INTERNATIONAL MARITIME ORGANIZATION

E

SUB-COMMITTEE ON HUMAN ELEMENT, TRAINING AND WATCHKEEPING
2nd session
Agenda item 8

HTW 2/INF.2
30 October 2014
ENGLISH ONLY

ROLE OF THE HUMAN ELEMENT

IAMU understanding of some Human Element issues

Submitted by the International Association of Maritime Universities (IAMU)

SUMMARY

Executive summary:	This document provides the Sub-Committee with information on the outcome of the IAMU Forum on Maritime Education and Training (MET) in Higher Education, which was held in Tokyo in February 2014. The Forum was devoted to trends in the Industry and implementation of a quality standards system (QSS) for on board training (OBT), which is mandatory for the MET process in accordance with requirements of the STCW Convention, 1978, as amended, and the STCW Code. This document also presents some outcomes of the IAMU research project "Influence of resources on implementation of quality procedures in MET system and safety at sea" (IRMETS).
Strategic direction:	5.4, 12.5
High-level action:	5.4.1
Planned output:	None
Action to be taken:	Paragraph 26
Related documents:	None

Introduction

1 Shipping underpins over 90% of world trade, thus making the professionalism and the high level of competence of seafarers the keys to the sustainable development of the shipping industry. The education and training of seafarers, which frame Human Element performance, play a most unique and important role for harmonizing the process of sustainability. IAMU believes that the level of education which is provided by Maritime Universities and enriching the STCW Convention requirements is the right way to proceed with regards to the safety and efficiency of the shipping industry.

2 It is hardly possible to reach "Accident Zero" level in the shipping industry if seafarers do not receive adequate education and training. It is also clear that dangerous shipping practices originate from substandard MET processes, which in turn result in substandard skill levels of seafarers, both officers and ratings.

3 Maritime Universities play an increasingly important role in providing the industry with highly talented people who are capable of designing, operating and managing ships with a constant focus on optimization, safety, protection of environment and energy efficiency.

4 Building new and more technically sophisticated ships will demand well-trained and educated personnel both on board and ashore. This need presents many challenges in terms of education, training and career development of seafarers.

5 The loss of competent personnel (instructors and students) will affect the overall level of situation awareness at sea, which currently accounts for roughly 70% of maritime accidents.[1]

6 It is obvious that the STCW Code requires that all seafarers should be properly qualified for the position that they hold on board, and the ISM Code requires the company to assess and document the position of responsibility and individual competency of each crew member. And instructors, supervisors and assessors themselves are required to be appropriately qualified. However, it is recognized that the current STCW Code's levels of competencies are minimum levels to assure safe and environmentally responsible shipping and that these minimum levels are not sufficient to cope with the increasing size and complex nature of many of today's ships.[2]

7 The seafarers' success and motivation for having a long career in the shipping industry is very much influenced by their level of education and the opportunity to take a worthy position ashore; and the lack of both results in high attrition among the most capable seafarers, which may lead to a significant increase in the number of accidents at sea. In addition, the lack of qualified senior competent seafarers creates a shortage of potential MET instructors and further limits the quality and quantity of young seafarers.

IAMU Forum on MET in Higher Education Results: main statements and outcomes

8 The difficulty for seafarers today is maintaining the safety first approach in the face of pressures outside of the ship and company. They are under too much pressure from port authorities, pilots, stevedores, agents and others with an investment in the ship and its cargo but not necessarily with such a direct interest in the safety of the crew. Clear and unequivocal guidance and support from companies as required by both the STCW Convention and the ISM Code are vital to maintain the safety culture on board in the face of these pressures.

9 Maritime Universities must first ensure that those involved in education and training of seafarers have undergone a "train the trainer" course. Not everybody in the seafaring profession can seamlessly change their position from being an officer on board the ship to being a teacher at an education and training institution. Imparting knowledge requires special skills and those doing so must acquire them before they can meaningfully carry out this responsibility. Additionally, this will also ensure that the seafarers are trained to the level of competence as set out in the STCW Convention and Code – resulting in quality seafarers.

1 Grech et al. (2002); website:https://demo.leximancer.com/wiki/images/4/44/HFES2002_MGRECH.pdf

2 Alert, Issue No. 20 April 2009; website: http://www.he-alert.org/objects_store/alert_20.pdf

10 The current situation in shipping does provide a unique opportunity for Maritime Universities to undertake research activities and provide the industry with effective solutions to maintain safety at sea and environmental protection. They can also undertake further work to find solutions to reduce fatigue at sea. This would help in reducing the number of accidents.

11 IAMU is uniquely placed to take the lead in maritime education and training to provide qualified seafarers to man and operate ships engaged in international trade, as well as to provide solutions to challenges facing the shipping industry through higher education and research.

12 The first and most significant task in the education and training of seafarers is to be focused on the provisions of the STCW Convention and Code. *It should not be a goal as the first step* to try and make them professors of Maritime Universities, but to ensure that they can competently carry out their designated duties on board ships engaged in international trade in a safe, secure, efficient and environmentally-friendly manner.

13 During the Forum, attention was also drawn to the following topics:

.1 Challenges of a private sector-based MET system;

.2 Harmonization of MET;

.3 Playing a more active role in international MET;

.4 Challenges relating with insufficient number of OBT berths provided for students;

.5 Institutionalization the role of shipping industry in providing OBT;

.6 The role of Onboard Training Officer;

.7 Ensuring quality seafarers;

.8 Creating talent through knowledge and competencies;

.9 Developing competencies of the future seafarers;

.10 Complying with today's requirements while also preparing for tomorrow; and

.11 Developing post-graduate study programs.

Quality standards system for training at sea

14 OBT is a crucial type of seafarer training in which shipping companies are to be professionally involved. Referring to regulation I/8 of STCW Convention each Party shall ensure that:

.1 in accordance with the provisions of section A-I/8 of the STCW Code, all training, assessment of competence, certification, including medical certification, endorsement and revalidation activities carried out by non-governmental agencies or entities under its authority are continuously monitored through a quality standards system to ensure the achievement of defined objectives, including those concerning the qualifications and experience of instructors and assessors; and

.2 where governmental agencies or entities perform such activities, there shall be a quality standards system.

15 Through the assessment results of students who have returned to Universities after passing OBT, it was revealed that onboard training had significant gaps, which are incompatible with quality MET processes.

The main reasons for those gaps are as follows:

.1 The provisions of section B-I/8 for companies relating to OBT are not mandatory;

.2 On some vessels an OBT officer is not designated;

.3 In some companies a training officer is not designated;

.4 Training is not well organized (shortage of time to train and assess students);

.5 Students are not allowed to enter the bridge or engine room;

.6 Work on deck instead of training in engine room, and vice versa;

.7 Absence of appropriate guidance from crew members to encourage students to be trained;

.8 Lack of communication between University and Company (no relation between education and training); and

.9 Officers on board may not be qualified enough to train students.

16 Concerning the situations above, IAMU poses the following fundamental questions:

.1 Is training provided on ships in service continuously monitored through a quality standards system to ensure the achievement of defined objectives, including those concerning the qualifications and experience of crew members on board the ship?

.2 Can a training record book be recognized as a key component of the quality standards system?

17 Shipping is a global industry and it has never been more regulated, inspected and certified than today. The question is whether the global industry needs a global QSS for OBT of seafarers, or can it be covered by the ISM Code without additional administrative burdens?

Research findings on significant parameters of safety management system[3]

18 Based on Fuzzy Logic, an analytical adaptive model of the Fuzzy Inference System (FIS) has been developed. It has provided research on the relationship between significant parameters of the safety management system such as "crew workload, crew performance, manning, skill and regulations". These parameters were transformed into appropriate linguistic variables and the following main findings were obtained:

.1 Increasing the "skill" level of seafarers causes fluctuations in the crew workload and the workload goes down normally;

[3] Influence of resources on implementation of quality procedures in MET system and safety at sea (IRMETS), FINAL REPORT, IAMU, 2005.

.2 The "crew workload" is also a function of "regulations and manning systems". The "skill" may be considered as a smoothing operator. It works like a filter, smoothing the fluctuations of "workload" due to fluctuations of "manning" and "regulation" systems. In other words a highly qualified crew is the basis of stability in maintenance of due safety level even if "regulation and manning" systems fluctuate;

.3 Even if the number of regulations is "functionally sufficient" and the "manning" and "skill" of the crew is conventional, then to make the conventional work the probable crew "overload" is a common thing;

.4 There is a near-linear function of "manning, skill" and "crew performance" in the vicinity of their standard (conventional) values but the workload is inversely proportional to "manning" and "skill" within the same limits;

.5 It is obvious that rules are meant to save costs or time or to increase safety levels … etc., but they have cost and time-increasing effects themselves. When governance rules cost more than they deliver; the situation can be identified as overregulation. A lot of safety problems were due to overregulation;

.6 The impact of "overregulation" is very similar to the lack of regulation. Overregulation is dangerous, as it distracts seafarers from performance of their direct official duties frequently to satisfy the ship inspectors. This is the main reason of so-called "paper safety", "paper security" and "paper quality";

.7 "Overregulation" is catastrophic for ship (company) when there is a "shortage of crew", especially if they both exist together with "low crew qualifications". It is accompanied by an enormous "overload". "Overregulation, unskilled seafarers" and "overload" go together, and they create the vicious circle of "continuously raising of overregulation level";

.8 Even in conditions of stiff competition, "overregulation" in the shipping industry can be avoided or its negative impact can be reduced by educating and training highly qualified seafarers, company shore-based staff and ship inspectors;

.9 Decreasing of seafarer's qualification is equal to increasing his/her "workload". It entails increasing the fatigue level and reducing the level of safety, security and the attractiveness of shipping industry;

.10 One of the causes of "overregulation" in the shipping industry is cheap and poorly-qualified crews;

.11 Functional overlap in regulations (in a context of model) gives essentially smaller workloads for qualified crew than "overregulation" does;

.12 The "functional redundancy in regulations" operates to improve their reliability and consistency if the "crew resources" are not lower than standard;

.13 The high absolute value of workload gradient or task complexity gradient (short transitional periods) is the most dangerous to the safety and security of the ship. This may be while the following activities, procedures or situations are carried out on board in a short time interval, such as: the relief of the watch, changing of a crew, reducing and even increasing the number of a crew, entering in force the new regulations, approaching and leaving the port, increasing or reducing the security level … etc.;

.14 Increasing the complexity of the task is equivalent to degrading the crew "skill"; and

.15 Lack of coordination between different kinds of activities makes shipping a very dangerous enterprise. For example, while entering in force of the new regulations the shipowner reduces the number of crew and degrades its skill or it may be the planning of the security drill while loading the ship…, etc. The industry needs some sort of coordination instrument.

Associated outcomes

19 Economic principle of Pareto optimality: "an allocation of resources is efficient if it is not possible to make one person better off without making at least one other person worse off". Interpreting the economic principle of Pareto optimality, a conclusion can be drawn as follows: it is impossible to maintain the efficiency of the shipping industry while reducing the cost of MET but not raising in a timely manner the cost of safety and protection of the environment by additional regulations.

20 Based on the developed ideology and FIS research results we can conclude that the Minimum Redundancy Principle (MRP – a little bit more than needed) in Crew Resource Management and manning is a reasonable principle in spite of any influence of economic pressure.

21 Why the MRP is needed in Crew Resource Management and manning?

.1 The MRP is necessary to maintain the level of reliability and safety at sea.

.2 The manning should be minimally redundant to avoid crew overload in even standard situations, or in cases of emergency.

.3 Rules and regulations should have the minimum functional redundancy to provide alternatives in case one component fails.

.4 Qualification of seafarers should have the training and educational redundancy being added by experience to provide better situation awareness.

.5 Seafarers should have opportunities for minimum redundant hours of rest to avoid fatigue.

.6 Crew performance should be higher than standard to provide the appropriate safety level in external disturbances.

.7 All of these points are achievable if the MET system is a system of excellence.

22 Low crew qualification is the catalyst of the race between regulations and bureaucratic procedures, resulting in increasing the administrative burden.

23 It is necessary to differentiate the two terms: minimum redundancy and over-redundancy. Electronic Data Interchange may considerably increase workload on minimum crew because of easier information interchange procedures, as the desire to increase the information flow is a fact. Nowadays, information overload is due to over-redundancy (Integrated Bridge System) and over-reporting (ISM Code, ISPS Code). It leads to an increase in mental workload for the crew. The restriction on information flow is necessary, otherwise it is possible to expect that "paper safety" will be transformed to a new IT phase not addressing real safety due to the "curse of dimensionality".

24 Another viewpoint in favour of MRP is as follows: If a safety management system (SMS) or a quality management system (QMS) is not provided with adequate resources from its surroundings, it can be considered a closed system. If an irreversible process occurs in a closed system, its energy dissipates and entropy always increases, according to the second law of thermodynamics. In other words the system degrades, and the level of safety decreases with it.

25 To maintain the system at appropriate (safety, energy, information) levels there should be resources adequate to changes of its environment, but always the involving of resources occurs with some delay concerning these changes. Wisdom of management consists in forecasting the situation and pumping or saving the (minimum) redundant system resources for maintenance of its ability to work in new, and sometimes unforeseen, circumstances.

Action requested of the Sub-Committee

26 The Sub-Committee is invited to note the information provided.