



SUB-COMMITTEE ON SAFETY OF
NAVIGATION
55th session
Agenda item 11

NAV 55/11/4
22 May 2009
Original: ENGLISH

DEVELOPMENT OF AN E-NAVIGATION STRATEGY IMPLEMENTATION PLAN

Methodology for developing e-navigation user needs using a task-based approach

Submitted by the United Kingdom

SUMMARY

Executive summary: The purpose of this document is to illustrate an approach to developing and mapping e-navigation user needs, taking MSI as an example. Developing e-navigation user requirements is a highly complex exercise that requires the commitment of resources and the involvement of key stakeholders. A systematic approach needs to be taken for this activity, boundaries must be set, and a formalised “mapping technique” to track information flows, terminology and responsibilities is highly desirable. The improved application of MSI onboard vessels has been clearly identified as a user need by mariners, and work on this issue under the agenda of e-Navigation should continue.

Strategic direction: 5.2

High-level action: 5.2.4

Planned output: 5.2.4.4

Action to be taken: Paragraph 13

Related documents: MSC/Circ.1091; MSC/Circ.878; resolution MSC.252(83);
MSC/Circ.982; NAV 53/22, NAV 53/13, NAV 53/13/1;
COMSAR 12/11; NAV 54/13 and NAV 54/INF.3

Introduction

1 The IMO Strategy, as agreed at MSC 85, states that e-navigation should be led by “User Needs”. Developing e-navigation “User Needs” is a highly complex, detailed, and resource intensive task. The IALA e-Navigation Committee’s Working Group (WG1) on Strategy and Operations has initially explored the issue of MSI in detail, in order to identify areas that may be improved through the application of e-Navigation. This exercise has been undertaken as an

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example of how a specific issue of user needs can be systematically investigated in terms of Harmonized Collection, Integration, Exchange, Presentation and Analysis.

2 The purpose of this exercise was only to give an example of an approach to developing and mapping e-navigation user needs. In no way should this exercise be assumed to be a complete work programme to enhance the provision of MSI through e-navigation.

Methodology

3 In developing a set of preliminary user requirements, a methodology was applied broadly based upon the following sequential steps:

- .1 define scope of each functional application and describe how the application is undertaken today;
- .2 identify strengths in today's solution (institutionally, operationally, technically, etc.) and also identify weaknesses and potential means of improvement;
- .3 identify key external boundaries with other applications and/or third parties, clearly documenting assumptions;
- .4 decompose each application into a series of processes and information flows, categorizing each as collection, integration, exchange, presentation and analysis, taking into account:
- .5 location of the participating users: on board, on shore, etc.;
- .6 distributed responsibilities of stakeholders;
- .7 the nature and amount of data to be exchanged;
- .8 quality requirements: usability, accuracy, integrity, reliability or availability, continuity, time behaviour, maintainability, security etc.; and
- .9 for each individual process, determine the underlying user requirement(s), independent of the means of provision or scope of technology.

4 This process must be repeated for each identified functional peer-to-peer application, noting common requirements, terminology and key inter-dependencies. This process can then be readily extended to identify system requirements and undertake a formal gap analysis.

Maritime Safety Information (MSI)

5 The existing procedures and protocol currently in place as part of the World-Wide Navigational Warning Service (WWNWS) offered a good example of a shore-to-ship structure, with a clearly defined scope, containing elements of collection, exchange, integration, presentation and analysis. It was identified by the user needs analysis that the provision of MSI had the potential for tangible benefits to be identified in relation to how mariners may receive and use MSI onboard in the future.

6 To begin with, the definition of MSI contained in SOLAS chapter IV, Radiocommunications, regulation 2, 1.9 was acknowledged:

“Maritime safety information means navigational and meteorological warnings, meteorological forecasts and other urgent safety related messages broadcast to ships.”

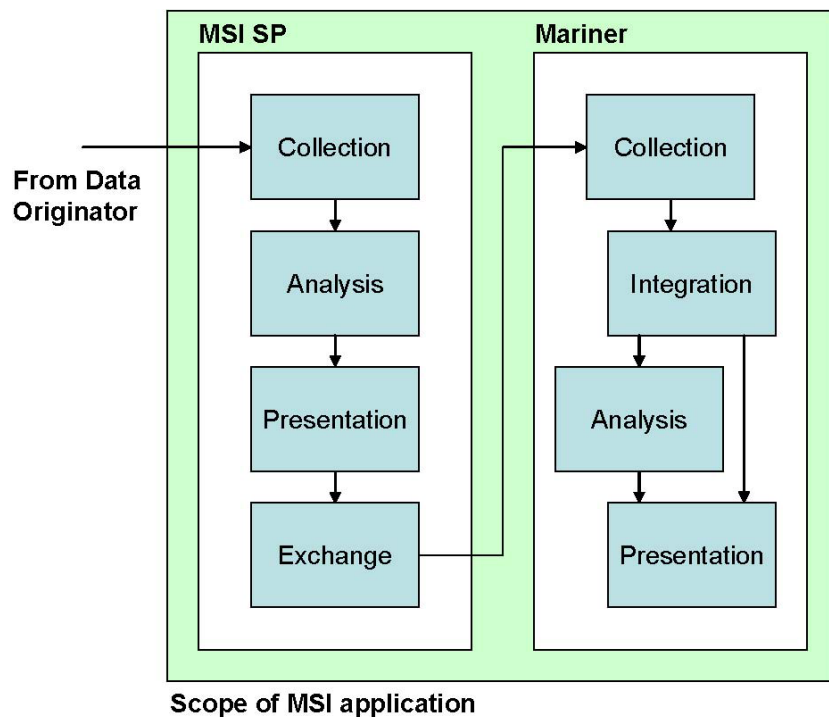
7 Due diligence and acceptance was also agreed in relation to the existing architecture for the coordination and promulgation of MSI as defined in the recently amended IMO documentation:

- .1 Resolution A.705(17), as amended – Maritime Safety Information;
- .2 Resolution A.706(17), as amended – World-Wide Navigational Warning Service; and
- .3 Joint IMO/IHO/WMO Manual on Maritime Safety Information.

8 The stepped approach of the differing types of Navigational Warnings (NAVAREA, Coastal and Local) and the underpinning on-shore institutionally structured organizations respectively responsible for the selection and distribution of the different types of warnings, was seen as a considerable strength to the current system. When looking forward to what e-Navigation may provide in the future, an improved network of storage, sharing and distribution of data in a variety of formats (by what could be described as MSI Service Providers (MSI SPs)) was identified as an objective worth considering.

Scope of application

9 The scope of this exercise encompasses the provision of MSI, as defined above, by organizations identified as MSI SPs to mariners. It specifically excludes the provision of other navigational information (such as electronic charts, radar and position fixing, etc.).



10 The provision of other types of navigational information may have very similar user requirements, potentially leading to common means of provision. It is clear that the mariner’s requirement is that all navigational information is presented in an integrated manner to support good decision making.

Preliminary User Requirements

11 The tables in the annex provide a two page extract from the preliminary set of MSI user requirements¹ developed for the purpose of this document. The requirements are separated into ship-based and shore-based and are subsequently developed under Collection, Integration, Exchange, Presentation and Analysis. In addition to each individual statement of requirement, the table includes a description of how the requirement is met today to provide the reader with a familiar frame of reference. It also demonstrates how this can be readily extended to include perceived strengths and weaknesses of the current solution and potential future improvements.

12 In developing the requirements, it has been necessary to develop a set of terms which should form part of a common library of terms to be used for all e-Navigation user requirements.

- .1 MSI (Maritime Safety Information) – as defined in Section 3;
- .2 MSI SP (MSI Service Provider) – an organisation responsible for making available MSI to mariners – that today includes NAVAREA and National Co-ordinators and local port authorities, etc.;
- .3 User – all maritime users of MSI on-board SOLAS and non SOLAS vessels; and
- .4 Data Originator – any individual or organisation providing data to an MSI SP.

Action requested of the Sub-Committee

- 13 The Sub-Committee is invited to note the following observations and recommendations:
- .1 developing e-navigation user requirements is a highly complex exercise that requires the commitment of resources and the involvement of key stakeholders;
 - .2 a systematic approach needs to be taken for this activity, boundaries must be set, and a formalized “mapping technique” to track information flows, terminology and responsibilities is highly desirable. The exercise outlined in this paper used Enterprise Architect software (others are available);
 - .3 when applying this technique to the subject of MSI, it became clear that the provision of MSI has many current strengths but also provides opportunities for improvement. In brief, the shoreside organization by the hydrographic community has been proven to be very effective – however great opportunities exist to improve the onboard analysis and presentation. Opportunities also exist to improve the accessibility of such essential information to non-SOLAS vessels;
 - .4 the improved application of MSI onboard vessels has been clearly identified as a user need by mariners, and work on this issue under the agenda of e-Navigation should continue; and
 - .5 the Sub-Committee is invited to consider how this type of approach may be applied to other areas of e-navigation development and the necessary allocation of resources.

¹ The preliminary set of MSI user requirements comprises twenty-five detailed user requirements.

ANNEX

PRELIMINARY USER REQUIREMENTS

Reference	User Requirement	Current solution	Strengths and weaknesses of current solution	Potential improvements from e-Navigation
ON-SHORE				
Collection				
MSI_REQ_1	The MSI SP shall enable appropriate data originators to provide reports, in accordance with international standards	MSI SPs make available contact details and relevant instructions for data originators Information received from variety of third parties via published means of contact (e-mail, fax, phone, paper, etc)	Single point of contact and well coordinated/structured. Duties are well specified in IMO resolution A.706(17) , as amended Inconsistency in format of incoming data	Greater level of automation in receipt and formatting of input data
Analysis				
MSI_REQ_4	The MSI SP shall assess and validate incoming reports to identify MSI	Manual subjective process, using charts and other relevant information	Potential for inconsistencies in working practices	Increased use of standardized decision support tools
Presentation				
MSI_REQ_5	The MSI SP shall format all MSI in a form suitable for subsequent integration and presentation on board all vessels	Guidelines published for different types of warning	Format used dictates presentation to end user. Potential for inconsistencies in working practices	Separation of data format from presentation offers flexibility in on-board presentation, which will require a published standard
Exchange				
MSI_REQ_6	The MSI SP shall make available MSI relevant to their scope of responsibility	MSI SPs pass information to other MSI SPs that is out of their scope of responsibility (i.e. NAVAREA, NAVTEX service area, etc.) MSI SPs monitor the on-air output of other MSI SPs	MSI SP relationships are well established Exchange of information is unstructured And <i>ad hoc</i>	Establish efficient and robust exchange mechanism providing information in known format
MSI_REQ_10	MSI shall be available to all users to whom each item of MSI applies – in both location and time	Variety of different broadcast methods and schedules In-force bulletin used for MSI no longer being broadcast	Repeated transmissions necessary to ensure that users receive the broadcast	Improved availability of all valid MSI, regardless of date of issue
MSI_REQ_11	MSI shall be available to all types of vessel, including both SOLAS and non-SOLAS vessels	Different technologies used for ocean and coastal MSI. Coastal NAVTEX service and RT more suitable for non-SOLAS vessels. Often rely on posters and notices for communication of MSI to non-SOLAS vessels	Needs of non-SOLAS users not well catered for	Provide MSI in a standardized form that can be used to develop solutions for all sectors of the market, removing the dependency on specific equipment

Reference	User requirement	Current solution	Strengths and weaknesses of current solution	Potential improvements from e-Navigation
ON-SHIP				
Collection				
MSI_REQ_12	The user shall acquire all MSI appropriate to operational requirements	Messages are currently received by multiple systems (NAVTEX, SafetyNET, voice, etc.) and manually logged	Risk of single person error, and lack of traceability in assessment of MSI by the user	The system should display all MSI relevant to voyage planning and/or voyage execution and save a record of all MSI received
Integration				
MSI_REQ_15	MSI alarms shall be integrated with the vessel's navigation alarm system	No integration with other onboard navigation alarm systems. No electronic/computerized treatment of MSI	Solely dependent on the MSI information collector presenting MSI to any concerned people	Enables consistency of presentation of alarms to user
Exchange				
MSI_REQ_16	Users shall be enabled to exchange MSI between vessels	Currently achieved by VHF transmission	No automatic procedure/system allowing the user to broadcast MSI	More effective exchange of MSI between vessels
Presentation				
MSI_REQ_17	All relevant MSI shall be presented in a user friendly manner and in conjunction with other related navigational information	Presently not integrated in terms of location and format onboard ships	Lack of integration into the navigation system doesn't guarantee the proper treatment of the MSI	MSI information should appear like any other navigational or safety information readily available on the navigational system
MSI_REQ_18	An alarm shall be presented to the user for any MSI when it represents a threat to the safe navigation of the vessel	Currently, the only alarm that is presented occurs at the moment of receipt (EGC)	Risk that MSI is not taken into account at the moment it is needed even if it has been previously acquired	System should be able to alert the user in due time and location when any MSI becomes relevant to the safe navigation of its ship
Analysis				
MSI_REQ_24	The criticality of each item of MSI shall be analysed	Continual process of assessment, undertaken manually today	The user analysis is the sole agreed way to perform a practical and knowledgeable evaluation of MSI criticality	Should still depend primarily upon human analysis
MSI_REQ_25	The analysis of MSI shall not be at risk of single person error	MSI is solely acquired, analysed and recorded by the watchkeeper at the time of receipt	At the moment it is at risk of a single person error	e-Navigation should provide a phased MSI alarm system to assist risk avoidance