

**THE INTERNATIONAL MARITIME TRANSPORT & LOGISTICS CONFERENCE
(MARLOG 4)
A SUSTAINABLE DEVELOPMENT PERSPECTIVE FOR MEGA PROJECTS
29- 31 MARCH 2015**

**INFORMATICS AND COMPUTING ROLE IN DEVELOPING AND
MANAGING SUSTAINABLE MEGA PROJECTS – HOW E-
NAVIGATION CAN CONTRIBUTE**

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ABSTRACT: Moving a ship from port to port is not an exclusive navigational process. There are other processes involved, such as ship reporting, practical and economic cargo handling, cargo control, legal requirements, security etc. Moving rapidly in the digital age, the shipping industry is continuously looking for benefits from digital opportunities in order to enhance safety, efficiency, security and protection of the environment.

It is well-recognized that IMO's e-navigation concept - particularly the provision of reliable and timely data and information dissemination along with enhanced interaction between ship and shore - could contribute to:

- enhancing the safety of navigation;
- improvements in the efficiency of shipping;
- better access to sea areas and ports; and
- further development of a worldwide, sustainable maritime transportation system.

More energy, food and leisure resources will be required to satisfy the growing population of the world. Most of these demands will be met in some form using maritime transport, especially container ships. E-navigation is expected to equip shipboard users and those ashore responsible for the safety of shipping with effective, user-friendly, proven tools of electronic information exchange that are optimized for effective decision-making in order to make marine navigation and communications more reliable, resilient and user friendly.

Keywords: exchange of information, harmonization, standardization, integration, simplification

INTRODUCTION

What is the e-navigation concept

In November last year IMO's Maritime Safety Committee (MSC 94) approved the e-navigation Strategy Implementation Plan (SIP) after several years of work. The implementation period is 2016-2019.

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The agreed and prioritized e-navigation solutions provide a holistic approach to the e-navigation strategy, connecting the ship with the shore and vice-versa. Improved and harmonized communications play a central role.

The concept is based on 5 solutions prioritized by IMO and represents an integrated and holistic approach to the concept of exchange of information in providing safe, secure and effective berth to berth navigation as well as protection of the marine environment

The first solution S1 provides a harmonized and user friendly bridge design in order to ensure that the navigator can immediately recognize all the navigational functions on any ship.

The second solution, S2, provides standardized and automated reporting of ships information for port arrival to the shore side, so that it is not necessary to use many individual ship reporting systems when arriving in a port, saving time and reducing the non-navigational workload of the navigator and increasing port efficiency

The third solution S3 provides improved reliability of bridge equipment and navigation information in order that the navigator can rely on the continuous update of the ships situation with regards to navigational awareness.

The fourth solution S4 provides integration of incoming information on bridge navigational graphical displays to avoid the need to plot additional information of the current situation of the ship.

The fifth solution S5 makes sure that the shore based information from ports VTSs and other service providers to ships is harmonized and standardized around the world.

The e-navigation concept is primarily based on improved digital communications between ship and shore and ship and ship.

If the e-navigation solutions above are realized then the concept of a Marine Electronic Highway (MEH) can be achieved. MEH was a Demonstration Project of the IMO in the Straits of Malacca and Singapore which was given the go ahead in June 2006. The overall objectives of the project were to enhance maritime services, improve navigational safety and security and promote marine environment protection and the sustainable development and use of the coastal and marine resources of the Straits' littoral States, Indonesia, Malaysia and Singapore.

IMPLEMENTATION OF E-NAVIGATION - THE PROPOSED FURTHER WORK

The implementation of e-navigation is crucial for ships and seafarers to continue being safe and efficient in a world that is undergoing unprecedented technology-driven change. A key aim of e-navigation is to ensure ship and seafarer safety remains a top priority amongst often uncoordinated technology-driven change.

The initial proposal for the development of an e-navigation strategy identified that a lack of standardization on board and ashore would lead to increased and unnecessary levels of complexity and incompatibility between systems. Significant economic benefits of e-navigation have become evident, based on the findings from recent e-navigation related test-bed projects. Increased efficiencies and reduced costs aided by improved ship reporting,

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dynamic route planning, sea traffic coordination, reduction of steaming distances and coordinated arrival times are some examples where e-navigation will contribute to the global economy.

For each of the 5 Solutions in the SIP there are tasks that still need to be carried out in order that the Solutions can be implemented. Outputs have been identified and proposed for further consideration in order to achieve the Solutions.

Two of the identified outputs are linked to S1, a harmonized and user friendly bridge design

The first is about Draft Guidelines on standardized modes of operation, S-mode. This will ensure a standardized mode of operation and display for all navigation equipment and provide seafarers with the ability to operate all navigation equipment in standardized manner, to improve the safety of navigation. Today with many different manufacturers of navigation equipment, the display and controls are different in operation from one equipment to another which can cause confusion to the mariner.

The benefit of S-mode is that all shipboard navigation systems will have the ability to change to a standardized navigation functionality, by a single operator action. S-Mode would supplement additional manufacturer-supplied modes. S-Mode supports the objectives of e-navigation to improve navigation decision making and hence safety and protection of the marine environment.

The second output is an update, by adding new modules, to the Revised performance standards for Integrated Navigation Systems (INS) (resolution MSC.252(83)) relating to the harmonization of bridge design and display of information.

Since the last revision of the performance standards for INS, the standard has been modular, this means that any new facilities can be added by adding an appropriate module to the performance standards for each facility. A module will be required to interface with the appropriate communications equipment so that information received via such equipment can be processed, filtered, routed and displayed on the navigational system. A module will also be required to ensure that the INS can display the information received via communications equipment. New modules will add functionality to the INS Performance Standard which will facilitate a simplified and harmonized bridge design and ensure relevant information is displayed, including information received via communications equipment. This will result in reducing complexity without compromising existing navigational functionality.

One proposed output is linked to the second solution, S2, which provides standardized and automated reporting of ships information for port arrival to the shore side and is about to revise the Guidelines and criteria for ship reporting systems (resolution MSC.43(64), as amended) relating to standardized and harmonized electronic ship reporting and automated collection of onboard data for reporting. Further updates to the Guidelines will provide standardized and automated reporting of ships information required by coastal and port states, saving time and reducing the non-navigational workload of the navigator and increasing port efficiency. This system of a single report is also referred to as a “single window” approach.

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Currently there are no harmonized standards for ship reporting by electronic means and a considerable burden is placed on the ship to complete different paper forms for different identities ashore such as customs, immigration, cargo manifest etc. A fully automated electronic system will have a benefit and reduce administrative burdens. The benefit will be a worldwide harmonized automated ship reporting system saving cost and reducing administrative burden, while increasing the efficiency of trade.

The third solution S3 provides improved reliability of bridge equipment and navigation information and the further focus here could be to revise the General requirements for ship borne radio equipment forming part of the global maritime distress and safety system (GMDSS) and for electronic navigational aids (resolution A.694(17)) relating to Built In Integrity Testing (BIIT) for navigation equipment

During the user needs capture stage of the e-navigation process, a high number of navigators advised that there was no indication of the quality and integrity of navigational data displayed. This built in integrity testing is to ensure that if any functionality of the equipment is not working correctly, the user is made aware. Currently the INS performance standard has integrity testing which may be useful.

Taking into account the safety of navigation, there is a compelling need to ensure that the navigator has is presented with information that is accurate and reliable at all times with an indication when the equipment is not working satisfactorily. Requirements for built in integrity testing of navigation equipment will ensure that navigators are confident that the information presented to them is accurate.

The fourth solution S4 provides integration of incoming information on bridge navigational graphical displays and there is a need for a harmonized way of displaying information received via communications equipment such as NAVTEX (Navigational Telex) and MSI (Maritime Safety Information) as currently these are mainly printed and not necessarily operational context acted on immediately. It is important that this information is displayed as task oriented on the bridge and harmonized with other navigation related information without obscuring critical navigation information. A way forward could be to draft Guidelines for the harmonized display of navigation information received via communications equipment.

Most information received via communications equipment is currently printed and has to be read, analyzed and transferred where necessary rather than being displayed on the navigational systems. To fulfill the requirements for safe navigation to include all means and information in the decision making, a presentation of this information at the navigational workstations is essential. A task-oriented integration and presentation of information, when all necessary information for the respective task and situation is available in a fast, reliable, consistent and easily interpretable format will support the officers onboard in their decision making and enhance the safety of navigation.

The display of the information in harmonized and effective way increases the overall awareness of the information improving the situational awareness as well as reducing the mistakes made transferring information from paper outputs.

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As a result of the user needs, gap analysis and the IMO process, the fifth prioritized solution will use the principle of the Maritime Service Portfolios (MSP). This concept contains all the necessary information provided by shore based service providers to the ship. Several initiatives are ongoing in regional projects and in order that a global solution can work, guidelines are needed from the relevant International Organizations.

There is a need to harmonize e-navigation systems quickly to avoid the establishment of many differing systems. This could cause many different protocols being adopted. MSPs for example are a key part of the e-navigation strategy. Harmonization of systems around the world is a priority. In this respect, IHO and IALA have taken responsibility for some parts of e-navigation.

INDUSTRY AND OTHER STAKEHOLDERS INVOLVED IN THE DEVELOPMENT AND IMPLEMENTATION OF E-NAVIGATION

The further development and implantation of e-navigation require joint international efforts and co-operation between IMO, maritime industry and other stakeholders, such as international organizations. A central issue is therefore the involvement of the maritime industry and other stakeholders in the development and implementation of e-navigation. Equipment designers and manufacturers, system integrators, shipbuilders, ship-owners/operators and other relevant International organizations such as IALA, IHO, CIRM, IEC, ICS, BIMCO and Nautical Institute et. al. play all an important role as e-navigation is based on identified user needs and e-navigation systems require the connection and integration of onboard navigational systems, as well as shore-side support systems and involve the collection, integration, exchange, presentation, and analysis of marine data and information.

A new proposed guideline is intended to be used by all stakeholders involved in the design and development of e-navigation systems, with its primary users being those that develop and test e-navigation systems. Human centered design principles including usability evaluation on navigational equipment provide a complete methodology from the concept of development to the evaluation of that concept as final equipment and systems. The user needs experience with the introduction of software based electronic systems showed that the control of software development and software lifecycle maintenance needed to be improved. Therefore, the guideline also includes software quality assurance (SQA) which can be applied to any type of e-navigation software system, including on-board or shore-based, new development, embedded, and software-centered systems that can be individual components or equipment as well as integrated software systems.

Development of any technology and institutional arrangements necessary to fulfill the requirements of e-navigation in the longer term should also be examined in light of the Guideline before their use.

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CONCLUSIONS

E-navigation is about the harmonized and simplified information exchange between systems on board and systems on shore and systems between other ships. I think this presentation has shown how e-navigation can contribute in developing and managing sustainable mega projects by making benefits from digital opportunities on information exchange between different stakeholders. However, the importance of continued leadership by the IMO to ensure global harmonization and active development of the approved e-navigation SIP cannot be underestimated.