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SUPPORT OF MARITIME EDUCATION AND TRAINING SYSTEMS FOR THE IMPLEMENTATION OF THE ISM CODE

ABSTRACT

The problem of the safety improvement and pollution prevention in maritime transport has become more and more critical and urgent to solve. In fact, the number of accidents at sea has increased very quickly over time. Concern is growing about poor qualification on safety and poor management standards in shipping industry. The ISM Code (International Safety Management Code) aims to provide international standards for safe management of ship operations and for pollution prevention. The paper, which presents a part of the work done by the University of Trieste - ISTIEE within the framework of the METHAR project, aims to identify the expected support from the Maritime Education and Training (MET) systems to implement the ISM Code, consequently improving safety and preventing pollution. The paper describes first the origin, the objectives of the ISM Code and the standard requirements on MET identified by the Code. Secondly, it summarises the opinions of the operators collected through questionnaires. Finally, it identifies the possible enrichment of the MET system in order to better optimise the implementation of the Code.

KEY WORDS

maritime transport, International Safety Management Code (ISM), safe management of ship operations, pollution prevention, seafarers' qualifications

1. INTRODUCTION AND METHODOLOGY

Over the last five decades the world of maritime transport has been characterised by a rapid development in advanced technologies and automation both of navigation systems and ship design and construction. As a result, there has been an increasing demand for seafarers with specialised skills in new technologies. At the same time, however, increased world competition in the maritime industry has pushed companies to cut costs in all areas, including personnel. Consequently, the number of staff has been reduced and the demand for seafarers from countries with low la-

bour costs has increased. The skills of seafarers have gradually deteriorated as the standards of education and training in most of the labour supplying countries have not kept pace with changing technology. The reduction in the number of staff, in particular ships' officers, and their professional standards has had a damaging effect on the quality of operations.

The aim of the METHAR project [1], developed within the Fourth Framework Programme of the European Commission's DG VII, is to propose improvements in the Maritime Education and Training (MET) systems, as well as their harmonisation at the European level.

Research has highlighted one of the present gaps in seafarers' qualifications, which has to be filled. This gap is the problem of how to guarantee safety onboard, that is, how to prevent injury to people and damage to property and the environment. In fact, statistical analyses suggest that about 80% of all shipping accidents are caused exclusively by human error and only the remaining 20% is of technical nature. Furthermore, the action or non-action of operators plays a part in every accident, including those where equipment and technical instruments appear to be the direct cause. Thus, there is a need for a pro-active approach to safety which should address the underlying root causes of accidents.

In recent years IMO and in general the international maritime community have concentrated their efforts on developing a fundamental document, namely the ISM Code (International Management Code for the Safe Operation of Ships and for Pollution Prevention) [2]. The code, establishing international standards for the safe management of ship operations, aims to ensure that seafarers and the personnel ashore, at all levels, are informed and equipped to fulfil their safety responsibilities. In other words, staff should have a full understanding of the consequences of every action affecting safety or pollution prevention.

Within this framework, the aim of our paper, which reflects the work done under the METHAR project, is to identify the support that maritime operators expect from the national MET systems in implementing the ISM Code and how this system of education and training can be improved in order to contribute to a better seafarers safety qualification.

Our objective is reached by using bottom-up methodology: the operators, who face the reality of navigation problems, are the only people able to identify the exact needs and make suggestions for better qualification. We have therefore used a questionnaire which we sent to all the categories of European maritime operators, that is, ship owners, port managers and pilots. In fact, we see MET issues within a framework of integration of on-board and on-shore positions.

Secondly, we analysed the responses to the questionnaire and we summarised the operators' responses, presenting critical review of some aspects of education and training in the maritime world.

2. THE ISM CODE

2.1 Origin and application of the ISM Code

The origin of the ISM Code (International Safety Management Code) can be traced back to the late 1980s, when concern was growing about poor safety qualifications and poor management standards in the shipping industry. The code, in fact, establishes an international standard for the safe management of operations on ships by setting rules for the organisation of the company in relation to safety and pollution prevention and for the implementation of a Safety Management System (SMS). The emphasis is on the improvement of the quality of shipboard operations. In fact, once the quality of operations is established, safety is automatically taken care of.

In 1989 IMO, the United Nations agency, adopted *Guidelines* on the problem of safety. In 1991 it revised them and in 1993 these guidelines became an IMO recommendation. Finally, it was felt that the code was important enough to become mandatory. Therefore, through the IMO Resolution 741 (18), the code was adopted as an amendment dated 24 May 1994 to the International Convention on Safety of Life at Sea of 1974 (SOLAS) [3]. It added a new Chapter (n. IX) to the Convention entitled "Management for the safe operation of ships". The code itself is not actually included in the convention, but it is made mandatory by means of a reference in Chapter IX. SOLAS, and consequently the code has been accepted by 137 states whose combined merchant shipping fleets represent more than 98% of world tonnage.

The ISM Code entered into force under the tacit acceptance procedure on 1 July 1998 [4]. It applies to

certain types of ships, that is, passenger ships, oil tankers, chemical tankers, gas carriers, bulk carriers and cargo high-speed craft of a minimum of 500 gross tonnage. It will apply to other cargo ships and mobile offshore drilling units of 500 gross tonnage and above, after 1 July 2002.

According to an inquiry carried out by the IMO Secretariat, approximately 78% of the ships due to comply with the code by 1 July 1998 met the target in time, and less than three months before the 1 July deadline the majority of ships had accomplished the task. Furthermore, many governments have already announced their intention to control rigorously the application of the code by barring entry into foreign ports to all ships which do not carry the necessary certification (see par. 2.2). Moreover, many protection and indemnity clubs have said that they regard compliance with the code as a condition for cover.

2.2 Objectives of the code

As mentioned above, the purpose of the ISM Code is to provide an international standard for the safe management and operation of ships and for prevention of pollution. The aim of the code is to have major impact on the management and internal structure of shipping companies. It emphasises the role of sound management in safety and pollution prevention and establishes guidelines to improve ship operations and the safety management system.

In accordance with the guidelines on the application of the ISM Code [5] the objectives of the code, and therefore the safety management objectives, are:

- to provide safe practices in ship operations and a safe working environment;
- to safeguard against all identified risks;
- to continuously improve safety management skills of personnel ashore and aboard ships, including preparing for emergencies related both to safety and environmental protection.

Each company, that is, "the entity which is responsible for the operation of the ship", has to develop, implement and maintain a **Safety Management System (SMS)** which includes a clear and concise safety and environment protection policy, instructions and strategies to achieve the objectives of the policy, defined levels of authority and lines of communication between and amongst shore and shipboard personnel. The aim of these procedures is to show in detail the following aspects:

- what to do in order to ensure safety and environmental protection in compliance with international and flag state laws and conventions;
- how to prepare reports on accidents, hazardous occurrences and non-conformities according to the provisions of the ISM Code;

- how to face emergency situations;
- how to develop an internal audit and a regular review of management policy to ensure that it remains relevant and effective.

According to the basic principle of any quality assurance, the general policy and the above procedures have to be in a documented form, both aboard and ashore. The company has to establish and maintain a document control procedure, which allows personnel to revise periodically the status of the documents in order to avoid that they become outdated. All the documents have to be written in a clear and simple manner and they are collected in both office and shipboard manuals.

An SMS enables the company to plan, organise, execute and check all the operations affecting safety and environmental protection in an efficient way; the documentation system allows the company to measure its performance and to identify the activities that could be improved at the right time.

The benefits derived from the implementation of the SMS are both quantitative and qualitative. Firstly, the economic benefits are evident and of a double nature: a decrease in the number of accidents means a fall in costs, for example, in terms of ship repairs or lost load and cost savings result from improved efficiency and productivity. Furthermore, a higher level of satisfaction of clients with the improved service could increase the market share, and as a consequence the revenue of the company. Secondly, the qualitative benefits consist in an improvement in safety awareness and management skills of the personnel and, consequently, of the company morale and in the development of a safety culture. This encourages continuous improvement in the manner in which tasks are carried out thus affecting safety and environmental protection.

The responsibility for controlling the effective application of the ISM Code is assigned to each individual administration, that is, the state to which the flag of the ship belongs. The administration has the power to issue both the "Document of Compliance" (DOC), which attests to the compliance of the company with the requirements of the code, and the "Safety Management Certificate" (SMC), i.e. a document certifying that the ship operates in accordance with the approved SMS.

3. SUPPORT OF THE MET SYSTEMS

Once it is understood that the ISM Code and the SMS are key factors for achieving the goal of increased safety in maritime operations, it becomes evident that personnel at every level must have the required knowledge, skills, competence and appropriate

attitude. These qualities need to be much higher for the people who are responsible for the operations and control activities both on board and ashore, that is, the ship officers and the company management.

In this respect, a good system of education and training for seafarers, officers and management ashore appears to be of crucial importance.

In order to understand if the present MET systems are able to give substantial support to the implementation and maintenance of the ISM Code or not, we summarise the standard requirements of the code in terms of qualifications of the personnel. Then, we identify the needs of the operators in relation to the responses given in the questionnaire and, as a consequence, the areas in which the qualifications are in need of improvements. We attempt to answer the following question: *In conformity with operators' opinion, how can the international MET system be improved?*

3.1 The standard requirements of the code

Even if the ISM Code does not prescribe special standards for education and training, it outlines, in several parts, the importance of good qualifications for personnel.

First, it forces the company to provide human resources of good professional standard suitable for the tasks to be performed. The allocation of adequate human resources, as well as material and financial ones, should not be underestimated [6].

In accordance with the ISM Code, staff designated for the implementation and control of the SMS should be qualified and experienced in safety and pollution prevention and fully conversant with company policy.

The master is considered to be crucial in achieving the ISM Code objectives and in providing good links between ship and shore. He is qualified to command, must have the required level of training, and hold the appropriate international certificates.

It is expected that the crew have the required skills in order to be able to perform both under normal conditions and in emergency situations. Seafarers should be certified in accordance with national and international requirements and be medically fit. They must be conscious of their SMS duties and familiar with all the published conventions such as national legislation on safety and pollution prevention and with flag administration requirements. Moreover, they should be able to communicate among themselves and with the passengers. This ability should be required at the crew recruitment and appraisal stage. Finally, qualified people ashore should be in charge both of monitoring the correct maintenance of the SMS procedures and of providing adequate technical support to ships as well as rapid and efficient feedback [7].

Competent, qualified and experienced personnel should carry out periodical audits and inspections in conformity of the SMS to its objectives.

All the qualities and values mentioned above for the people responsible for operations and control, both on board and ashore, should be developed, added to or modified as appropriate.

Furthermore, the company has the task of periodically checking the validity of recorded qualifications and organising safety-training drills for emergency situations in accordance with procedures defined in the SMS.

More precise indications on the standards of competence and qualifications that the personnel must have in order to apply the ISM Code are given in the "Guidelines on the Implementation of the ISM Code by Administration" [5].

According to these guidelines, personnel who participate in the verification of company compliance with the requirement of the ISM Code should have the following basic skills:

- qualification from a recognised tertiary institution in the field of engineering and physical sciences (minimum, two years programme) or, alternatively,
- qualification from a marine or nautical institution and relevant sea-going experience as a certified ship officer.

Furthermore, the staff should have competence, skills and training in:

- knowledge and understanding of the ISM Code and other mandatory rules and regulations;
- assessment techniques in examining, questioning, evaluating and reporting;
- technical or operational aspects of safety management and pollution prevention;
- basic knowledge of shipping and shipboard operations;
- participation in at least one marine related management system audit.

Personnel in charge of the initial and periodical verification of compliance with ISM Code requirements should have at least five years experience in areas relevant to the technical or operational issues of safety management and have already participated in a minimum of three verifications.

Finally, the guidelines strongly recommend that the organisations performing ISM Code certification implement a documented system for qualifications and the updating of the knowledge and competence of the personnel involved. This system should include both theoretical training courses and practical tutored training, covering all the skill requirements and the appropriate procedures connected to the certification process.

3.2 The operators' needs: the results of the questionnaire

The results of the questionnaires sent to the operators show that all of them think that MET should give substantial support to the implementation of the ISM Code. However, the majority of them considers the organisation of some practical training onboard, in conformity with the above mentioned guidelines, to be of equal importance.

The person to be designated to implement the Safety Management System (S.M.S.) should be a master mariner, if possible with long experience at sea on various types of vessels or a person ashore from the company management or both of these.

In order to keep in touch with problems onboard, that person must have some experience as an officer - a minimum of 5 and a maximum of 25 years. Only one respondent required experience of 35 years.

As required by the code, almost all the operators have already designated a person for a periodical verification of the SMS efficiency. In some cases this controller is the same person designated for the SMS implementation. In other cases a small group of people from the land-based organisation who are certified to audit the vessels or, the master and a person ashore from the company's top management, are given the task. The people who carry out the verification must have some experience in navigation: ranging from 2 to 5 years.

A high percentage of the respondents agree that it is very important to revise the international education and training syllabus for the certificate of competency in order to completely achieve the objectives of the ISM Code. This aim could be reached in the following ways:

- by redefining the objective standards development;
- by revising some teaching subjects, for example introducing a module which explains the aim and the importance of the ISM Code, and practical guidelines to a better implementation of the code;
- by adding specific courses on environmental protection and Total Quality Management;
- by a greater international standardisation of certificates, both for the competency level and contents;
- by extending of the mandatory practical period.

The qualification and the requirements that the personnel on board and ashore should have, in order to achieve the objectives of the ISM Code are largely considered to be the following:

- a greater awareness of safety problems and environmental ethics;
- specific training in ISM administration and auditing, for example an ISM audit training course;
- knowledge of the ISM Code and the quality manual of the company;

- experience in auditing and in ship management;
- specific qualification: a university degree for the top management and technical qualifications for the department managers.

Finally, nearly all the operators highlighted the development of new technologies in achieving the objectives of safety and environmental protection. The most important technologies for such a task are those related to reducing injury to staff and damage to property and, to increasing safety onboard in general. The following are examples:

- automation and I.T.
- ECDIS
- GMDSS
- VTS
- PCS (Port Communication System)
- technologies related to voyage planning
- technologies related to cargo handling.

As a consequence, the standards of education and training have to keep pace with the new technologies. Moreover, by creating a very flexible educational background, the MET systems have the task of enabling graduates to rapidly and efficiently adapt themselves to the development of technology over time.

4. CONCLUSIONS

An exhaustive and critical analysis of the answers provided in the questionnaires highlights three main aspects.

The first is the general awareness that national MET systems should help the operators in implementing the ISM Code and in auditing its application.

Secondly, a general revision of the syllabus and the harmonisation of MET systems and international certificates is considered of high importance. In particular, there is an evident need to include in the present programmes, lessons on safety management and environmental problems, quality systems, and techniques of examining, evaluating and reporting. The purpose of the ISM Code, the Safety Management System and the guidelines for their implementation need to be underlined.

Finally, since the evolution of the technology seems to give substantial support in achieving the objectives of the ISM Code, the use of new technologies should be included in the education and training programmes for personnel aboard and ashore. In fact, even if 20% of accidents involves technical instru-

ments, the immediate cause of these accidents is human error because, obviously, the equipment is moved or controlled by people.

IL SUPPORTO FORNITO DAI SISTEMI DI EDUCAZIONE E FORMAZIONE MARITTIMA PER L'APPLICAZIONE DELL'ISM CODE

Negli ultimi anni il problema di garantire una maggiore sicurezza e prevenzione ambientale nel trasporto marittimo è diventato sempre più critico ed urgente da risolvere, anche a causa dell'incremento del numero degli incidenti in mare. Si sta prendendo coscienza che nel campo marittimo vi è una scarsa preparazione su questi temi anche a livello manageriale. Di conseguenza, l'IMO ha predisposto un importante documento, l'ISM Code (International Safety Management Code), che si prefigge l'obiettivo di stabilire degli standard internazionali per una gestione delle operazioni marittime capace di garantire appunto una maggior sicurezza e prevenzione ambientale. Lo scopo dell'articolo, che presenta una parte del lavoro svolto dall'Università degli Studi di Trieste - ISTIEE nell'ambito del progetto METHAR, consiste nell'identificare quale supporto può essere fornito dai sistemi di educazione e formazione marittima (MET) nell'applicazione del codice suddetto. Nell'articolo, dopo aver descritto l'origine, gli obiettivi e gli standard formativi indicati nell'ISM Code, vengono riportate brevemente le opinioni degli operatori marittimi raccolte tramite questionari. Infine, prendendo spunto dai suggerimenti degli stessi operatori, si suggeriscono dei possibili interventi migliorativi da applicare al sistema di formazione europeo al fine di ottimizzare l'applicazione del Codice e dei suoi obiettivi.

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