in 2010. This was the first time since 2006 that collisions were more common than groundings in the Baltic Sea. The number of reported collisions has been decreasing since 2005-2006 but increased by 40% in 2010 from the lowest reported number of collisions in 2009 - 34 collisions (Figure 4).

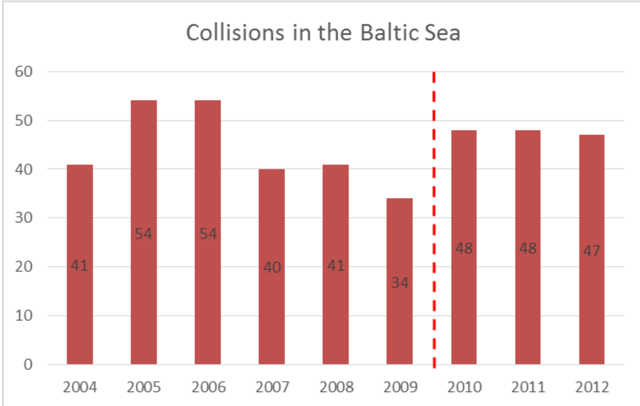

Figure 4. Collisions in Baltic region in the period 2004-2012[helcom].

Ship to ship collisions accounted for 50% of all collision cases in 2010 and the rest of the cases were collisions with fixed and/or floating structures, e.g. peers, navigation signs etc. The number of ship to ship collisions in 2010 was higher than in the last three years but still 30% less than in 2005-2006. The number of collisions with objects has remained largely unchanged in previous years but decreased by roughly 20% in 2010 compared to 2005-2009 (Figure 5).

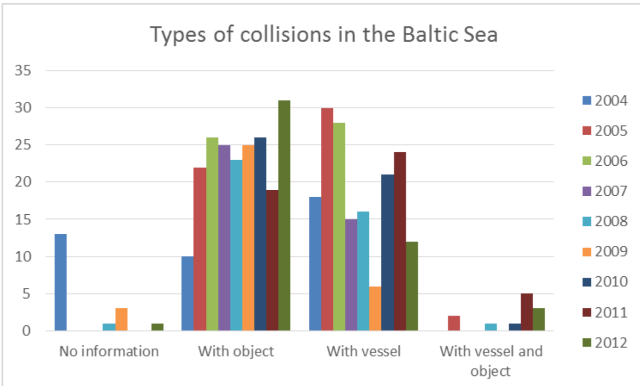

Figure 5. Types of collisions in Baltic region in the period 2004-2010[helcom].

On the picture below there are statistical information from insurance company The Swedish Club.

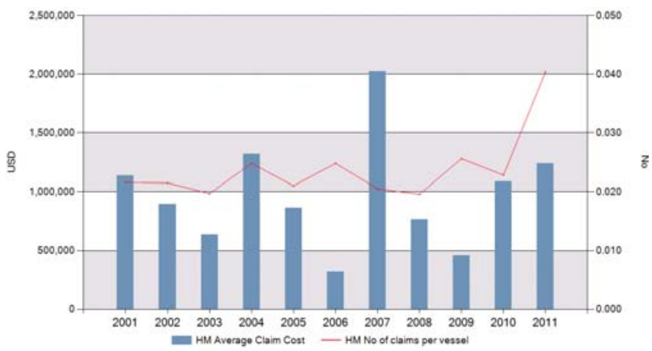

Figure 5. Average claim cost & frequency 2001 — 2011, limit >= USD 10 000 [Swedish]

According data presented above, average cost of collision is more than 1 million USD. The Swedish Club shares 13.6% (2010) of hull and machinery insurance global market. According Figure 5, around 2.5% of vessels are in collision every year i.e. over 1,900. In this situation the total cost of collisions is around 2 billion USD per year. According data from International Union of Marine Insurance, worldwide premium volume in 2013 was 34.2 billion USD.

ESABALT aims to increase the safety of all vessels operating in the Baltic Sea by providing tools and services which enhance situational awareness. This is achieved using the latest technological advances in sensing, positioning, eNavigation, Earth observation systems, and multichannel cooperative communications. In addition, ESABALT aims to facilitate crowdsourcing of relevant information from a multitude of users. That is, by reporting information to a central repository, all end users will be able to achieve a greater level of situational awareness than they would by acting independently. A guiding tenet of the ESABALT concept is that all maritime users in the Baltic Sea can operate more safely by collaboratively building and maintaining situational awareness.

3 INFORMATION EXCHANGE PROCESS

Information exchange is a key enabler of situational awareness due to the fact that no individual in a system as complex as the maritime transportation system holds all of the information relevant to his or her safety. Similarly, at the level of a vessel, no vessel collectively holds all of the information relevant to her own safety. Therefore, in order to obtain as much relevant information as possible and maintain good situational awareness, a vessel and her crew must engage in various information exchange processes. This section outlines some of the guiding assumptions concerning the information exchange processes used in the maritime domain, which are relevant for the ESABALT project.

Assumption 1: Information must flow from shore-to-ship, ship-to-shore, and ship-to-ship. All three types of information flow are expected to be used by the ESABALT system. Shore-to-ship and ship-to-shore are extremely important because centralized information management, for example, through a VTS operator provide a higher level of reliability and quality assurance for maritime information exchange. However, VTS operators cannot maintain good overall situational awareness without regular updates from vessels, for example, updating of routes when a vessel changes her planned route due to unforeseen circumstances. Lastly, ship-to-ship communication is assumed to be beneficial due to the fact that the ship-to-shore and shore-to-ship links may not be available all of the time and in all locations at sea. In addition, ship-to-ship communication may provide the most timely and reliable means of communication when the information is of critical nature and needs to be exchanged quickly (e.g. maneuvers to avoid collision). Another example of ship-to-ship communication is direct transmission and reception of position and heading data through a vessels' AIS transponder.

Assumption 2: Different vessels have different communication capabilities. In particular, larger vessels, such as commercial cargo or passenger ships are assumed to have greater communication capabilities compared to, e.g. pleasure boats. For example, most commercial ships have VSAT capabilities, which allow them to send and receive data globally, whereas a pleasure boat may have only VHS or cellular radios/phones. VHS may be limited to voice-only communication and cellular phone coverage is generally only available in coastal areas. As a result of this assumption, the ESABALT system must be interoperable with different communication systems, and it must adapt itself based on the communication capabilities of the user terminal.

Assumption 3: Adequate standards for maritime information exchange already exist. Standardized protocols and formats for exchange of maritime information are important because the information must be processes by multiple parties, and furthermore the formats must be machine readable, in order to facilitate automation. Examples of relevant existing standards include NMEA 0183, NMEA 2000, S-57, S-100, S-101, and S-102.

Assumption 4: Information exchange processes should be highly automated. As a result of a survey of potential users, it was apparent that information exchange processes should be highly automated, in order to not burden the crew with additional workload. In addition, automated systems generally require less training, so automation also reduces the training burden created by the ESABALT system.

Assumption 5: Most users are assumed to be cooperative and trustworthy. Since it is planned that the ESABALT system will utilize crowdsourcing to build up situational awareness, it is important to consider the trustworthiness of those participating in the collection of information. If an uncooperative or malicious user intentionally provides falsified information, this can have serious consequences for the overall system. The system must have capabilities to identify such users and to restrict them from using the system. It is assumed, however, that most users of ESABALT are cooperative and trustworthy. This is a reasonable assumption, especially if authentication is required to access or otherwise use the system. If a user behaves contrary to the guidelines and principles in the end-user license agreement, then he or she will be banished from the system. Because most users are linked to a ship or shipping company and have a reputation to uphold, they will be motivated to operate according to established procedures and guidelines.

4 ESABALT STAKEHOLDERS

The maritime sector comprises a number of processes; for example, transport process, information exchange process, and disaster management process, etc. The ESABALT system is primarily targeted towards persons and entities involved with the information exchange process.

Therefore, the objective of this study is to identify participants in this maritime sector process who would be the primary beneficiaries or stakeholders and to categorize them based on three criteria, stakeholders by information needs in relation to time, stakeholders by information need types, and stakeholders by maritime information services.

The first criterion lists the stakeholders according to the time-characteristics of the information they require, for example current operational information, current tactical information or information based on historical data. The second criterion lists stakeholders by the type of the information needed, for example operational information, information regarding transport logistics and traffic management, and information regarding the environment and management of calamities. The third categorization is made based on maritime information services and the providers of those services. Table 1, 2 and 3 shows the different stakeholders under each of the criteria.

Table 1. Stakeholders by information needs in relation to time

Stakeholder group	Examples of stakeholders
Operational data user	seamen, sailors, fishermen, pilots, VTS operators, non-professional users (i.e. leisure boats), meteorological, hydrological institutions/service providers, freight forwarders, shipping agencies, port authorities,
Tactical data user	shipping agencies, port authorities, VTS operators, meteorological, hydrological institutions/service providers, freight forwarders, maritime advisors and superintendents, ship owners, charterers,
Historical data user	ship owners, equipment manufacturers, classification and insurance societies, metrological, hydrological institutions/service providers, maritime administration (accidents analysis, events statistics), MET (maritime education and training) institutions, research institutions.

Table 2. Stakeholders by information need types

Stakeholder group	Examples of stakeholders
Operational information: (collision avoidance, optimization of ship maneuvers, optimization of harbour maneuvers, optimization of loading/unloading operations)	seamen, sailors, fishermen, non-professional users (i.e. leisure boats), pilots, VTS operators, ship owners, shipping agencies, port authorities,
Information for traffic management and transport logistics: (tracking dangerous goods, traffic monitoring, signaling dangerous situations, voyage planning, port and terminal management, cargo and fleet management)	shipping agencies, port authorities, VTS operators, ship owners, freight forwarders, maritime advisors and superintendents,
Information for environment protection and calamity abatement: (planning and monitoring of life and property rescue operations, planning and monitoring of actions taken to counteract and reduce natural calamity consequences, planning and monitoring of actions taken to counteract and reduce natural environment pollution consequences)	state (national) authorities: maritime authority/office, ministry of transport/shipping/environment, VTS, SAR centres, spills – emergency response centres, port authority, regional legal bodies (e.g. Baltic region, Gulf of Finland), classification and insurance societies,

Table 3. Stakeholders by maritime information services

Maritime Information Service	System Operator/Provider	Beneficiary
VTS Information Service (IS)	VTS authority	seamen, sailors, fishermen,
Navigational Assistance Service (NAS)	national competent VTS authority / coastal or port authority	pilots, freight forwarders,
Traffic Organization Service (TOS)	national competent VTS authority / coastal or port authority	ship owners, charterers, ship handling agencies, port authorities VTS operators,
Local Port Service (LPS)	local port / harbour operator, port / commercial tug organization,	ship handling agencies, port authorities,
Pilotage Service	pilot Authority/ pilot organization	VTS operators,
Tug Service	tug authority	freight forwarders,
Icebreaking Assistance superintendents,	port / commercial tug organization	maritime advisory firms and
Maritime Safety Information (MSI)	national competent authority	ship-owner associations,
Vessel Shore Reporting	national competent authority, ship owner / operator / master	classification societies,

Remote Monitoring of ships Systems	VTS authority, shipowner	
Maritime Assistance Service (MAS)	coastal / port authority / organizations	
Search and Rescue (SAR) Service	search and rescue authorities	
Ice Navigation Service	national competent authority / organisation	seamen, sailors, fishermen, pilots,
Meteorological Information Service	national meteorological authority / WMO / public institutions	
Telemedical Assistance Service (TMAS),	national health organization / dedicated health organization	seamen, sailors, fishermen, pilots,
Nautical Chart Service	national hydrographic authority/governmental agencies	
Nautical Publications Service	national hydrographic authority/governmental agencies	
Real-time Hydrographic and Environmental Information Services	national hydrographic and meteorological authorities	

Table 4. Potential ESABALT system users

Users	General characteristic	Anticipated needs
Charterers	Monitoring of vessels' status, surroundings and voyage parameters	Access to current data
Classification and insurance societies	Collecting information about vessels and companies for classification and insurance processes	Access to historical and statistical data
Coastguard	Monitoring of vessels' parameters and voyage for security purposes on administered area	Access to current data, sending emergency information to the system
Colleges	Collecting data for students training and scientific research	Access to historical and statistical data, on-line access to current data
Crewing agencies	Monitoring voyage parameters i.e. ports of call, ETA, ETD etc.	Access to the system via ship operator or ship owner
Emergency management center	Monitoring administrated area for emergency purposes	On-line access to current data, sending emergency information to the system
Equipment manufacturers	Post processing only, no need on-line access	Access to historical and statistical data
Fishermen	Monitoring own vessel parameters, its surroundings and nearest traffic	On-line access to all current data, sending information to the system
Hydrological services	Monitoring administrated area for hydrological purposes	On-line access to current data, sending emergency information to the system
Icebreaking assistance	Monitoring administrated area for icebreaking purposes	On-line access to current data, sending emergency information to the system
Local authorities data	Managing the administered area	Access to historical and statistical
Marine accident investigation branches	Collecting information about vessels and companies for investigation processes	Access to historical and statistical data
Maritime advisors	Collecting information about vessels and companies for investigation processes	Access to historical and statistical data
Superintendents	Monitoring of vessels' status, surroundings and voyage parameters	Access to current data
Maritime authority	Managing the administered area	On-line access to all current data, sending information to the system
Meteorological services	Monitoring administered area for meteorological purposes	On-line access to current data, sending emergency information to the system
Ministry of transport/shipping/ environment	Preparing the rules	Access to historical and statistical data
Naval vessels	Monitoring of vessels' parameters and voyage for security purposes on administered area	On-line access to current data, sending emergency information to the system
Offshore	Monitoring the surroundings of offshore installations	On-line access to current data, sending information to the system
Pilot stations	Monitoring voyage parameters i.e. ports of call, ETA, ETD etc.	On-line access to port related information
Pilot vessels	Monitoring own vessel parameters, its surroundings and nearest traffic	On-line access to all current data, sending information to the system
Port authorities	Managing port and its surroundings	On-line access to port related Information
Research institutes	Collecting data for scientific research	Access to historical and statistical data, on-line access to current data
Research vessels	Monitoring own vessel parameters, its surroundings and nearest	On-line access to all current data,

	traffic, collecting data for research purposes	sending information to the system
Sailors	Monitoring own vessel parameters, its surroundings and nearest traffic	On-line access to all current data, sending information to the system
Seamen	Monitoring own vessel parameters, its surroundings and nearest traffic	On-line access to all current data, sending information to the system
Search and rescue SAR	Monitoring administered area for SAR purposes	On-line access to current data, sending emergency information to the system
Ship operators	Monitoring of vessels' status, surroundings and voyage parameters	On-line access to current data
Ship owners	Monitoring of vessels' status, surroundings and voyage parameters	Access to current data
Shipping agencies	Monitoring of vessels' status, surroundings and voyage parameters	Access to current data
Training organizations	Collecting data for students training	Access to historical and statistical data, on-line access to current data
Universities	Collecting data for students training and scientific research	Access to historical and statistical data, on-line access to current data
VTS centers, VTS personnel	Monitoring of vessels' traffic on administered area	On-line access to current data, sending emergency information to the system

Based on these lists of ESABALT stakeholders, the actual users of the system can be derived, as shown in Table 4. The list of users will help in categorizing into different user profiles to ensure that appropriate access rights are provided to them in the ESABALT system. Another benefit of identifying the users is that it allows to define the system requirements specific to every user profile type.

5 CONCLUSIONS

The ESABALT consortium is developing and evaluating an innovative concept for increasing maritime safety with particular emphasis in the Baltic Sea. The focus is on increasing overall situational awareness, through the use of crowdsourcing and by integrating various advanced navigation, Earth Observation, and communications technologies. We seek feedback and strong engagement with the enduser community and various stakeholders, including Search and Rescue (SAR) Centers, Vessel Traffic Services (VTS) Centers, and environmental authorities. Furthermore, we will inform the user community and public concerning progress of the project through our website and through dedicated dissemination and outreach activities.

ACKNOWLEDGEMENT

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