Proceedings of
The 11th Annual General Assembly
International Association of Maritime Universities

Technical Cooperation in Maritime Education and Training

Editors :
Prof. Jin-Soo Park
Prof. Ki-Joon Kim
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Korea Maritime University
Busan Korea
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On behalf of all professors, staffs and students in Korea Maritime University (KMU), I am very pleased to host the 11th Annual General Assembly (AGA) of the International Association of Maritime Universities (IAMU) in Korea Maritime University, Busan, Korea from October 15 to 18, 2010.

Looking back past 10 years, host universities of IAMU – Russia, USA, Ukraine, China, Sweden, Australia, Egypt, Japan, and Turkey have contributed significantly to setting global network and friendship in the fields of maritime education, training and research among IAMU members.

Now in 2010, IAMU is stepping up its endeavor to achieve measurable and worthwhile outcomes in a range of academic research and practical applications associated with maritime education and training, through the cooperation among all members. Thereby the major final goal is to contribute to the enhancement of maritime safety and environmental protection. At AGA11, we will see how these IAMU activities are going on and share the real feel of colleagues.

As you well know, IMO, in association with relevant non-governmental organizations of maritime industries, has launched "Go to sea!" campaign, and its Council has agreed with the theme for the World Maritime Day of this year as "2010: Year of the Seafarer". We are happy to hold the annual assembly of IAMU with "Technical Cooperation in Maritime Education and Training" as its theme in this global atmosphere.

With Forty-three papers being presented at the 11th AGA, we expect to have an informative and innovative discussions among all maritime colleagues, and hope that our mutual collaborations will continue to make an effective global maritime education and training.

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Chair of AGA11 Local executive committee,
President of Korea Maritime University

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AGA11
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Jin-Soo Park, Ki-Joon Kim and Tae-Goun Kim
Korea Maritime University

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The texts of the papers in this volume were set individually by the authors. Only minor corrections to the text pertaining to style and/or formatting may have been carried out by the editors.

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Cooperation between Constanta Maritime University and the Local Maritime Industry – A Solution for the Compulsory Training On Board

Corina Popescu
Assistant Professor, Constanta Maritime University, Mircea cel Batran Street, No. 104, Constanta, Romania, 900663
corypopescu25@yahoo.com
Anastasia Varsami
Assistant Professor, Constanta Maritime University, Mircea cel Batran Street, No. 104, Constanta, Romania, 900663
anastasia.varsami@yahoo.com
Radu Hanzu-Pazara
Lecturer, Constanta Maritime University, Mircea cel Batran Street, No. 104, Constanta, Romania, 900663
raduhanzu@yahoo.com

Abstract Maritime students' training as far as seagoing experience is concerned represents a sensible issue for maritime universities all over the world. The main question is how could this be done if a training ship is missing? A solution to this problem could be a protocol signed with crewing agencies. Closing this protocol, crewing agencies have a responsibility in training the young students for serving their compulsory periods on board merchant ships in order to get their officer on watch licence. A good example is given by Constanta Maritime University that has such a signed protocol with over 20 crewing agencies and it has been noticed that it has been working properly.

On board maritime students' training became a very important component of the maritime education process since the International Maritime Organization (IMO) introduced seagoing as an integrated educational part for future seafarers.

Over the generations, the education of professional officers has undergone many evolutions. Today's maritime universities, academies and faculties using advanced methods of teaching, modern simulators and other sophisticated equipment have not to forget that practical training on board a ship plays an invaluable role in officers' education. On board practice gives students and Apprentices an opportunity to practice their skills under the control of experienced seafarers. Thus, this means that shipping companies need to have a certain standard for employing when commencing collaboration with crewing agencies all over the world and those young future officers should pass several tests before being accepted on board merchant ships. In the same time, the company should provide the best training programme for these Apprentices as it is in their interest to have well trained officers.

In this paper we are trying to point out the fact that a proper training programme of future officers means combining simulator hours (Radar Training, Ship Handling Training, and Global Maritime Distress Safety System – GMDSS Training) provided by the Maritime University (in this particular case Constanta Maritime University) with the experience acquired on board merchant ships inside a multinational crew.

Keyword: *maritime education, maritime university, training on board, crewing agency*

1. Maritime Education and Training

The quality improvement of the Maritime Education and Training system is an issue which strongly impacts worldwide the competitiveness of the shipping sector. However, Maritime Education and Training is a really expensive Education and Training system as it requires high investments and incurs high running costs. Taking into account the present economic crisis, all the maritime institutions (universities) should consider cutting their costs in order to survive but in the same time not to reduce the quality of Education and Training. Training on board training ships or training on board merchant ships is a sensible issue for all the maritime universities. The main question is if this training on board should continue or there could be another solution for training the cadets for the required 12 months (this could be done through a protocol with the main shipping companies).

Maritime Education and Training is expensive education and training system, particularly if costly equipment, such as simulators and training ships, is purchased and operated which is considered to be a necessary prerequisite for offering high-level Maritime Education and Training. This situation, which suggests sharing or concentrating these resources, which are worth several million euro and incur considerable running costs, is acerbated by the reduced number of students at many Maritime Education and Training institutions. It leads to the theses that not all institutions can offer high-quality Maritime Education and Training (particularly not those which cannot afford expensive equipment) and that Maritime Education and Training is more expensive than it needs to be. These arguments make it necessary to have a closer look at costs and financing of Maritime Education and Training to investigate the constraints in the present economic conditions.

Rapid evolutions of technologies, increased globalization of information, communication and economy will occur. Therefore, it is compulsory for the Maritime Universities to catch up with the technologic advancements and to improve the quality standards in order to remain viable and competitive, to design the education of next generation and to compete with the other universities. In the present economic conditions, these can be done if the costs for training the students on board training ships are reduced, so that the money can be redirected.

Constanta Maritime University considers education along with scientific research to be the most important factors of economical growth, and human resources are seen as the main condition for permanent development and innovation. That is why every higher education institution should target first towards identifying, training and developing students' innovation, creativity and originality capacities.

On these lines, traditional teaching and evaluation practices are considered to be out of date on the background of nowadays economical, social and cultural conditions. Constanta Maritime University, through all members of the academic community, promotes the concept of innovative university, with a specific interest towards practices allowing educational activities' to focus on student's needs. The suggested education system is an open and flexible one, able to easily adapt to all requests coming from the world maritime industry and connected legislation such as 1995 STCW Convention.

2. Training the Apprentices

2.1 Training inside Constanta Maritime University

Constanta Maritime University is training engineers for navigation and naval engineering field, according to the national standards developed by the Ministry of Education, Research and Innovation, and to the international standards elaborated by IMO (International Maritime Organisation). Apart from the evaluations made by the Ministry of Education, Research and Innovation, the University's curricula are assessed and approved by the Romanian Naval Authority considering the legislation and recommendations of the International Maritime Organisation, and of the European Agency for Maritime Safety and thus, the certificate of competency has international recognition.

The Bachelor of Science degree graduates have the advantage of a double certification. They get:

- Engineer diploma in the Naval Engineering and Navigation field (the European equivalent of Bachelor of Science diploma);
- Officer of a Navigational/Engine Watch.

Constanta Maritime University is fitted with simulators and laboratories with software for each specialty discipline thus every student from each faculty gets the best theoretical training before going on board merchant ships as Apprentices.

Constanta Maritime University is particularly aiming at providing training by IMO courses for the students of all maritime specialisations as well as guiding students who carry out onboard training. First year students are attending four IMO courses necessary to get the seaman's book and apprentice deck officer certificate.

As a result of the examinations that take place at the end of the classes the graduates will get certifications of graduation for each course. All the students that have passed the IMO classes and the medical tests get the Seaman's Book and the Apprentice Deck/Engine Officer certificate from the Romanian Naval Authority. As a consequence, students can be trained on board merchant ships. This period of training (12 months) is compulsory for getting the deck/engine officer certificate of competency. Students' training can be performed on board merchant ships of 500 TRB or above, on international voyages.

Also, the University develops programmes for the continuous training of students. *Bridge/Engine Team Management* course aims to familiarize students with the bridge/engine systems operations considering the special conditions of ship operation and to perform teamwork procedures required on board the ships. This course consists of drills based on bridge/engine simulation. The drills are supervised by an instructor and a technician who, initially, will allow the students/officers to familiarise with the instruments and controls found on the bridge/engine room of a merchant ship. The student/officer will be able to locate and use the bridge/engine room equipment in normal operating conditions.

The exercises get more and more difficult and the student/officer gets accustomed with the procedures used for turning on the navigation/engine room equipment. Every exercise is preceded by a briefing and followed by a group discussion - debriefing, in which the actions and decisions taken by the student/officer are analysed.

During exercises, every student/officer will play different roles within the bridge/engine team and will have the possibility of taking part in all the operations done during the watch, covering all the steps in the chain of command of the navigational bridge/engine room. The scope of these exercises is to achieve the following goals:

- Familiarisation with the use of instruments and controls from the navigational bridge/engine room;
- The ability of making decisions;
- Organising the bridge/engine team;
- Understanding the individual role in the chain of command while working in a team;
- Understanding the specific tasks according to certain situations;
- Understanding the necessity of a good planning, the following of step by step check lists, and the scheduling of each specific procedure;
- Good understanding of the watchkeeping procedures;
- Getting the expertise in identifying the operational problems and solving them;

Global Maritime Distress and Safety System Long Range Operator's Certificate Course -GMDSS LRC is another course provided by Constanta Maritime University and consists of the students' familiarisation with the issues considering the fundamental theoretical concepts about: maritime radio - communications and satellite equipment and systems (SMM - Maritime Mobile Service and SMMS - Satellite Mobile Maritime Service), communication techniques used in GMDSS, radio frequencies, GMDSS functions, and communication procedures etc.

The goal of training is to achieve abilities for operating, testing and maintenance of the GMDSS equipments and systems provided and set up on yachts and pleasure boats.

This course is both theoretical and practical, aiming at complying with the requirements of the curriculum for SMMS - GMDSS - LRC Radio Operator Certificate, issued according to that specified in A IV/2 STCW Code, the CEPT ERC/REC 31 - 05 E recommendations and to IMO courses models and ITU documents.

2.2 Training On Board Merchant Ships

According to the STCW Convention requirements, the sea time necessary for obtaining the watch officer license should be minimum 12 months.

Over the generations, the education of professional officers has undergone many evolutions. Today's maritime universities, academies and faculties using advanced methods of teaching, modern simulators and other sophisticated equipment have not to forget that practical training plays an invaluable role in officers education. On board practice give students and cadets an opportunity to practice their skills under the control of experienced teachers and seafarers.

As previously mentioned, practical on board training of maritime students became a very important component of the maritime education process since International Maritime Organization (IMO) proposed seagoing as integral educational part for future seafarers. So, the training of the future Romanian officers is performed by combining the simulator hours (Radar Training, Ship Handling Training, GMDSS Training) inside Constanta Maritime University and the training on board merchant ships.

On Board Training Record Book includes sea training tasks for deck cadets. During this training, the cadets gain professional skills and experience necessary in the work as a watchkeeping officer. On board training skills gained according to the program included in the Training Record Book fulfil the minimum requirements for certification as an officer in charge of a navigational watch. During sea training the cadets learn to combine theoretical knowledge obtained during the classes from Maritime University and practice. It allows the future watchkeeping officer to learn the job on board modern and automated seagoing ships. Sea training properly integrated with theoretical education is necessary for an officer of a contemporary ship. Practical training should be compared under supervision of the Master, Chief Officer and designated supervising officers. Properly filled Training Record Book is evidence that the trainee has achieved professional skills and experience required in the standards of competence according to the Code A of the STCW 78/95 Convention. That is why the Training Record Book should be precisely filled up.

There is also another important issue to be taken into account and that is the multicultural crew that will be on board a merchant ship. Nowadays, the shipping industry is a multinational one. All activities in this industry are based on interaction and collaboration between people from different countries and cultures. In an international company these details are common, due to company necessity in having offices placed in different countries according to business interests. But these aspects become more complex when we refer to onboard ship activities. For this reason it is necessary to observe and study the kind of compatibilities or non-compatibilities that exist between seamen from different countries in order to create a proper working environment on board the ship. These problems are even more important when we talk about a person at the first experience on board the ship and especially in a multinational and multicultural crew. This category includes cadets and young officers who made their practice stages on board merchant ships under international flags.

Facing multicultural working environment, many seafarers have accommodation problems, difficulties in working relationships onboard and the biggest problem has been created by the use of a foreign language, mostly Maritime English, in the daily duties communication.

The multicultural problems are hard to be managed at the first contact and here we refer to young maritime cadets and officers, persons who can be very affected by the difficult relation with people that have a different nationality. A solution can be represented by the involvement of the training institutions in preparing the young cadets for a multicultural work environment. Before their first experience onboard ships, a special training about multicultural concepts and social activities in a multicultural crew can prove to be useful in order to offer the necessary knowledge about how to deal with problems raised by cultural differences.

Maritime English represents another problem for students. It is a fact that the language barrier on board ship can be overtaken only if students really master Maritime English, so it is important for them to work in a multinational crew in order to get used to speaking in a different language other than their mother tongue.

2.3 Solution for Compulsory Training on Board

In our opinion, in order to obtain the best training for young cadets on board, it is much better for the Maritime University to sign a collaboration protocol with the shipping companies. This way, students have the opportunity to work in a multicultural environment and to get used to it; they have the opportunity of improving their Maritime English and the opportunity of learning from experienced seamen. Also, the shipping companies can form their future officers as per their company policy and on their type of ships. It is in their interest to train the apprentices the best they can in order to have on board well trained officers after the students ended their 12 months period of training on board. On board merchant ships, there are usually one, two or maximum three cadets, so the entire attention of the officers focuses on training fewer people than on board a training ship where there are more cadets (some training ships can accommodate up to 30 students) and so it is rather difficult to properly train each one of them and to make sure that they fully understand their responsibilities. But there is also the reverse side of the coin for the shipping companies – the students they take on board could have a poor theoretical background or they might not adapt to the sea life, so the Master could be forced to disembark them and so the company could lose the money invested for bringing them onboard.

Constanta Maritime University is a good example of a maritime institution that uses a protocol with the most influent shipping companies in Romania. In 2004, the University suspended the students' training on board the training ship "Neptun". Since then, the solution found for training the deck and engine cadets was to send them in international voyages with different shipping companies, local or international and for this action the local crewing agencies or owners' offices have been contacted. This was the first step, when over half of our students covered their requested on board training on ships belonging to different owners, most of them, international shipping companies with a well known name on the world shipping market, as AB Crewing, Ofer Brothers (Management) Ltd., Dohle Manning Agency, SeaTrans Crewing, Barklav, Cosena, Zodiac Maritime Agencies Ltd., Histria ShipManagement, Smart Group, Maersk Romania, V Ships Manpower, Fair Play Maritime, Navmar Incorporated Ltd., Triton Company, Bright Maritime Service, Rickmers Marine Agency Romania, Kru Maritime, Capital Ship Management, Stargate Crewing Agency, Tigitrans S.A., Cardinal Shipping Services, CMA Ships Romania.

Recruitment for onboard practice of cadets is done by the Crewing agencies in consultation with the school lists of students (by agents) and the test imposed to the cadet who goes into effect (specialized English tests, interview with a manager or crew manager on general maritime knowledge, logic, test insight and psychological profile). The main objective of the onboard training is to achieve the standards of competence specified in the STCW Code.

Therefore, Constanta Maritime University is a good example of how not using a training ship can work and this way the money that should have been invested in a new training ship were actually spent for training the teachers, for acquiring last generation simulators, for investing in a high standard material base, for improving the library with the latest editions of the required bibliography and most important for developing training on board programmes that actually help the future maritime officers.

Constanta Maritime University's main objectives concerning the on board training programmes are:

- increasing students' training level in order to integrate them in the European environment and provide compatibility and comparability with European diplomas regarding quality and competencies in Constanta Maritime University study domains;
- implementing a monitoring system of graduates' hiring capacity;
- identification of the maritime and technical – economical environments' requirements and real expectations regarding each specialization graduates' competencies and correlating them with the university's experience and international (European) practice;
- continuous tracking of students', graduates' and employers' feed – back, regarding educational performance structure and quality, and improving it accordingly;
- improvement of students' practical training by increasing the number of practice jobs on board operating ships belonging to national and international companies;
- University's academic integration accomplished by promoting partnerships' development with public and private organizations aiming for supporting students' integration process in the social economical life.

Constanta Maritime University disposes of a "*Scholarship* REGULATION" and other forms of material support for students, where types of scholarships and conditions for getting them are presented. Scholarships are given from the state budget allocations and from own resources. The best example when it comes to the on board training programmes is the Japanese Ship Management Company NYK which awards scholarships of 100 EURO per month during the whole period of school to students that take and pass the selection exam of the company. Besides this scholarship, that actually represents a support for school expenses, students get a 400 – 500 EURO wage for the period they are embarked as Deck/Engine Cadets on board the company's ships.
The students performing training on board merchant ships combining with the theoretical base acquired from the University's classes obtain general competencies and abilities like:

- Usage of electronic charts and complex calculi of navigation problems based on the knowledge accomplished by: Electronic Navigation, Radar Navigation, Seamanship, Theory, Construction and Vitality of Ship, Bridge Team Management, Commercial Operation of Ship, Voyage Planning and Execution, Astronomy and Celestial Navigation, Ship Handling, Navigation in Special Conditions.
- Conducting and coordinating experiments, measurements, analysis and interpretation of obtained data and usage of techniques, special instruments and modern practices in the engineering activity based on the knowledge accomplished by: Electric Aids to Navigation, Thermo-techniques, Heat Engines, Electronic Transducers and Measurements, Mechanics, Electronic Devices and Circuits.
- Solving of managerial, communication, professional ethics, specific legislation and environment protection problems based on the knowledge accomplished by: Bridge Team Management, Maritime English, International Maritime Law, Global Maritime Distress and Safety System, International Maritime Organisations.

3. Conclusion

Nowadays, it is generally accepted that in order to maintain a safe shipping environment all seafarers across the world should observe high standards of competence and professionalism in the duties they perform on board. The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended in 1995 (STCW-95), has the role of setting those standards, governing the awarding of certificates and controlling watchkeeping arrangements. Its provisions not only apply to seafarers, but also to ship-owners, training establishments such as maritime universities and national maritime administrations.
Therefore, all Constanta Maritime University's affiliations and member qualities along with the fact that our university is evaluated every year by the Romanian Naval Authority are solid proofs of a proper implementation of the 1995 STCW Convention in our institution. All training programmes and assessments in our university are provided in connection with the STCW-95 certificate and comply with STCW-95 standards, being approved by the respective Administration in our country, the Romanian Naval Authority.
In our opinion, the costs for training the students on board training ships could be totally reduced and redirected to other more important investments and the training on board could be solved by the shipping companies that need to train their future officers. It is also a good deal for the shipping companies as they train the students as per their own purposes and they make sure that they will have well trained officers on board their fleet ships.
While the world is facing a large economic crisis, it is important to cut costs from wherever it is possible. Cutting the costs for training the maritime students can also be good for them because they have the chance of training on board merchant ships and this is not a bad thing. They can accommodate to the sealife from an early stage of their career. They can see from the beginning what the ship means (working in a multicultural and multinational crew, the responsibility for the lives of the entire crew members, for the safety of cargo and the ship itself while performing the watch and not only during this period, using a language different to their native one while working on board and so

on). This is an economy of scale that could permit the Maritime Universities to maintain their strong positions in the Maritime Education and Training.
Our final conclusion can be resumed to: as far as Constanta Maritime University is concerned from the training on board point of view, the protocol signed with the 22 crewing agencies represents the best solution for training on board because the companies offer the best conditions for students to learn and to acquire the proper experience for developing a seamanship career..

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Comparison of Training and Education in the Training Ship

Daegwun Yoon
Assistant Professor, Mokpo Maritime University, dyoon@mmu.ac.kr
Adj. Professor, State University of New York, dyoon@sunymaritime.edu
Taek Kun Nam
Associate Professor, Mokpo Maritime University, tknam@mmu.ac.kr
Jeong-Bin Yim
Professor, Mokpo Maritime University, jbyim@mmu.ac.kr
Young-Sup Ahn
President, Mokpo Maritime University, ysahn@mmu.ac.kr

Abstract The research regarding maritime cadets' training and education onboard training ships is compared among the international maritime universities including United States, Japan and South Korea. By comparing the education and training these international maritime universities offer, this paper can show differences, as well as beneficial and non-beneficial aspects of training and education onboard the training ships, accordingly. In addition, it will examine the impact of the recently amended content of STCW (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers) for the training ships including ship security officer and fast rescue boat will be reviewed.

Keyword: *Training, Ship, Education, Comparison, Maritime*

1. Introduction

This article is to show to compare training and education of the training ship of three countries including the United States, Japan, and South Korea. It offers specification of the training ship, period and duration of training, method of training and calling ports. First of all, we reviewed the STCW-95 Training requirement for certification including STCT-95 Certificates, General requirement, Training Issues, On board requirement, STCW's Fast Rescue Craft Training and Ship Security Officer, and Revised STCW Convention and Code adopted at the Manila Conference, 21-25 June 2010. Objective of this article is aimed to find some difference by applying STCW and comparing with the training and education of training ship of three countries including the United States, Japan, and South Korea.

2. STCW's Training Requirement for Certification

2.1 STCW-95 Certificates

The term "certificates" covers all official documents required under STCW-95. It includes certificates of competence, endorsements, certificates of proficiency, special certificates and any documentary evidence showing that a requirement of the Convention has been met. Certificates are important as they are the main paper evidence you have on hand to prove that your level of maritime education and training, your length of service at sea, your professional competence, medical fitness and age all comply with STCW-95 standards. Every party to the Convention has to ensure that certificates are only issued to those seafarers who meet STCW standards.

2.2 General Requirement

If someone wants to be an officer in the merchant vessel, he or she must meet minimum requirements in respect of standards of competence, seagoing service time, medical fitness and age. They should be in possession of a valid certificate of competence according to their rank and functions on board. This certificate should be endorsed (in the same certificate or in a separate document) by the issuing Administration. They should also have all the ancillary certificates required such as radar or ARPA, GMDSS, and those referring to safety duties on board specific types of ships. Part 2 and part 3 of this section will give them guidance as to what certificates officers require. To know the exact requirements and standards of competence for each certificate it is consulted with chapters II (master and deck department), III (engine department), IV (radio personnel), V (training requirements for personnel on certain types of ships). VI (emergency, occupational safety, medical care and survival functions) of the STCW-95 Convention.

2.3 Training Issues

All training program and assessments provided in connection with an STCW-95 certificate need to comply with STCW-95 standards and must be approved by the respective Administration. The competence tables contained in the STCW Code (Part A) provide information on what should be included in the teaching program, the criteria by which competence is assessed, and what standard of ability the student performing that competence needs to demonstrate. These regulations apply to training given both on board and ashore (Kim, 2005). All instructors, supervisors and assessors need to be qualified and experienced in the particular types and levels of training and assessment they give. They also need to know about teaching techniques. Each education and training institution needs to have its academic and training program approved by the Administration issuing the certificate. It is common for educational and training institutions to issue their own certificates for the courses they run. Before enrolling on any course, find out first if the program offered comply with STCW-95 standards and, more importantly, if the training center has been authorized by the respective Administration to provide the courses and services offered and, where applicable, to issue STCW-95 certificates for short courses.

2.4 On Board Requirement

The STCW-95 Convention lays great emphasis on practical competence. Therefore an important part of any STCW training program is to put into practice what you have learned from books or with an instructor in a classroom. For some specific skills this is best done at approved training establishments in purpose built installations ashore (fire-fighting courses, for example). However, to gain certain other competencies the best way is to practice them at sea under the supervision of a person with appropriate training and experience. This is why it is extremely important that experienced seafarers take every opportunity to train less experienced seafarers. This is the best way of passing on knowledge to new generations of seafarers (STCW, 1995).

2.5 STCW's Fast Rescue Craft Training and Ship Security Officer

In order to taking charge of a fast rescue boat (FRB) during and after launch including as follows

- Understand the construction and outfit of FRBs and individual items of their equipment
- Know the particular characteristics and facilities of FRBs
- Understand safety precautions during launch and recovery of an FRB
- Know the procedures for righting a capsized FRB
- Be able to handle an FRB in prevailing and adverse weather and sea conditions
- Understand navigational and safety equipment available in an FRB
- Search patterns and environmental factors affecting their execution
- Assessment of the readiness of FRBs and related equipment for immediate use
- Knowledge of the maintenance, emergency repair, normal inflation and deflation of buoyancy compartment of inflated FRBs
- Operate an FRB engine, including methods of starting and operating an FRB engine and its accessories.

The training should intend for seafarers who are required to take charge of a fast rescue boat (FRB) in emergency situations during and after launch, in accordance with:

- SOLAS regulations
- STCW convention and code
- The Merchant Shipping (Life Saving Appliances) Regulations 1986
- The Merchant Shipping (Training and Certification) Regulations 1997

On successful completion of the training and assessment, the trainees will have knowledge of the construction and function of different types of fast rescue boats and associated equipment and be able to:

- FRB capsize; causes, prevention and righting
- FRB craft; equipment and operation
- FRB maintenance, operations and casualties
- Take charge of FRB's during and after launch and upon recovery
- Participation in all aspects of rescue and care of casualties from the water
- Operate FRB engines

The training for ship security officer should design to meet the requirements of the STCW section VI/5, requirements of the ISPS Code sections A/2.1.6, A/12.1 and A/12.2 and is based on the guidelines of IMO Model course 3.19. The training is needed for those who may be designated to perform the duties and responsibilities of a Ship Security Officer. After successful completion of the training, the trainees will be able to undertake the duties and responsibilities as Ship Security Officer, identifying behavior patterns of individuals likely to threaten security, detecting weapons and calibrating security equipment and systems. The training should include like maritime security policy, security responsibilities, ship security assessment, security equipment, ship security plan, threat identification, recognition, and response, ship security actions, emergency preparedness, drills and exercises, security administration, and security training (Joseph, 2006).

2.6 Revised STCW Convention and Code adopted at the Manila Conference, 21-25 June 2010

The 2010 amendments will enter into force on 1 January 2012 under the tacit acceptance procedure and are aimed at bringing the Convention and Code up to date with developments since they were initially adopted in 1978 and further revised in 1995; and to enable them to address issues that are anticipated to emerge in the foreseeable future. Major revisions to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (the STCW Convention), and its associated Code have been adopted at a Diplomatic Conference in Manila, the Philippines, thereby ensuring that the necessary global standards will be in place to train and certify seafarers to operate technologically advanced ships for some time to come (Kim, 2005). The Conference was held in Manila from 21 to 25 June under the auspices of the International Maritime Organization (IMO), the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution from ships.

The amendments adopted are as follows:

- New certification requirements for able seafarers;
- New requirements relating to training in modern technology such as electronic charts and information systems (ECDIS);
- New requirements for marine environment awareness training and training in leadership and teamwork;
- Improved measures to prevent fraudulent practices associated with certificates of competency and strengthen the evaluation process (monitoring of Parties' compliance with the Convention);

- Revised requirements on hours of work and rest and new requirements for the prevention of drug and alcohol abuse, as well as updated standards relating to medical fitness standards for seafarers;
- New training and certification requirements for electro-technical officers;
- Updating of competence requirements for personnel serving on board all types of tankers, including new requirements for personnel serving on liquefied gas tankers;
- New training guidance for personnel serving on board ships operating in polar waters; and
- New training guidance for personnel operating Dynamic Positioning Systems.
- New requirements for security training, as well as provisions to ensure that seafarers are properly trained to cope if their ship comes under attack by pirates;
- Introduction of modern training methodology including distance learning and web-based learning (STCW, 1995).

3. Specification of Training Ship and Organization of Training

As previously mentioned, this article comprises of maritime training for three countries including the United States, Japan, and South Korea. In this chapter, the specification of training ship and time period of training will show as follows, accordingly;

3.1 The United States

TS Empire State VI In 1994 the *Empire State VI* was activated by MARAD to support the withdrawal of American troops from Mogadishu, Somalia. In the 2005 aftermath of Hurricane Katrina and Hurricane Rita which devastated the Gulf Coast, MARAD again activated the *Empire State VI*. The vessel provided housing and support for port workers and petroleum industry workers as they began repairs on strategic infrastructure and facilities in Louisiana. With twenty years of service to the Maritime College, the ship holds the record as the longest serving power-driven vessel ever used by the school. She is expected to remain in use through at least 2014 (SUNY, 2007~2010).

The TS *Golden Bear* is the training ship of the California Maritime Academy (CMA), a campus of the California State University. The first training ship of the California Maritime Academy was known as the Training Ship *California State*, then as the T.S. *Golden State*. Since then, there have been three ships to bear the name T.S. *Golden Bear*. The current Training Ship *Golden Bear* was transferred to the United States Maritime Administration (MARAD) from the US Navy in 1994. She was converted for use by the CMA and transferred there in 1996.

The USNS *Tanner* (T-AGS-40), was built for the United States Navy as a fast Oceanographic Research Vessel by Bethlehem Steel Corporation at its Sparrows Point Yard in Maryland in 1990. The vessel was the second oceanographic research ship to bear the name of Zero Luther Tanner, a noted oceanographer and inventor of a patented sounding machine. The vessel experienced catastrophic engine failure in 1993 and was laid up by the Navy and eventually transferred ownership to the Maritime Administration (MARAD). Today Maine Maritime students in majors leading to a USCG Third Assistant Engineer (Marine Engineering Operations, Marine Engineering Technology, and Marine Systems Engineering majors) or USCG Third Mate (Marine Transportation Operations major) licenses participate in training cruises aboard the TS State of Maine. These cruises last about 60 days on average, and during that time midshipmen will rotate through both class and laboratory training at sea, ship's operations including deck and engine watches, as well as emergency drills. Port visits offer a time to relax, and visit other maritime nations, but also include watch responsibilities and routine ship's maintenance. The USCGC *Eagle* (WIX-327) (ex-*Horst Wessel*) is a 295-foot (90 m) barque used as a training cutter for future officers of the United States Coast Guard. She and the USS *Constitution* are the only active commissioned sailing vessels in American government service. She is the seventh U.S. Navy or Coast Guard ship to bear the name in a line dating back to 1792. Each summer, *Eagle* conducts cruises with cadets from the United States Coast Guard Academy and candidates from the Officer Candidate School for periods ranging from a week to two months. These cruises fulfill multiple roles; the primary mission is training the cadets and officer candidates, but the ship also performs a public relations role. Often, *Eagle* makes calls at foreign ports as a goodwill ambassador.

Name:	TS *Empire State VI*	TS *Golden Bear*	TS *State of Maine*	USCG *Eagle*
Owner:	U.S. Maritime Administration	U.S. Maritime Administration	U.S. Maritime Administration	The United States
Operator:	SUNY Maritime College	California Maritime Academy	Maine Maritime Academy	US Coast Guard
Ordered:	February 29, 1960	28 June 1985		
Builder:	Newport News Shipbuilding and Drydock Company, Newport News, Virginia	Bethlehem Steel	Bethlehem Steel	Blohm & Voss
Laid down:	March 1, 1961	29 July 1986	1990	15 February 1936
Launched:	September 16, 1961	4 September 1987		13 June 1936
Acquired:	April 19, 1962	31 March 1989	*June. 6, 1997*	
Homeport:	Fort Schuyler, New York	Vallejo, California		United States Coast Guard Academy (New London, Connecticut)
Type:	Training Ship/Troopship	T-AGS		
Displacement:	17,000 long tons (17,273 t)	9,319 long tons (9,469 t) light 15,821 long tons (16,075 t) full		1,784 long tons (1,813 t) full load
Length:	565 ft (172 m)	499 ft 10 in (152.35 m)		295 ft (90 m) overall 234 ft (71 m) waterline
Beam:	76 ft (23 m)	72 ft (22 m)		39 ft 1 in (11.91 m)
Draft:	25 ft (7.6 m)	30 ft 6 in (9.30 m)		17 ft 6 in (5.33 m) full load
Propulsion:	2 × Foster Wheeler Type D steam engines, steam turbines, single screw	Twin diesels, 17,000 shp (12,677 kW), single 5-blade propeller, 18'7½" diameter (5.68 meters)		1 × Caterpillar (C399) diesel engine (1980)
Speed:	22 knots (41 km/h; 25 mph)	20 knots (37 km/h; 23 mph		17 kn (31 km/h; 20 mph) under sail 10 kn (19 km/h; 12 mph) under diesel
Complement:	791 (684 cadets, 107 officers/crew)		*302*	19 officers, 56 crew, 175 cadets and instructors

Table. 1 Training Ships in the United States

3.2 Japan Training Ship in National Institute for Sea Training (NIST)

Nippon Maru was built in 1984, equipped with two diesel engines as a substitute ship "the second Nippon Maru" to take the place of the former Nippon Maru which was engaged in the sea training for more than half a century. Nippon Maru is the largest sized sail training ship that was built only by Japanese own technologies for the first time, including design and manufacture of sailing gears.

Kaiwo Maru was built in 1989 as a substitute ship "the second Kaiwo Maru" to take the place of the former Kaiwo Maru as well as Nippon Maru. Although Kaiwo Maru is almost the same size and type sail training ship as Nippon Maru, it is highlighted to adopt feathering propellers different from Nippon Maru equipped with conventional propellers. The builder/owner of Kaiwo Maru was The Training Ship Education Support Association (currently, Maritime Academy Foundation) at that time, and she was built by combining the governmental subsidy, the subsidy from the Japan Shipbuilding Industry Foundation, public subscription and a loan from a bank. NIST puts Kaiwo Maru into effect for continuous sea training by leasing her from TESA with a new mission to familiarize maritime consciousness, accepting twenty trainees from the public several times a year.

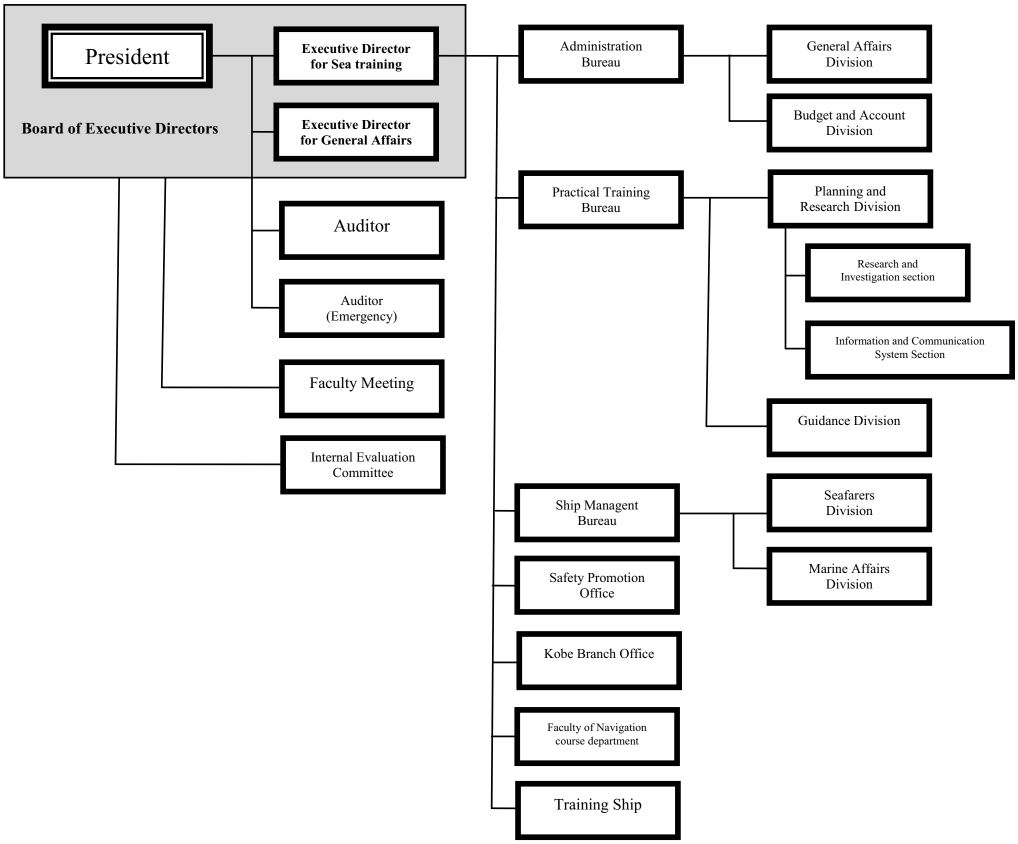
Taisei Maru was built in 1980 as a substitute ship "the third Taisei Maru" to take the place of the former Taisei Maru. Taisei Maru is equipped with steam turbine plant as its propulsion system and is a unique steam turbine training ship that has been in service since another steamer ship "Hokuto Maru" was decommissioned in 2004

Ginga Maru is the newest training ship built in 2004, equipped with a diesel engine and CPP as a substitute ship "the third Ginga Maru" to take the place of the former Ginga Maru. A new concept, that is response to the marine intelligent transport system, to modernization of domestic vessels and to functions as a training ship for the next generation, was adopted when she was built.

Seiun maru was built in 1994, equipped with a diesel engine, CPP and fin stabilizer as a substitute ship "the second Seiun Maru" to take the place of the former Seiun Maru. The engine room was located in the semi-afterpart of the hull for the first time and also designed to be able to sail an around-the-world voyage in 75 days. When she was built, new facilities such as onboard ship handling simulator, classroom in tiers, sports dome, sanitary accommodations for the cadets from abroad, and etc, were installed, considering embarkation of foreign cadets which was an additional mission newly given to her.

Name	Nippon Maru	Kaiwo Maru	Taisei Maru	Ginga Maru	Seiun maru
Flag	Tokyo	Tokyo	Tokyo	Tokyo	Tokyo
Owner	NIST	NIST	NIST	NIST	NIST
Type	Sailing Ship	Sailing Ship	Steamship	Steamship	Steamship
Launch	Feb.15, 1984	Mar. 7, 1989	Oct. 3, 1980	Dec. 12, 2003	Mar. 4, 1997
Built	Sep.14, 1984	Sep. 12, 1989	Mar. 16, 1981	Jun. 15, 2004	Sep. 25, 1997
Call Sign	JFMC	JMMU	JLPY	JFFP	JLLY
Voyage Area	Open Sea	Open Sea	Open Sea	Open Sea	Open Sea
Gross Tonnage	2,570	2,556	5,886.73	6,185	5,890
LOA(m)	110.09	110.09	124.84	116.40	116.00
Breath(m)	13.80	13.80	17.00	18.00	17.90
Draft(m)	10.72	10.72	10.50	10.50	10.80
Engine	Two of Diesel	Two of Diesel	One of Turbine	One of Diesel	One of Diesel
Power (PS)/(kW)	1,500×2/2,206	1,500×2/2,206	7,000/5,148	9,000/6,600	10,500/7,722
Fuel Capacity(kl)	433.3	432.35	1,660.7	1612.8	1,476.9
Utmost Velocity(k't)	14.33	14.09	19.22	20.5	21.0
Voyage Velocity(k't)	13.2	12.95	17.9	18.62	19.5
Voyage Distance(mile)	9,800	9,800	12,600	11,000	15,000
Complements (Cadets)	190(120)	199(128)	214(140)	246(180)	252(180)

Table. 2 Japan Training Ships in National Institute for Sea Training (NIST)



Faculty and Staff (2009)	Number
Professor	73
Associate Professor	65
Instructor	21
Teaching Assistant	7
Assistant to Professor	102
Technical Staff	137
Administrative Staff	47
Dispatched Faculty and Staff	3
Total	455

Fig. 1 Organization and Arrangement of NIST

3.3 South Korea

Table 3 shows training ships in Korea including Mokpo and Korea Maritime University, and Korea Institute of Maritime and Fisheries Technology. Each institution has run with two training ships. Specific information of the vessel is in the table.

Name	SaeNuRi	SaeYuDal	HanNaRa	HanBaDa	HanBanDo	HanWooRi
Owner	Mokpo Maritime Univ.		Korea Maritime Univ.		Korea Institute of Maritime and Fisheries Technology	
Type	Steamship	Steamship	Steamship	Steamship	Steamship	Steamship
LOA	103.00m	102.7m	102.70m	117.20m	99.8m	86.85m
Breath	15.60m	14.50m	14.50m	17.80m	14.50m	15.00m
Depth	7.30m	7.00m	7.00m	8.15m	9.50m	7.20m
Draft	5.40m	5.20m	5.40m	5.90m	5.22m	4.50m
Gross Tonnage	4701t	3,644t	3,640t	6,686t	3,491t	3,288t
Full Capacity	208	202	202	246	228	210
Average Speed	16.5kts	15.0kts	15.0kts	17.5kts	12.0kts	12.7kts
Voyage Area	Open Sea	Open Sea	Open Sea	Open Sea	Open Sea	Inshore
Call Sign	D8QS	D8WX	D9GV	DSON4	D8WU	305Hanwoori
Main Engine	Diesel 6,060Hp	Diesel 3,970Hp	Diesel 4,000Hp	Diesel 8,130Hp	Diesel 3,800Hp	Diesel 2,500Hp
Built	2003.03.24	1993.10.30	1993.12.23	2005.12.08	1975.08.	1969.12.

Source: (Noh, et al., 2008)

Table. 3 Training Ships in Korea

4. Applying STCW in the Training Ships and Calling Ports

4.1 The United States

4.1.1 Courses and Time Period for Training

State University of New York – Maritime College has run with several ways of effectively applying STCW as follows;

Freshman Sea Term will consist of 45 days, Sophomore Sea Term will consist of 45 days (or an optional 75 day Cadet Observer), and Senior Sea Term will consist of 90 days.

ADVISORY SYSTEM (Big Brother System) - All First Class Deck Cadets will be assigned a licensed Deck Officer, this deck officer will be an advisor, and will mentor the cadet during the Sea Term. The licensed deck officer will also be responsible for the Voyage Plan assignment of his or her First Class cadets and to assist the cadets in their studies on board. The First Class cadets are obligated to satisfactorily complete all voyage plans and any other assignments in a timely fashion and by the appointed date

- The Big Brother Family - Every first classman will be assigned one or more second classmen and every second classman will be assigned one or more third classmen. They and their assigned officer will make up the “Q” family. They are to mentor and assist one another in all their studies aboard but especially in the Qualification areas. Since there are two cruises, Cruise A and Cruise B, the 1/C will have new underclass half way through their 90 day cruise.

CADET FUNCTIONAL ORGANIZATION - For purposes of the ship's functional organization, Deck Cadets are divided into three watch sections (1,2, and 3) of approximately equal size and with equal

distribution of first, second and third classmen. Assignments to Watch, Maintenance and Repair, or Lecture, are in accordance with the Watch section structure. Watch sections are subdivided into 'A' and 'B' groups for the purpose of in-port watch standing, maintenance and repair labs, and for at anchor / in port training.
The Summer Sea Term is broken up into four (4) principle training study areas, each being an integral part of the Summer Sea Term grade. They are:
1. Watch standing
2. Lecture and associated requirements.
3. Maintenance & Repair, under the supervision of the Ship's Deck Department.
4. Oral/Written Qualifications (SUNY, 2007~2010).

4.1.2 Calling Ports
Calling ports of TS State of Maine are as follows in order of time;

- 1998 - Iceland, Estonia, Russia, Germany
- 1999 - Spain, France, Italy, Gibraltar
- 2000 - Bermuda, Barbados, Philadelphia, Port Everglades (Ft. Lauderdale, FL)
- 2001 - Natal,BRAZIL; Galveston, TEXAS; San Juan, PUERTO RICO; New York City
- 2002 - Cobh, IRELAND; Kiel, GERMANY; Portsmouth, ENGLAND; Tallinn, ESTONIA
- 2003 - Antwerp, BELGIUM; Tenerife, CANARY ISLANDS; Halifax, NOVA SCOTIA
- 2004 - Vera Cruz MEXICO; Bermuda; Tampa; San Juan PUERTO RICO
- 2005 - Aruba, Nassau BAHAMAS, Quebec City, CANADA Boston, MA
- 2006 - Barcelona SPAIN, Cohb IRELAND, Gdynia, POLAND, Portland, ME
- 2007 - GIBRALTAR, Odessa, UKRAINE, Split, CROATIA, Halifax, CANADA
- 2008 - Norfolk, VA, CANARY ISLANDS, BERMUDA, Savannah, GA
- 2009 - San Juan, PR, Key West, FL, St. John, NEWFOUNDLAND, Baltimore, MD
- 2010 - Marseille, FRANCE, Kiel, GERMANY, Belfast, IRELAND, Portsmouth, ENGLAND

4.2 National Institute for Sea Training in the Japan

4.2.1 Courses and Time Period for Training
Navigation and engineering training course are prepared each for Third/Fourth Grade Maritime Officer Competency Certificate and navigation training course for Sixth Grade Maritime Officer Competency Certificate. The training curricula/programs are based on "The Law for Ship's Officer's and Boat's Operators", its associated regulations and STCW convention. Training periods are one year for the third grade course, nine months for the fourth grade course and two months for the sixth grade course. As one-year/nine-month training period is regarded by the law as equivalent to three-year onboard experience required for having national examinations, the students can take the examinations to obtain the Third/Fourth Grade Maritime Officer Competency Certificate, soon after they complete the training program. In addition, the training curricula for the Third Grade Officer Competency Certificate meet requirements of the operational level stipulated in STCW convention, so that persons who have the certificate can get on board any type of the international seaborne transportation vessels as a third officer/engineer.
In order to attain this educational policy represented by this concept, the training curricula are structured of three elements, which are practical training, tactical exercises and lectures. In the lectures, necessary instruction and knowledge for effective practical training are given to the cadets and these instructions contribute to smooth training process and to help them understand practical knowledge. These lectures are given usually in ports, sometimes at sea as a course lesson or briefing just before practical training. As for the practical training and tactical exercise, the cadets experience duties of

ship's officers at any situation of the training ships in a suitable group size and tactical exercises are accordingly assigned to the cadets to let them study some subjects by themselves.

4.2.2 Calling Ports

Calling ports of Nippon maru from April 1 2006 to March 31 2007 are as follows; Tokyo, Yokkaichi , Nagasaki, Kobe , Shimonoseki, Yokohama, Vancouver, Canada, Hilo, USA, Honolulu, USA, Tokyo, Dock Yard, Tokyo, Hiroshima, Shimizu, Osaka, Nagasaki, Chiba, Tokyo, Kobe, Moji, Takamatsu, Kagoshima

4.3 The South Korea

4.3.1 Courses and Time Period for Training

In South Korea, there are courses that the cadets should take part in order to get mariner certificate including voyage plan, voyage and positioning, safety information, maneuvering, safety duty, emergency response, GMDSS, navigational gear as Radar (ARPA) and ECDIS, operating vessel, COLREG, maintenance of ship, handling of life saving gear, fire-fighting, and medical provider in the ship so forth (MMU, 2007~2010).

4.3.2 Calling Ports

Table 4 below indicates the calling ports both domestic and international of two training ships in Mokpo Maritime University including Yeosu, Gwangyang, Jeju, Busan, Kobe (Japan), Sanghai (China), Hochimin (Vietnam), Subic (Philippine) so forth;

Year	Semester	SaeNuRi	SaeYuDal
2009	Spring (Mar.~June)	Busan	Masan
		Okinawa, Japan	Subic (Philippine)
		Malaka, Malaysia	Hochimin,Vietnam
		Hochimin,Vietnam	
	Fall (Aug.~Dec.)	Sokcho	Jeju
		Hukuoka, Japan	Chingdao, China
		Daireon, China	Hiroshima, Japan
		Incheon	
2010	Spring (Mar.~June)	Donghae	SeoGuipo
		Jeju	Inchon
		Malaka, Malaysia	Subic, Philippine
		Hochimin, Vietnam	Okinawa, Japan
	Fall (Aug.~Dec.)	Inchon	Jeju
		Tokyo, Japan	Shanghai, china
		Shanghai, china	Osaka, Japan
		Jeju	Busan

Source: (MMU, 2007~2010)

Table. 4 Calling Ports of Training Ship in MMU, South Korea

5. Conclusion

This article is compared with training and education in the training ships of three countries including the United States, Japan, and South Korea based on the STCW requirements. This research found that some difference applications of training and education are performed and conducted in terms of time period of training, training institution, and faculty & staff arrangement. For example, in the United States, training ship was operated usually in Summer Season only during the summer semester, whereas in Japan, they have run a specific National Institute for Sea Training (NIST) for maritime cadets who want to obtain deck and/or engine certificates. In future study, SWOT (Strong, Weak, Opportunity, and Threat) analysis will be conducted for the each training and education in the training ship of the countries in terms of most effective cost approach, education method for cadet, and training time and period.

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Information Competency Skills for Maritime Students

Shafeek Fazal
Assistant Library Director and Head of Reference and Access Services, Stephen B. Luce Library, Maritime College, sfazal@sunymaritime.edu

Abstract As more information technologies are infused into the maritime environment it is becoming vital for today's mariners be information competent. This paper "Information Competency Skills for Maritime Students" reviews the technological activities, classroom instruction and assessment process undertaken by the SUNY Maritime College Library to foster the development of students' information competency skills. As the technology for information access advances, the library keeps up to date by implementing state of the art tools to allow for students' experience and knowledge. Access to online catalog of maritime information resources, cross linking among maritime information databases and Google, web portal to publications for maritime agencies, digitized repositories of maritime documents, local area network of information resources onboard the training ship are all inclusive of the multitude of activities to ensure students are exposed to the technological tools for advancement of their information competency skills. In addition, the Library has established a comprehensive instructional program that is integrated across the maritime curriculum enhanced with various pedagogical tools such as hands on experience, online guides, and multimedia tutorials. This instructional program is designed to begin developing students' information competency skills from their freshman year and continue throughout their course of study, including Summer Sea Terms aboard the Training Ship. Also, with years of reviewing and generating feedback information through assessment activities of the information literacy program, SUNY Maritime Library has continuously revised and enhanced the program to ensure students are exposed to optimal instruction and tools for developing lifelong information competency skills.

Keyword: Information, Competency, Technology, Literacy, Assessment, Library, Instruction

1. Introduction

In recent years the maritime industry has seen a growing dependence on the use of information technology. New systems are constantly being implemented onboard to aid the seafarer in navigation, safety, and environmental awareness. Whereas our forefathers have used paper charts and sextants, today's mariner must be knowledgeable on use of radar, GPS, electronic charting, and various other electronic publications [1]. Consequently, maritime educators are recognizing the need for students to be trained in information technology.

In the mid 1990s as information evolved in many different formats, maritime libraries increased emphasis on library instruction programs and information literacy emerged as the instructional framework to develop students' competencies in analytical skills and critical thinking. The Association of College and Research Libraries [2] defined information literacy competency standards as "…a set of abilities requiring individuals to recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information." Information literacy, as defined, is the basis for lifelong learning because a student who graduate with the ability to locate, evaluate, and effectively use information can learn independently and address their own needs and questions in any area of life [3].

The information competent mariner is one who is able to apply information technology skills to be able to locate, evaluate, and use information effectively; in other words to be information literate. To train maritime cadets to become information competent, the Stephen B. Luce Library has interwoven

a framework of technological tools, library instruction, and assessment activities to design a program that's infused in the Maritime curricula. The library facilitates access to a myriad of digital and print information sources along with some state of the art research tools such as enhance OPAC, federated searching, cross linking with Google, worldwide catalog, and more. Also, technology is incorporated into various pedagogical tools that are used to enhance cadets' training in information competency. In addition, with the tools in place, the Library designed a robust instruction program to integrate information competency in the curricula. Some of the key strategies used in the instruction program are librarian-faculty collaborations and student outreach. Various assessment activities have been implemented to provide much needed feedback on the effectiveness of the information competency training. The Library uses the assessment data to continuously enhance the program.
The Stephen B. Luce Library serves the academic information needs of the oldest maritime academy in United States, SUNY Maritime College, founded in 1874. The college is one of 64 colleges in the State University of New York system and offers offers a solid academic program coupled with a structured cadet life in the regiment for both men and women. Maritime College prepares students for careers through a content-centered curriculum and a hands-on, team building approach to learning. Maritime offers undergraduate and graduate degrees, 23 varsity athletic teams, summer training cruises to Europe, United States Coast Guard license and intern programs [4]. The Library is accredited by professional organizations such as the Middle State Commission on Higher Education and it adheres to the standards and guidelines of the Association of the College and Research Libraries of the American Library Association, American Library Association [5].

2. Technology

A key component for effective information competence training is to expose maritime cadets to some of the current technological tools. The Stephen B. Luce Library strives to stay abreast with technology developments in both pedagogy and information research and delivery.

2.1 Information Research and Delivery Tools

<u>OPAC:</u> The online public access catalog (OPAC) is the main gateway to researching the Library's collection and cadets are well trained on its use. With a name of *the Sextant*, cadets easily associate the OPAC as a tool to navigate information. The librarians constantly incorporate new technology to enhance the OPAC as a one-search interface for all print and electronic resources (except for periodical articles). All ebooks, electronic government publications, and other similar sources are fully searchable and are just a click away with embedded URLs in the OPAC. Detailed information on books such as summaries, table of contents, and excerpts are accessible through the OPAC with cross-linking service to Google Books.
<u>Federated searching:</u> Stephen B. Luce Library subscribes to over 70 information data banks with access to more than 47,000 titles of periodicals. With such an array of sources it is often a difficult task for cadets to search each information resource individually. To streamline this process the Library implemented a new information portal, called *the Beacon*, which uses federated search technology. This enables cadets to search multiple information databases through one search interface. Intense training on the use of the Beacon is done during library instruction sessions, where cadets are taught how to construct effective search strings to retrieve relevant results.
<u>Partnering with Google:</u> Today's generation of Maritime students are web savvy and very inclined to do all information research using Google only. It is a challenge for librarians to teach cadets on how to use Google competently and a significant part of library instruction dwells on evaluating web sources and suggests the use of academic versions of Google such as Google Scholar and Google Books. To facilitate the cadets' search habits, the Library has partnered with Google to make its collection searchable via Google search engine. So, as an example, a cadet searching Google Scholar for information on "Ship Navigation" will see results for Stephen B. Luce Library (see Fig. 1).
<u>Access beyond Luce Library boundaries:</u> The Stephen B. Luce Library makes every attempt to increase access to information resources for the Maritime College community. All subscribed electronic resources are accessible 24/7 and from anywhere via special server technology, called

EZProxy. Also, through Luce Library membership to resource sharing consortiums, Maritime cadets have access to many more books and other information sources not available in the Library's collections. Using a worldwide OPAC, called Worldcat, cadets can search and request any items from libraries nationally and internationally. This process, referred to as interlibrary loan, is managed by a 24/7 online system with the capability to deliver materials electronically.
Ship's Library aboard Training Ship Empire State VI: Similar to Maritime College Library ashore, the Ship's Library afloat is equipped with the appropriate technology to accommodate cadets' mode of learning and information researching. The Ship's Library has several computer workstations networked on its local area network (LAN). The Library's LAN is networked to the Ship's intranet which is connected the Ship's satellite communication system. All library computers provide access to electronic publications, information on the Library operations and staff, image and data banks, various training software, and the Library's OPAC [6].

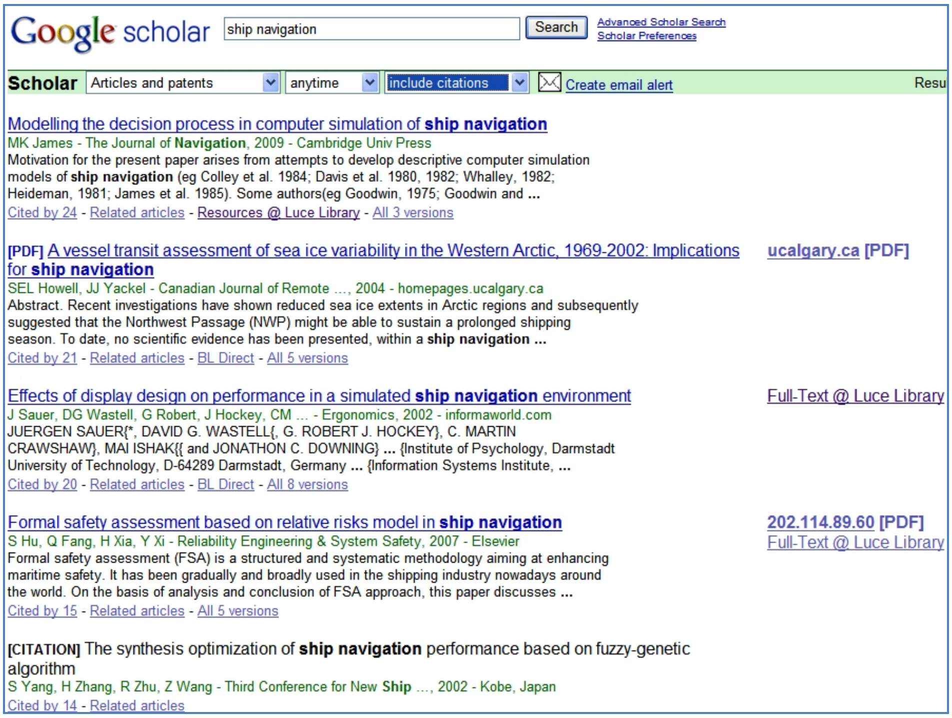

Fig. 1 Google Cross Link to Luce Library

2.2 Pedagogical tools

The new generation of learners arrives to our campuses far more prepared in computer skills, far more skillful in multi-tasking and far more experimental. The students are also far more demanding in their expectations for instantaneous access to information. To acknowledge the students' new mode of learning the Stephen B. Luce Library set forth to bridge the generation gap by ensuring the information and formats through which it is conveyed to students remains relevant. As is the case with other types of instruction, the Library is committed to teaching information competency using various pedagogical techniques to achieve positive student learning outcomes.
Classroom Technology: All library instruction sessions are computer-assisted, utilizing state of the art equipment for effective multimedia instruction and hands-on experience.
Online Information Literacy Tutorial: A major pedagogical tool for information competency training is the Library's online information literacy tutorial. This full-scale, multi-module tutorial is designed to assist cadets to navigate through the information research process at their own pace. It is also an

important tool for distance learning students to learn about the information research process (see Fig. 2).
Online Guides and Pathfinders: Based on the demands of the curriculum, the Library continuously creates online pathfinders and online research modules (general and discipline-specific) to address the information needs of students. In addition, the library faculty liaisons collaborate with instructors to create course-specific research guides. Course-specific web tutorials serve to guide students in their research and to reinforce learning beyond the library instruction session. The library's research publications also serve an additional purpose - to provide the student with the choice and the flexibility to complete their assignments independently outside of the classroom teaching environment.

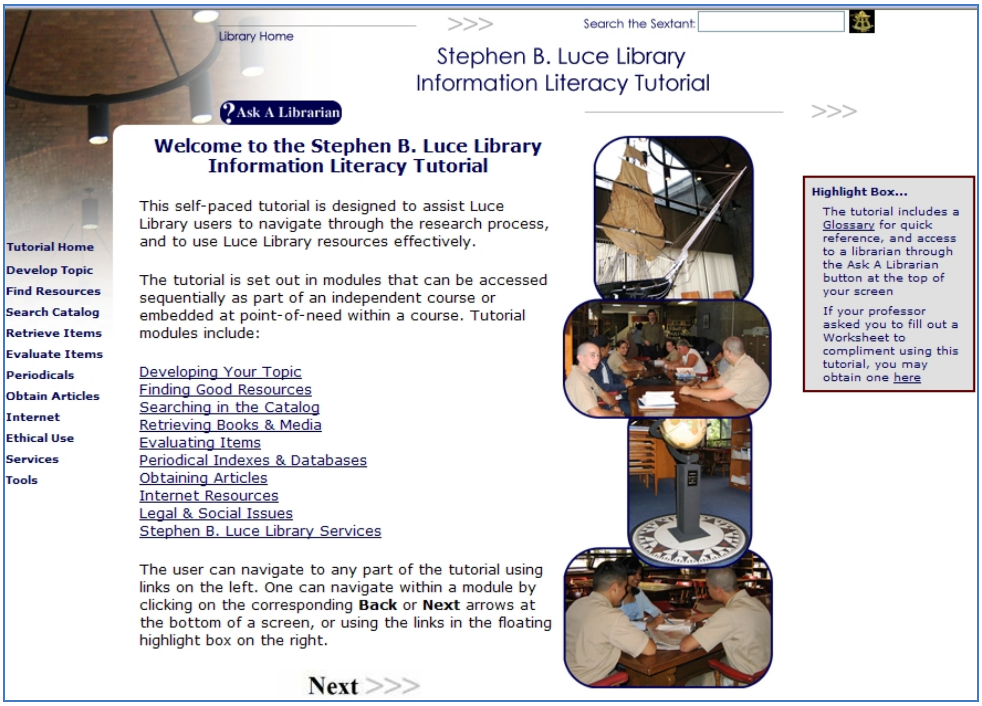

Fig. 2 Online Information Literacy Tutorial

3. Library Instruction Program

Having an array of information access tools in place is of no use if cadets are not properly trained on their use. The Library instruction program is woven into the maritime curriculum's content, structure, and sequence. The maritime curriculum has rigorous academic demands, including an unusually high number of degree credits, several semesters at sea, and license examinations. The Luce Library designed an equally rigorous and complimentary information literacy program to support the maritime core curriculum. The Library's instructional program systematically integrates information competency skills throughout the maritime curriculum to foster lifelong learning. As Ward stated, "Students do not achieve information literacy skills by attending one or more library sessions. Rather, students learn relevant information skills when they are systematically integrated and sequenced throughout the curriculum" [7].
The primary focus for developing information competency skills is to immerse library instruction with regular course work. Librarian-faculty collaboration and student outreach beyond the basic reference transaction are methods used to systematically develop cadets' information competency skills in the maritime curriculum.

3.1 Student Outreach

The Stephen B. Luce Library information literacy program is designed to develop students' skills at various levels of their college careers. An extensive library orientation program provides all new students with an introduction to the information competency concept. Working closely with the Dean of students, the faculty and program coordinator of graduate studies, and the leadership of the Regiment, all incoming students, undergraduate and graduate alike, receive their first library orientation session.

The goals of the first library orientation session are to familiarize the students with the library facility, the physical environment and locations of resources, the history of the library, to remove barriers such as anonymity and introduce familiarity of library personnel. The objective of the first orientation session is to transfer ownership of the library to the students. Phrases such as "your library" and "you belong in the library and the library belongs to you" become the constant refrain during orientation sessions [8].

The concepts of transferring the library's ownership to the students are reiterated during the followed weeks of students' assimilation to the college and campus life. Subsequent to the first library orientation session, the first and second semester freshman students receive a general information literacy course integrated session. Most common courses during the first and second semester freshman year are introductory English, History, Science, Engineering and International Trade and Transportation courses. Upper level students receive a more discipline-specific information literacy session; information literacy sessions are taught for English composition courses, American History and American Civilization, Introduction to Business and Economics, General Science, Marine Biology, Oceanography, Computer Science and General Engineering. Graduate level students receive in-depth sessions for various courses, including preparation for the graduate capstone course.

In addition, the Library's Research Assistance program, a one-on-one information literacy consultation session, is available to all students at all levels. The Library's Research Assistance program is widely promoted to students through the library's web portal and campus announcements. (see Fig. 3).

The Library's instructional activities continue during cadets' Summer Sea Term training aboard the Training Ship Empire State VI. With the appropriate technology tools, and an array of print and electronic information sources in the Ship's Library, the travelling Librarian actively engages cadets in information competency skills development.

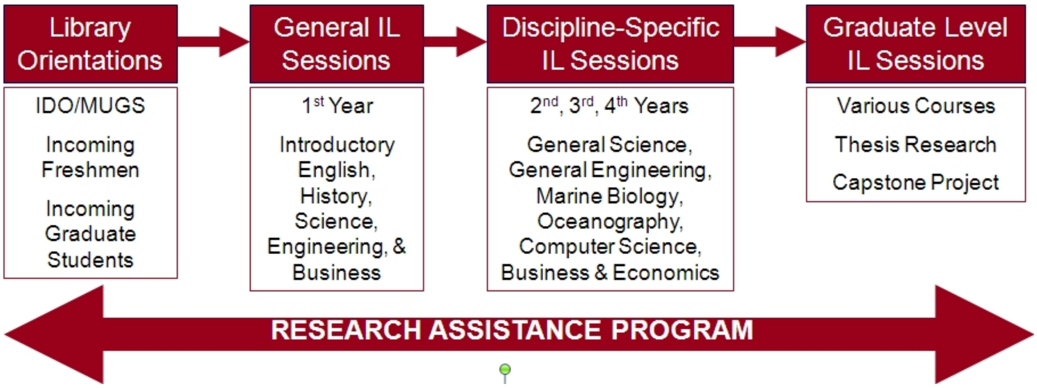

Fig. 3 Library Instruction Program

3.2 Partnerships in Pedagogy: Librarian – teaching faculty collaboration

The core methodology for integrating library instruction through course-integrated lectures involves close collaboration between librarians and teaching faculty to design the lectures and to develop assignments that stress critical thinking as well as information competency skills development. The literature stresses that such librarian and teaching faculty collaborations are critical to developing effective library instruction. Mackey and Jacobson refer to librarian-faculty collaboration as "teaching alliances" that involves working together in course planning, classroom instruction, and assessment [9]. Librarians at Stephen B. Luce Library hold dual advanced academic degrees and are well positioned to liaison with other academic departments. Collaborative activities include information literacy meetings to conduct syllabi analysis and create appropriate assignments for course-integrated library instruction. Librarians hold meetings with instructors prior to the library instruction sessions to discuss lesson plans and assignments. During the librarian's lecture it is common practice for instructors to be present in the classroom to further stress to students the course-related importance of the information competency concept. Course integrated assignments are designed to develop information competence as well as to meet the teaching faculty's instructional goals.

For course-integrated library instruction it is essential that the program articulate well with the maritime curriculum. Therefore, the collaboration between teaching faculty and library faculty remains critical in enhancing the design and development of the maritime curriculum as it relates to information competency. Each librarian serves as liaison to academic departments to provide advice and assistance for course-integrated library instruction, collection development, and information literacy component for the design of new courses or programs and/or revision of pre-existing courses or programs. In addition, the library takes a proactive role in the college-wide curriculum committee to ensure that the library's resources could support the demands of the courses and that information literacy is included in appropriate courses and programs.

Continuing library instruction beyond the classroom on a one-on-one level is the underline objective of the Library's Research Assistance program. Optional and available to students on an appointment basis, this program seeks to engage the individual in interactive and hands-on instruction to fulfill research needs for a specific course assignment. This particular instruction method epitomizes the concept that instruction in information retrieval is most effective if it is course-integrated and delivered at the time of need.

4. Assessment

4.1 Outcomes Assessment

Assessment of student learning outcomes is essential to evaluating library instruction programs. Are students really developing the information competency skills necessary to become lifelong learners? Libraries have been conducting information literacy assessment practices since the mid 1990s and, as Lindauer stresses, "assessment of library performance should be defined and shaped by its connections and contributions to institutional goals and the desired educational outcomes." [10]. These outcomes-based assessment can be conducted either as an independent library-only project or integrated into a campus-wide assessment project such as general education program.

Stephen B. Luce Library instruction program focuses on developing students' information competency skills in the maritime curriculum and assessment of this program provides a quantitative means of documenting progress towards the College's educational goals. The Library's instructional program is structured in a way that all efforts are concentrated to contributing to program accreditation and program outcomes.

In 2004, the Stephen B. Luce Library began assessing its instruction program to measure how well maritime students are developing information competency skills. This process was part of a campus-wide activity on general education assessment and was scheduled to repeat on a three year cycle. The Library established two measuring objectives which correlate with the national standards for information competency:

- Understand and use basic research techniques
- Locate, evaluate and synthesize information from a variety of sources

A standardized test, comprising of short answers and yes/no questions, was the measuring instrument used to gather data. This test assessed maritime students' abilities to locate and evaluate information from a variety of sources and formats, including how well they can conduct basic and advanced searches in the Library online public access catalog and research databases, search for print information using indexes and periodicals, and locate and evaluate web sources. Assessment scale was set for exceeds expectations (90-100%), meets expectations (70-89%), approaches expectations (60-69%), and not meeting expectations (0-59%). The standardized test was distributed to students at the end of each session with a given due time of one week for completion. When completed, the tests were reviewed, graded, and assessed by librarians and the results forwarded to instructors for extra credits. The arrangement of giving extra credit for the assignments demonstrated to students the serious nature of the assignment and encouraged them to learn the information competency concepts [11]. Collected data for 2004, 2007, and 2008 are shown in Fig. 4.

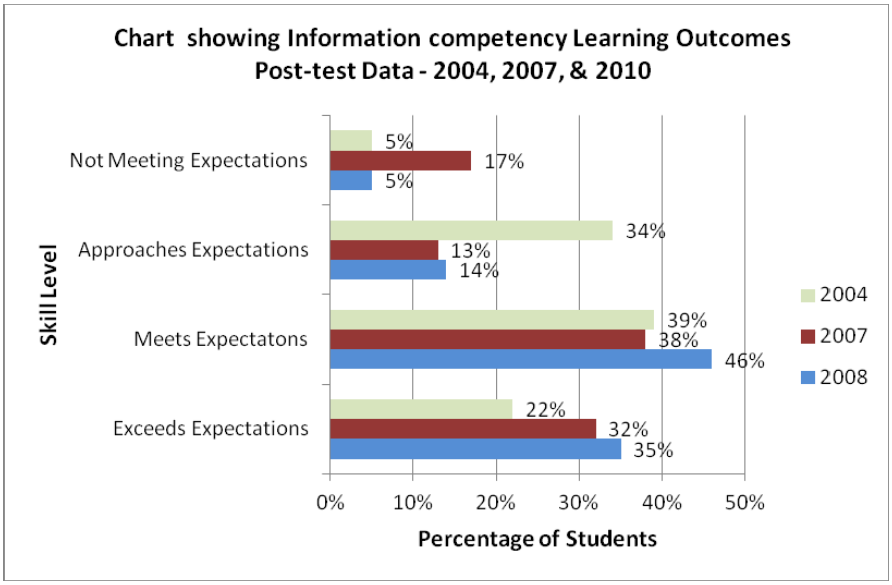

Fig. 4 Learning Outcomes Data

4.2 Closing the Loop: Enhancing the Library Instruction Program with Assessment Data

Prior assessment process and results were used to improve the Library instruction program as well as revise the assessment process itself. This is termed "Closing the Loop" as defined by SUNY's General Education Assessment Review Group. For an initial effort at "Closing the Loop", a new process using a pre-test tool was added to the Library instruction program assessment methodology. This revised methodology, complete with pre-test and post-test activities, provided key data to assess effectiveness of Library instruction techniques i.e. how well are students learning research skills given the Library instruction received. The underlining process is to compare information competency skills of incoming freshmen without providing any library instruction to the skills acquired by these freshmen after experiencing a library instruction session. The measuring instrument remained the same, and was distributed to all Maritime freshmen in LEAD 101 (the freshmen orientation course) as a pre-test and was then repeated in other freshman courses such as English and History as a post-test. Administering the pre and post-test in separate courses was done purposely in order to minimize skewed results. As Emmett and Emde discusses, when administering identical pre and post-test students are prepared for the post-test by the pre-test itself, especially when the tests are give within a time frame of minutes or hours apart [12]. The findings for pre-test and post-test learning outcomes data are shown in Fig. 5. As anticipated, the results show almost a reverse in skill levels from pre-test to post-test. Only 34% of incoming freshmen meet or exceed expectations but after taking a Library instruction session and completing the post-test this jumped to 81%.

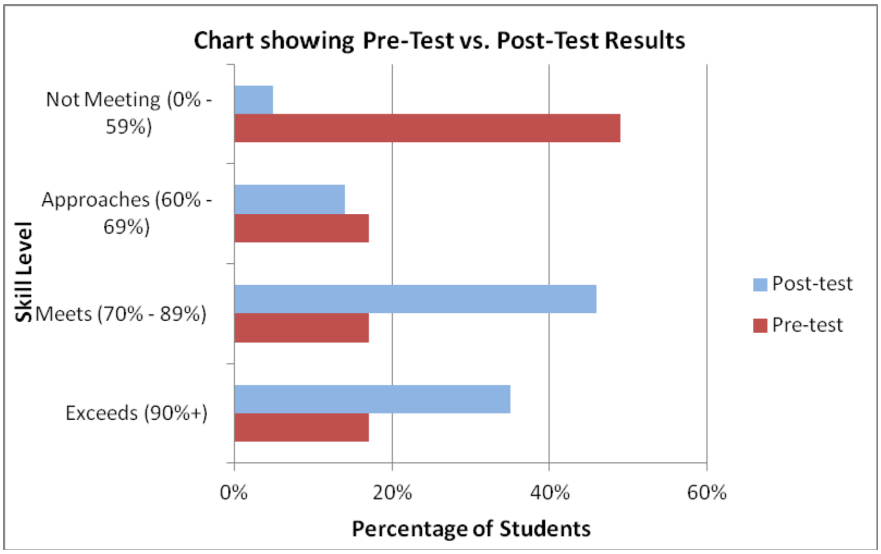

Fig. 5 Pre-test versus post-test

5. Conclusion

Graduating information competent mariners is critical to meeting the demands of the maritime industry. The responsible role of education is to produce seafarers with the talents, ideas, and abilities to meet the challenge of modern maritime development. Stephen B. Luce Library of Maritime College embraces this responsibility to train Maritime cadets to be information competent and hence be lifelong learners. Providing the right tools for training greatly encourages learning. Similar to the idea of exposing maritime students to simulator training, the Luce Library strives to provide access to various information technology tools to foster the development of students' information competency skills.

Utilizing the information technology tools, the Luce Library instructional program is carefully designed to systematically integrate information competency sessions in the maritime curricula. Librarians are serving as partners in the classroom, collaborating with teaching faculty in a variety of ways to ensure the progressive development of students' information competency skills. In addition, librarians' efforts reach beyond the classroom as exemplified by the Library's Research Assistance program, a one-to-one instruction session that is clearly an effective follow up to class sessions to reinforce the techniques of information researching.

As the Library instruction program focuses on integrating effective information literacy into the maritime curriculum, assessment of the program provides a quantitative means of documenting progress towards the College's educational goals. The assessment data have clearly indicate that the Library's instruction program is effective and is moving in the right direction to continue graduating lifelong learners in the maritime industry. Also, the data gives the necessary feedback to continuously revise, redesign, and enhance the instruction program to expose maritime students to the most effective training possible with the appropriate tools and instruction sessions.

The Library's mission to instruct and train cadets continues at sea onboard the Training Ship Empire State VI. The Ship's Library is equipped with the computer technology and electronic resources to provide for cadets' continuous mode of development from ashore to sea. A Librarian travels with the Training Ship at all times to continue the instructional activities to integrate information competency in the maritime curriculum.

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Influences of System Integration to the Safety of Navigation and to the Training of Seafarers

Sauli Ahvenjärvi
Principal lecturer, Satakunta University of Applied Sciences, sauli.ahvenjarvi@samk.fi

Abstract In this paper, the influence of the increasing system integration to the safety of navigation is discussed. Increased integration has been a key trend in the development of navigation systems during the last decades. The modern navigation system of an ordinary commercial ship integrates the radar, the speed log, the gyro compass, the Electronic Chart Display and Information System (ECDIS), the autopilot and the satellite navigation system into one single entity. It might be difficult for the user to figure out all connections between different parts of the system. Understanding the hidden interrelations between individual devices in a complicated integrated system is a true challenge, especially in fault situations. A fault of the speed log, for instance, could lead to false operation of the gyro compass, the autopilot, the ARPA radar and the ECDIS of the ship. Consequences of such single failure can be dangerous if these situations have not been anticipated in the design of the system and in the training of deck officers. Automatic Identification System (AIS) has raised the integration to a new level: The officer of the watch has on the ECDIS display in front of him symbols and texts which are based on information produced by equipment on-board another ship. The AIS system integrates the navigation systems of all ships on the same traffic area logically into one single network. Such high level of integration has both positive and negative influences on the safety of navigation. The designers and the users of these systems should be aware of the potential new safety risks related to integration. This should be taken into account also in training of deck officers.

***Keyword**: Navigation systems, integration, safety, training*

1. Introduction

Wider integration has been one of the key trends in the development of navigation systems during the last decades. Integration is not a target as such, but it has been virtually a necessity in development of the performance and the safety of navigation systems.

Until the 1970's the devices used for navigation operated individually, without interconnections. The officer of the watch had to perform the everlasting ”triple-jump” between the radar display, the navigation desk and the steering stand. The integration of navigation devices into bigger entities began in the 1980's. The integration changed the navigator's work as the information and control of the equipment was concentrated into one place on the bridge. The integration of the radar image and the digitized chart was an important step in the development towards the modern Integrated Navigation System (INS). An important milestone in development of the steering systems was reached when the significance of the dynamic error of the gyro compass was understood and effective methods for eliminating the error were introduced. Due to the operation principle of the gyro compass, after every turn of the ship, an oscillating error component appears in the gyro heading signal. This oscillating error component, the dynamic error, gradually weakens and disappears. However, if the ship makes several consecutive turns the dynamic error can accumulate into several degrees. The active correction of the dynamic error of the advanced gyro compasses keeps the error below one degree.

A major goal of the development of steering automation was to introduce a system for fully automatic track keeping. Accomplishment of this function was not possible without means to define the precise position of the ship in real time. Introduction of the Global Positioning System (GPS) satellite navigation system and the differential GPS correction system finally made it possible to build a fully automatic track keeping system for merchant ships, accurate enough also for the narrow archipelago fairways [1], illustrated by Figure 1.

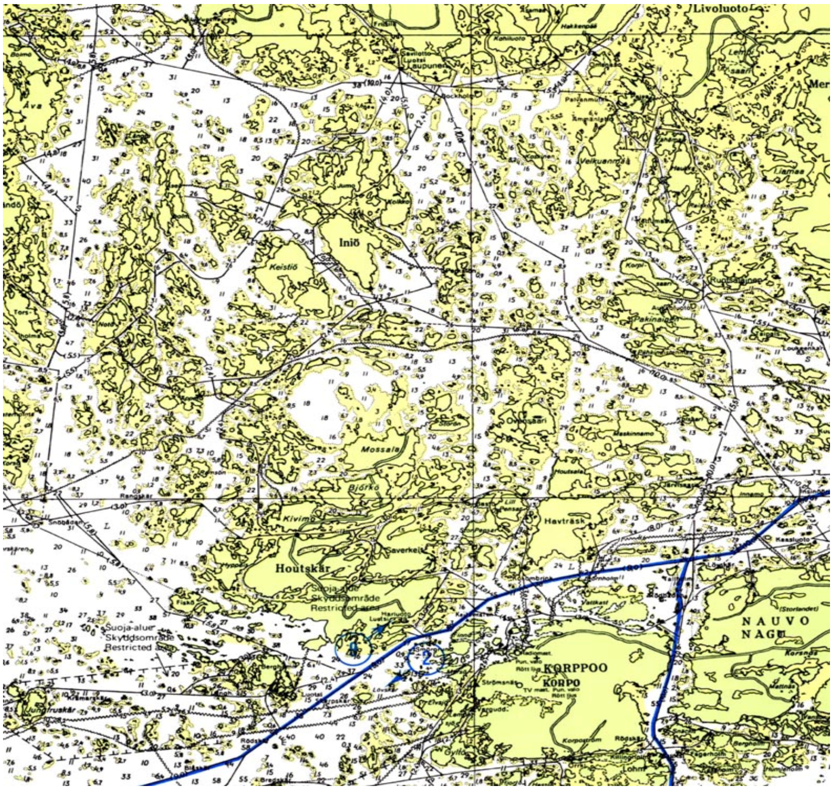

Fig. 1 Typical archipelago fairways near the Finnish coast.

A fully automatic track keeping systems was developed by the Electronics department of Hollming Ltd in Rauma, Finland already 30 years ago. The flagship Keldysh of the Academy of Science of the Soviet Union, delivered by Hollming Ltd on the 24th of January 1981, was equipped with an INS capable of steering the ship automatically along a programmed track [2]. The system integrated the autopilot, the position and speed measurement devices, the gyro compass and a digital chart plotter into one single entity. The system utilised Kalman filtering technique in calculation of the real-time position and speed of the ship. Due to the limitations of the accuracy of the available positioning methods, the accuracy of the system was not, however, sufficient for archipelago routes.

The practical requirement for the dynamic positioning accuracy in the Finnish archipelago routes is ten meters. This requirement was finally fulfilled when the public differential GPS (DGPS) service by the Finnish Navigation Administration was put into operation on the 23rd of March 1991. This was the world's first public differential GPS service [1]. It brought the average error of the position fixes below 5 meters. Now the INS of a merchant ship is able to take the ship virtually automatically from port to port along a programmed track with the accuracy of a few meters.

Introduction of the Electronic Chart Display and Information System (ECDIS) brought the integration even further by combining the electronic chart with the navigation system. The Voyage Data Recorder (VDR) was another step on the way towards the modern bridge system, which integrates the radar, the speed log, the gyro compass, the ECDIS, the autopilot, the satellite navigation system and a few other systems into one single entity, as presented Figure 2.

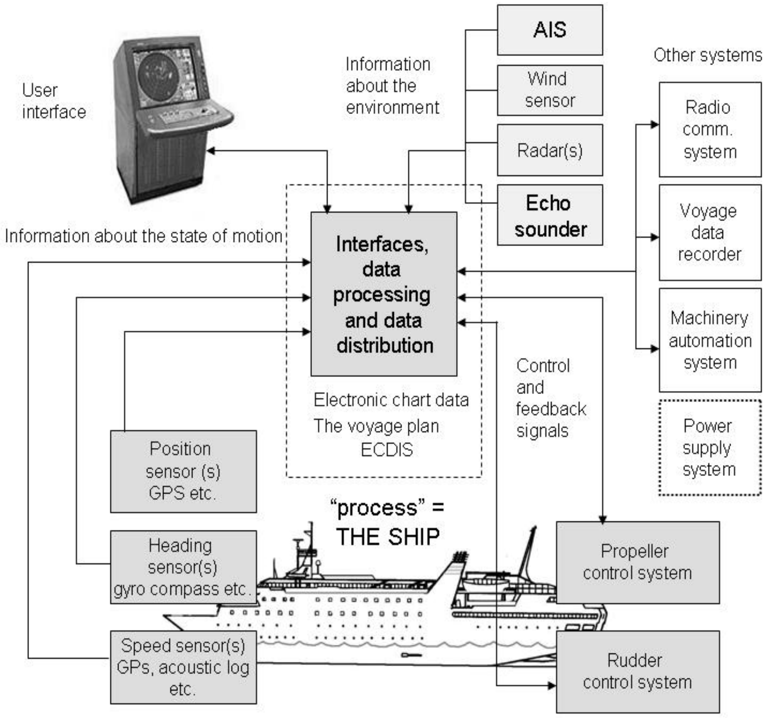

Fig. 2 A generic block diagram of an INS system.

The integration of modern bridge systems is not anymore limited to the equipment on-board the ship. The navigation satellites on the sky and even the navigation equipment on-board other vessels may communicate in real time with the ship's equipment, thus belonging to the same logical entity. The Automatic Identification System (AIS) is an example: The officer of the watch has on the ECDIS display in front of him symbols and texts which are based on information produced by equipment on-board other ships. The AIS system integrates the navigation systems of all ships on the same traffic area logically into one single system. Consequently, the decisions by the officer on the bridge of a modern ship are strongly influenced, not only by the operation of satellites 20 000 km above the earth's surface, but also by information processed and produced by navigation equipment on-board other ships. This high level of integration has influences on the safety of navigation, both positive and negative ones. Consequently, it also has implications to the training needs of deck officers. These implications have to be understood and taken into consideration.

2. Positive and Negative Consequences of Integration

2.1 Safety through integration

The obvious purpose of integration of the navigation equipment and systems is to enhance the efficiency and the safety of navigation. These are the positive consequences of integration. The officer of the watch does not any more need to look for the necessary navigation information from different places on the bridge. The information from different devices is concentrated to a single work station and it is displayed in real time. Moreover, integration makes it possible to process, compare and to combine the information in new ways. By intelligent integration one plus one is more than two. The ECDIS is a good example of this. The real time position and speed of the ship are received from the GPS receiver and displayed on the electronic chart. Similarly, the heading of the ship is read from the gyro compass and indicated graphically on the electronic chart. The planned route is also shown on the chart. These pieces of information are not only collected on the display but combined and processed to form new type of information and a new function: The system compares the position of the ship with the planned route in real-time and activates an off-track alarm if the position of the ship deviates too much from the planned track.

Many useful functions of the modern INS would not be available without integration: precise automatic steering of the vessel along a planned track, on-line display of the position and heading of the ship on the electronic chart, display of the AIS targets on the ECDIS chart, the predictor display (see Figure 3), automatic identification of other vessels. Overall, integration has made it possible to anticipate and avoid hazardous situations and to avoid accidents much better than before. And the development towards even deeper and wider integration has not reached the end. The idea of e-navigation is very much connected with wider integration. A key task is to make the exchange of information between different parties easier and more efficient. Logical and physical information links between parties integrate them into larger and more complicated systems than ever before. The basic principle is that better exchange of information means better safety.

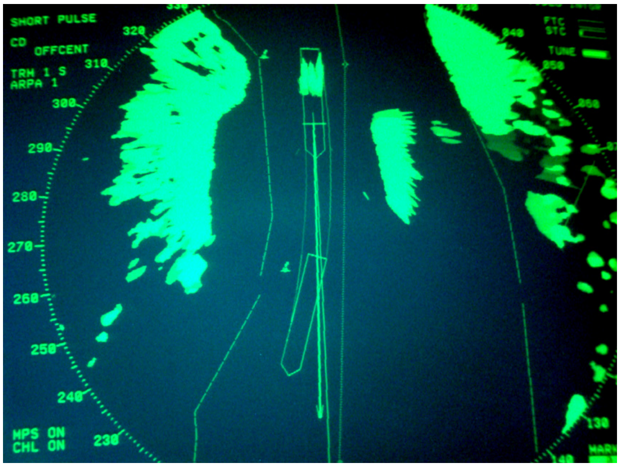

Fig. 3 The predictor on the radar screen

2.2 Tighter couplings and increasing complexity

There is always the other side of the coin. Increased automation and integration have created new safety risks that did not exist earlier. While the integrated navigation system offers many features that enhance the safety of navigation, it also contains much more dependencies and couplings than the old-fashioned bridge with separate navigation instruments. According to Charles Perrow the risks of an accident within a system has a relation with two factors: the couplings and the interactions within the system. The couplings vary from loose to tight and the interactions from complex to linear [3]. In a large integrated bridge system, the interactions between the subsystems have become more and more complex and the couplings have become very tight, which means that a malfunction of one subsystem will inevitably cause a malfunction of another subsystem. The critical functions of the integrated navigation system are dependent on a great number of individual devices and subsystems. In the early navigation systems, the couplings were loose and the interactions rather linear than complex. In the light of the criteria by Perrow, the risk of an accident caused by the navigation system of a ship has increased.

The automatic steering system of a ship is an example of a system with tight couplings and complex interactions. The autopilot controls the rudders of the ship according to the information received from the gyro compass and the route plan from the ECDIS. An error in the gyro heading would immediately cause an error in the operation of the autopilot. But, surprisingly, the measured speed of the ship has also a critical role in this activity. The speed information is utilised in the gyro compass to correct the speed error, and it is also necessary for the on-line self-tuning of the autopilot. Consequently, a malfunction of the speed log would cause a direct error in the operation of the autopilot, and it would cause another, indirect error by causing a deviation to the gyro heading. A malfunction of the speed measurement has a direct impact also to the operation of the ARPA radar, the AIS and the ECDIS.

It is interesting how interactions tend to get more complex as new technical aids for navigation are introduced. The Automatic Identification System (AIS) is an utmost result of this development. Firstly, the operation of AIS system is totally dependent on perfect timing, or synchronisation of the AIS transponders with each other. The synchronisation need is solved by utilising the time signal received from the GPS satellites. Each AIS transponder transmits the real-time position of the vessel. This information is also measured using the GPS satellite navigation system. Consequently, the AIS system is tightly integrated to the GPS system, i.e. without the operation of the GPS system the AIS system would not work either. Moreover, the AIS system connects together also the navigation systems of all ships sailing in the same area. On each ship, the officer of the watch can monitor the real-time position, heading and the speed of all other ships, provided by the AIS system. Thus, the officer of the watch will base his/her predictions and steering decisions partly on information produced by navigation sensors on the other ships! The introduction of the e-navigation idea indicates that this kind of integration development will continue in the future.

3. Implications of Integration to the Training of Deck Officers

The operator is a critical component of such socio-technical system as the integrated navigation system of a ship. Much attention has been paid to management of the human factor of the safety of navigation. The officer of the watch must be properly trained to be able to operate the integrated navigation system correctly and to monitor its performance. The role of the user becomes crucial if the operation of the system differs from the normal. The user has to make a quick and correct diagnosis of the situation and to initiate rapidly the necessary corrective actions to prevent an accident or other unwanted consequences of the abnormality. Operation of the user in abnormal situations is one of the weak points of the entity [2].

Monitoring becomes more and more demanding as the complexity of the systems increase. It is practically impossible to know the exact status of a large system consisting of several intelligent or computer-based devices communicating and interacting with each other. The user must rely on self diagnostics of the system in order to efficiently detect its abnormal behavior. The system has to tell the user that there is something wrong in its performance. The problem with large integrated systems is that the self diagnostics does not necessarily cover all abnormalities within the system. It is possible that although the operation of two individual devices is correct, the operation of the entity formed by these two devices is not [4]. In such situation, the ability of the user to monitor the system and to make correct judgments is crucial.

The officer of the watch must have good knowledge about the structure, operation and limitations of the performance of the integrated navigation system he/she is using. For instance, the user must be aware that the AIS information displayed on the ECDIS monitor in front of him/her is produced by equipment on-board another vessel.

The following list contains some of the aspects that should be taken into account in training of users of large integrated systems:

1) The user should know the structure of the integrated system: what are the devices connected with each other and what is the role of each device in the entity, i.e. what information it produces, what information it receives and what kind of processing of information it carries out.

2) The user should know the operating principle of each device in the system, at least on a general level, and the limitations of the performance of each device.

3) The user should know the principles of the communication between the devices.

4) The user should understand how the functions of the entity depend on the performance of different devices of the system.

5) For each individual critical device, the user should know how a disturbance or a malfunction of that device affects the operation of the entity, especially what are the safety risks associated with such malfunction

6) The user should also know how to detect and how to manage different abnormal situations.

7) The user should know how to replace the functions of the integrated system with lower-level automation in different practical situations. This should be trained in a simulator.

The important question is: how the demanding requirements of this list could be met? It is a well known fact that the integrated bridge systems are not yet standardized. There are hundreds of different hardware configurations and tens of different system architectures being used on-board ships. On the other hand, to know how a specific system behaves in an abnormal situation, the structure of that particular system needs to be known. Therefore, a thorough knowledge on the subjects listed above can not be reached if these aspects are discussed only on a generic level, i.e. on a level which applies to all – or at least most of - the existing systems. Apparently the requirements set by highly integrated systems are too hard to be met by the present training systems of the MET institutes. Therefore, the ship owner shares the responsibility of training the deck officers to manage the integrated systems they are using.

4. Conclusions

Increased integration has been a key trend in the development of navigation systems during the last decades. The modern navigation system of an ordinary commercial ship integrates the radar, the speed log, the gyro compass, the ECDIS, the autopilot and the satellite navigation system into one single entity. The user should be aware of the critical connections and dependencies between different parts of the system. Understanding the hidden interrelations between individual devices in a complicated integrated system could be critical for proper management of fault situations. These needs must be taken into account in training of seafarers. However, the low degree of standardization of the systems makes it difficult, if not impossible, to design such training courses that could give the required knowledge on the systems used on-board modern ships today. This is a hard challenge for MET institutions. The variety of different system configurations leads to the conclusion, that the ship owners must share the responsibility of training the officers to know and to manage the integrated systems in normal and abnormal operating situations.

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INFORMATION SYSTEMS ON THE *TRAINING SHIP EMPIRE STATE VI:* PROVIDING ELECTRONIC RESOURCES TO CADETS AT SEA

Constantia Constantinou, MLS, MA
Director, Stephen B. Luce Library and Department Chair
Maritime College, State University of New York, USA
6 Pennyfield Avenue, Bronx NY 10465
cconstantinou@sunymaritime.edu

Abstract SUNY Maritime College prepares students for careers through a content-centered curriculum and a hands-on, team building approach to learning. As a part of the STCW requirements, the SUNY Maritime Cadets are required to participate on Summer Sea terms aboard the *Training Ship Empire State VI,* the largest training ship in the United States used for cadet training. The *Training Ship Empire State VI* is fitted with classroom space, computer rooms and a fully functioning research facility with access to the library's information systems and electronic resources. Similar to Maritime College Library ashore, the Ship's research facility is equipped with the appropriate technology to accommodate cadets' mode of learning and information researching. The Ship's Library is equipped with several computer workstations networked on its local area network. The Library's systems are connected with the Ship's intranet and the Ship's satellite communication system to provide access to the library's digital resources. All library computers aboard the training ship provide access to electronic publications, data banks, various training software and an automated integrated library management system. The paper "Information Systems on the *Training Ship Empire State VI:* Providing Electronic Resources to Cadets at Sea" describes the ship's library information systems in support of the maritime courses taught at sea.

Keyword: *Information Systems; Training Ships; Library Electronic Resources; Maritime Cadet Education at Sea; Ship Libraries*

1. Introduction

The study "Information Systems on the *Training Ship Empire State VI:* Providing Electronic Resources to Cadets at Sea" describes the information systems on Ship's Library in support of the maritime courses taught at sea at the State University of New York Maritime College. The study also demonstrates how technological advances in information systems and the electronic delivery of library's resource, enhances cadet education at sea.

The Maritime College is one of the 64 colleges and universities of the Sate University of New York System (SUNY). SUNY Maritime College offers an academic program combined with a structured cadet life in the regiment for both men and women. Maritime College prepares students for careers through a content-centered curriculum and a hands-on, team building approach to learning. The curriculum offers undergraduate and graduate degrees, and a European summer sea term of 90-days aboard the Training Ship *Empire State VI*, SUNY Maritime [1]. Cadets pursuing a professional license as a United States Merchant Marine Officer are required to take a minimum of three Summer Sea Terms. Cadets aiming to qualify as a third mate undergo extensive (basic, intermediate, and advanced) training in ship operation and management. While onboard the "deckies" are exposed to rigorous training in the areas of communications, navigation, ship handling, ship operations, safety, and meteorology. Under the supervision of the Chief Engineer and the Senior Engineering Training Officer, Cadets qualifying as assistant engineers receive in-depth training in the ship's organization, interrelationship of the components of an operating engine room, and safety of person and ship. Each cadet must take and pass intensive oral and written examinations, SUNY Maritime College.

2. Education and Training Aboard the *Training Ship Empire State VI*

The SUNY Maritime College Cadets, spend 90 days at sea aboard the *Training Ship Empire State VI* during the months of May-August for three years. During the 90 days at sea, the *Training Ship Empire State VI* visits four to five European ports. The educational objectives of the summer sea term are outlined as such, SUNY Maritime [3]:

1. To provide an understanding of shipboard organization, administration, facilities and functions of the various departments of a merchant vessel.
2. To develop a full appreciation of the principles of command, to train Cadets in the duties and responsibilities of watch officers and other supervisory personnel, and to promote a complete understanding of the duties and responsibilities of personnel in general.
3. To supplement ashore classroom instruction in professional subjects through practical application aboard the training ship at sea.
4. To promote an understanding, through practical experience, of the leadership, teamwork, techniques, and technical skills required to manage and operate a vessel efficiently, safely and economically.
5. To enhance cultural and professional backgrounds through as many contacts with the geography, history, and national distinctions of other countries and peoples, as the limited time allows.

The training ship is fitted with classroom space, computer rooms and a fully functioning research facility with access to the library's information systems and electronic resources. The Ship's research facility is equipped with the appropriate technology to deliver the library's electronic resources. A library faculty serves the duties of Ship's Librarian. The Ship's Librarian maintains all library operations and provides research expertise for the information needs of the shipboard community. The SUNY Maritime College Library aboard the *Training Ship Empire State VI* is the primary resource and research facility for all cadets and crew.

3. Information Systems on the *Training Ship Empire State VI*

Like many similar types of vessels, the *Training Ship Empire State VI* is equipped with communication systems, radars and global positioning systems. In order to meet the requirements for training and educating cadets, the *Empire State VI* is equipped with four multi Purpose Computer Labs and a Server Room. The cadet labs are running course related software such as real time navigation and charting application/software that assist students to learn how to navigate through international waters. The additional two computer labs are designed for online communications, such as email access via satellite communication systems. Access to email for all staff and students is available 24/7.

A secure area on the Ship is dedicated to server units. The Server room on the ship contains two email servers (one for crew and another server for students), a web server and NS5 server. Two email servers are dedicated to email communication for students and staff. It is the only communication system available to students and crew for routine and social communication with the world while they are at sea during the summer sea term. In addition, the training ship maintains an active website. The website contains announcements, sea logs, and pictures of students and crew from different ports of call. More importantly, the web server is utilized to post course material for students such as assignments, readings, etc. to review for their classes and is also to update the cruise related information. The NS5 server is dedicated to the inventory of ship's equipment and parts.

3.1 Library Technology Aboard the Training Ship Empire State VI

The SUNY Maritime College Library is an academic department, accredited by professional organizations such as the Middle State Commission on Higher Education. Like many libraries in the United States, The Maritime College Library adheres to the standards and guidelines of the Association of the College and Research Libraries of the American Library Association, American Library Association [2]. The Library's collections, print and electronic support the research requirements of the maritime disciplines in engineering, science, business, marine transportation, and the humanities. In addition, the library's instructional program supports the information literacy and assessment requirements of the maritime curriculum and the general education courses.

The Library on Training Ship *Empire State VI* is located on deck four and it occupies approximately 2500 square feet. It has a reading room with seating capacity for 55 people and shelving that holds approximately 7,000 books. Similarly with the SUNY Maritime College Library ashore, the Ship's Library is furnished with the latest technology to facilitate the teaching and learning objectives of the SUNY Maritime cadets at sea.

It is imperative to have the latest technology is imperative on modern ships. Technology is also a major mode of learning for the new generation of cadets. Young cadets are well proficient and oriented with technology and they are accustomed to instantaneous access to information. Decision making process at sea is subject to instantaneous access to information; prime example is electronic navigation, electronic weather reports, electronic communication with other vessels and electronic access to important documents and resources. The Ship's Library is furnished with several computer workstations which are networked on its local area network, (LAN).

The Library's LAN is networked to the Ship's intranet which is connected to the *Empire State VI* satellite communication system. Library computers provide access to electronic publications needed by the cadets for their studies. Electronic information is also provided specific to library operations and personnel; image and data banks; a suite of various training software; and the Library's OPAC. Management of library operations is done using LibrarySoft, an integrated library management system. Cataloging of books, circulation, patron record maintenance, statistics and report generation are all managed by LibrarySoft. Content specific electronic resources and research databases are made accessible through several networked computer terminals in the ship's library, Constantinou & Fazal [4]. The Library's local area network is a shared system for running all the web applications and the local based setup for the library's website. The LAN system also serves as a databank that houses images and the library's electronic resources. The Library's server is part of the Ship's intranet server. It is possible that anyone from anywhere aboard the ship can access the library's LAN system. In addition, the library has networked printing capabilities from any of the library's workstations to a central printer.

The Ship's Librarian workstation has all the rights and privileges to update and mortify the library's server; a task that is a part of the librarian's duties during the summer sea term. The Librarian updates information on the fly, for instance: at each port of call, the Librarian receives updates and transmitted electronic information for the research needs of the crew and students.

4. Access to Electronic Resources

The Ship's Library technology infrastructure is built on a local area network (LAN). Several computer workstations are networked to the Ship's intranet which is connected to the Ship's satellite communication system. Cadets and crew can access the electronic publications and research material through an image and data banks of various training software. The most updated editions of various official government publications are transferred in electronic format and made available on the library's computers. These publications are on subjects such as ocean conditions, navigations, federal regulations; and several sources on countries/cultures information and ports guide to support travelling to various ports of call. (Image 1.)

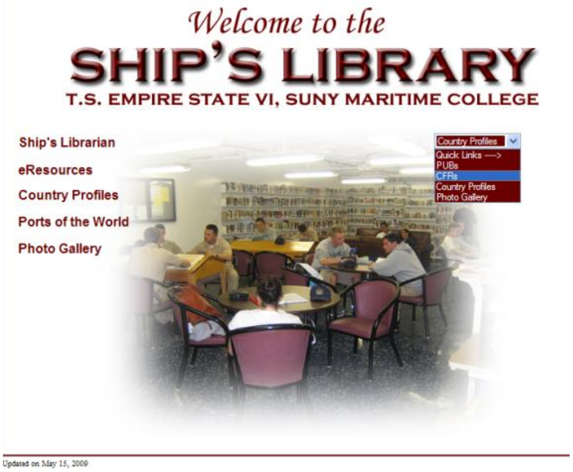


Image 1.

Cadets and crew have electronic access to titles such as *Bowditch Practical Navigator, List of Lights, International Code of Signals, Code of Federal Regulations, Pilot Charts, Sailing Directions, Radio and Radar Navigation*, and *Sight Reduction Tables, Countries and their Cultures, CIA World Factbook,* and *Encyclopedia of Food and Cultures.* Additionally, access to email enhances the delivery of electronic information to the Ship's Library. The email system is set up to work with the Ship's data satellite service.

The Ship's Librarian remains in constant communication with the librarians at the main library ashore. Whenever there is a need for access to additional electronic materials, the librarians are able to transmit the latest information via email to the ship's library.

4.1 Maritime Electronic Resources

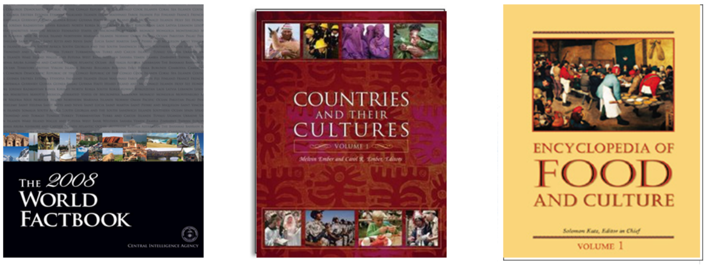
Cadets studying navigation, use one of the leading reference works for marine navigation, the *Bowditch Practical Navigator* [5]. The electronic reference work encompasses thirty-eight chapters, on marine navigation, piloting, electronic and celestial navigation, navigation mathematics, navigation safety, oceanography and marine meteorology. The electronic format of the *Bowditch Practical Navigator* is the digital version of the print book which includes charts, drawings, and mathematical formulas as they appeared in the print version. The *List of Lights* is made available electronically by the Navigation Center of the United States Homeland Security, Coast Guard department [6]. The resource includes the most up-to-date information on the list of lights presented in a PDF format. Electronic access to the *International Code of Signals,* provides the cadets with an overview of the history of the international code of signals and a detailed list with colored pictures of all signal flags.

The *Code of Federal Regulations, (CFR)* is published by the United States Government Printing Office (GPO). The CFR is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the United States Federal Government, CFR [7]. The most popular sections of the CFR used by the cadets for their studies are CFR-50 Wildlife and Fisheries; CFR-49 Transportation; CFR-46 Shipping; CFR-40 Protection of Environment, CFR- 35 Panama Canal, CFR-33 Navigation and Navigable Waters. *Pilot Charts,* and *Sailing Directions,* provide electronic access to most up-to-date navigation charts. The *Sight Reduction Tables,* are used by all cadets for charting their course during navigation classes [8].

In addition to the course-specific electronic resources the cadets are required to use during their studies at sea, the library also makes other related non-course-specific resources available through its networked stations. During the ninety days at sea, the Training Ship *Empire State VI* visits five to six European ports. The SUNY Maritime College Cadets have the opportunity to be exposed to other countries, languages, customs, cultures and civilizations. Exposure to other countries customs and ethnic identities is a valuable lesson learned in an international discipline such as the maritime studies.

Electronic access to resources such as *Countries and their Cultures* [9], *CIA World Factbook,* [10], and *Encyclopedia of Food and Cultures* [11] provide invaluable information on other countries. *Countries and their Cultures* is a searchable database with images and maps with emphasis on the local and ethnic culture of each country. The *CIA World Factbook,* is published and made available by the Central Intelligence Agency of the United States government. It is one of the most comprehensive and current databases on factual country information about the history, government, communication, transportation, population etc. The *Encyclopedia of Food and Cultures* is an electronic book format made available through the library's Gale databases subscriptions. (Image 2.)

E-Resources



- Regulations, manuals, and navigational sources
- Countries and cultures information sources

Image 2.

4.2 Integrated Library System

The Ship's library uses an integrated library system called Librarysoft for collection management, circulation functions, cataloging and statistics gathering. It is made up of a number of modules that provide the library with a great degree of control over the large amounts of complex data required to run an efficient library. The circulation system provides checking In and checking out of materials, renewals, fines, and reserves. Library users are able to search the library's holding s and find items using the simple or the advance search options by title, author and subject. In addition, the system allows library staff to generate reports and statistics of circulation, searches and cataloging functions.

Librarysoft, also allows the ability to transfer patron accounts of all library users on the ship and data from the library's systems shore to the Ship's Library management system. Patron records are downloaded from Aleph, (integrated library system ashore), they are being converted to appropriate format in excel spreadsheet and uploaded to the Ship's integrated library system. The same practice is performed for all monograph records so that library users are able to search the library's holdings by title, author and subject. (Image 3.)

LibrarySoft - Library Management System

- Fully automated
- Manages all circulation and cataloging operations
- Integrated online public access catalog (OPAC)
- Generates statistical reports

Image 3.

4.3 Library Blog

The Ship's Library also utilizes blog technology to keep the community ashore and afloat engaged with daily updates and news. The Ship's librarian uses satellite email communication to send his daily ship logs to the library ashore. The library ashore subscribes to a Blogger where the librarian's ship logs are posted. The campus community ashore, (students, parents, relatives and faculty) of the shipboard community look forward to reading and responding to the blogs posted by the librarians. The library blog has received praises for keeping our two communities (ashore and afloat) connected during the summer sea term [12].

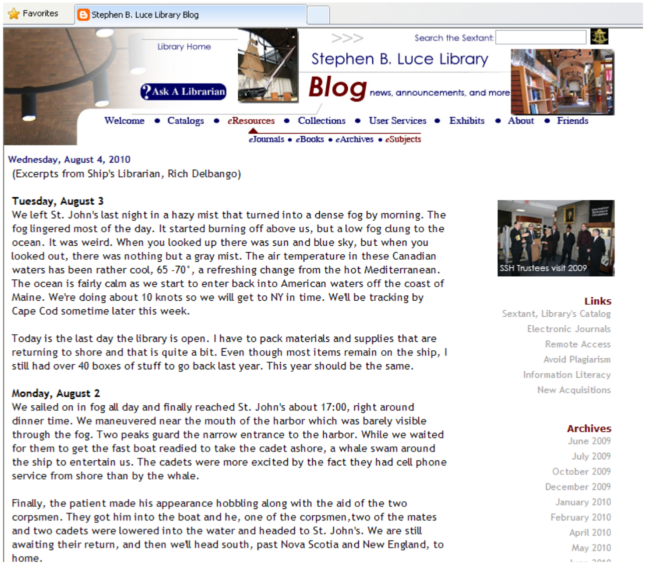


Image 4.

5. Conclusion

Traditionally and throughout history young mariners learned how to read and write and received their education from book they read at sea. Advancements in technology have revolutionized maritime studies in the areas of navigation, engineering and communication. All decisions made aboard vessels are based on access to information systems and technology. SUNY Maritime College educates and trains cadets to work under the most technologically advanced environments. The SUNY Maritime College Library aboard the Training Ship *Empire State VI* plays a critical role in providing the shipboard community with the most relevant up-to-date information. One of the most important objectives of educating mariners at sea is learning to appreciate and understand access to information as a critical component to decision making.

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The effect of radar and ECDIS display mode on navigational accuracy and situational awareness: A bridge simulation experiment

Steven D. Browne
Associate Professor, California Maritime Academy, sbrowne@csum.edu

Abstract In March 2010, a study was conducted in the full mission bridge simulator at the California Maritime Academy, examining the effect of the radar display mode on navigational accuracy and situational awareness. The purpose of the study is to inform bridge watchstanding practices and instruction of Bridge Resource Management courses. The participants in this study were 22 maritime cadets. The participants, in six teams of three or four students, attempted to follow three predetermined navigation routes. For each route, two teams used both radar and ECDIS in North-Up, two teams used both radar and ECDIS in Head-Up and the remaining two teams used radar in Head-Up and ECDIS in North-Up. Numerical data were collected on navigational accuracy as measured by cross-track error and perceived situational awareness was self-assessed by post-scenario survey. Statistical Package for the Social Sciences (SPSS) 18.0 was used for the statistical analysis of the quantitative and qualitative data and this paper reports the results.

Keyword: ECDIS, Bridge Resource Management, Situational Awareness, Maritime Education, Bridge Simulation, Marine Navigation, Radar Display Mode

1. Introduction

Modern radar and automatic radar plotting aid (ARPA) units may be used in either North-Up or Head-Up (and the similar, Course-Up) mode. In the Head-Up display mode, radar information from targets ahead of the vessel is displayed at the top (‘y’ axis) of the radar display screen. In the North-Up mode, radar information from north of the vessel is displayed at the top. Most professional mariners currently use the North-Up mode because paper charts, and the electronic equivalent raster charts, are constrained to that orientation. North-Up attempts to “maximize situational awareness by ensuring that the radar scene is matched to the paper or raster chart” [1]. As a consequence, however, the mariner must mentally reorient to correlate the radar and chart displays with the view seen through the bridge windows. This mental rotation has been shown to be “difficult and time consuming” [2]. Alternately, while the use of Head-Up on the radar might increase situational awareness by easing correlation between the visual scene and the radar display, it makes the correlation between radar and chart more difficult. The past decade has seen the advent of the Electronic Chart Display and Information System (ECDIS) and Electronic Chart Systems (ECS). When using these technological advances, the watch officer may choose between Head-Up mode and North-Up mode to display the navigational chart information. As a result, Norris states “on the fully electronic bridge there is no longer a need to be bound by this practice [using North-Up mode] and using Head-Up on both ECDIS and radar seems a very sensible choice, giving immediate tie-up with the view from the bridge windows” [3]. Although several studies have investigated the effects of map orientation, particularly in the field of air transportation, little, if any, empirical research has been conducted in the maritime industry.

In the maritime industry and related fields such as air and rail transportation, situational awareness is generally accepted as being a good thing to have [4]. One commonly cited definition of situational awareness is “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future” [5]. Or, to put it more simply, situational awareness (SA) is knowing what is going on around you [6]. Situational awareness can be measured in numerous ways, including questionnaires [7] & [8] and direct performance measures. Cross-track error (XTE), the lateral distance of the vessel from its intended track, is a commonly used performance measure used to determine navigational accuracy and situational awareness [9] & [10].

The research in map orientation has provided mixed results. Several aviation studies have shown that using charts and maps in the Head-Up mode increased navigational accuracy and efficiency [11], [12] and [13]. This is attributed to the increased effort required to mentally rotate a North-Up display so that it can be correlated to the visual [14]. Other studies, however, found no significant differences, neither positive nor negative, in situational awareness between the Head-Up display mode and North-Up [14] & [15]. In a study conducted by Porathe [2], participants navigated along a route marked through a 6 meter by 6 meter square room using a North-Up electronic map, a Head-Up electronic map, a 3-D map or a paper map. Participants using the 3-D map completed the route the quickest (111 seconds) and with the fewest errors (1.7), followed by Head-Up (142 seconds, 3.6 errors) and North-Up (142 seconds, 4.2 errors). Those participants that used the traditional paper map finished the route the slowest (167 seconds) and with the most errors (8.2). Porathe concluded that egocentric map orientations are more user friendly because they eliminated the need for mental rotation of a North-Up chart, improve the ease of understanding of other electronic navigational equipment, and increase situational awareness of the individual.

During navigation, radar and Bridge Resource Management (BRM) courses at the California Maritime Academy, most faculty regularly instruct cadets that North-Up is the proper display setting for radar, because, when used in conjunction with paper charts, radar/ARPA in the North-Up mode increases navigational situational awareness and reduces the chance of confusion. It is routine practice among instructors to correct cadets that attempt to navigate with radar set to the Head-Up mode. But, as Norris [3] has pointed out, ECDIS enables the mariner to orient both the chart and the radar in Head-Up, thereby eliminating the need for mental reorientation. The purpose of this study is to investigate the effect of radar and chart display mode on navigational accuracy and situational awareness. The results will inform the teaching of BRM, navigation and radar courses at maritime academies and bridge watchkeeping practices.

2. Methodology

This study was conducted in March 2010 during California Maritime Academy's elective *e*-Navigation course. The participants were 22 maritime cadets. Students registered for this course as they would for any other course at the Academy. The course met one hour per week in a classroom setting where students learned about topics related to *e*-Navigation and research methodology. During the first class meeting the participants completed an initial questionnaire that looked at background data and read and signed an Informed Consent form. Participants also met for four hours each week in a Lab section where they had an opportunity to participate in bridge simulation exercises that focused on different aspects of *e*-Navigation and to participate in the research that was being done.

During the semester, a total of 10 lab scenarios were conducted utilizing the Academy's 3 full mission bridge simulators. This paper reports the findings of Lab #7. In the first meeting of the course, the instructor grouped the students into 6 bridge teams; 2 teams consisted of 3 students and 4 teams consisted of 4 students. In each group a 4th year cadet (a Senior cadet) was selected to act as the watch officer, a 3rd year cadet (a Junior cadet) acted as the navigator/radar operator and a 2nd year cadet (a Sophomore cadet) served as the helmsman. The 4th member of each team, if any, acted as observer. In general, the participants maintained the same watch teams throughout the course, though there was some variance week to week due to absences. Prior to this study, the teams had worked together for 6 previous simulation labs during a period of 6 weeks.

In this study, the teams of participants stood watch on the navigation bridge of a simulated containership. The same ship model had been used in previous exercises, so the participants were familiar with the navigational equipment and handling characteristics of the vessel. The navigation equipment on the vessel consisted of an ECDIS and a radar/ARPA unit. Each team participated in a series of three scenarios with short breaks in between scenarios. Prior to the start of each scenario, the teams were given a navigation route which they were instructed to input into the ECDIS unit. Each route consisted of 7 waypoints and 6 legs, requiring 5 turns. The 3 routes were each approximately 6 nautical miles long and took approximately 30 minutes to complete. Route #1 was generally towards the north, Route #2 was generally towards the south and Route #3 was generally towards the west. Because only 3 full mission bridge simulators were available for use, an easterly route was not utilized in this study. None of the participants had previously navigated in the simulated geographic area. In each scenario, a one knot current was applied in a direction perpendicular to the intended track. The participants were not informed of the current prior to the commencement of each exercise.

In each scenario, two of the teams used both radar and ECDIS in the North-Up display mode, two teams used both devices in the Head-Up mode, while the remaining teams used ECDIS in the North-Up mode and radar in the Head-Up mode. (See Table 1). The researcher instructed each team to follow the route as closely as possible with the goal of minimizing cross-track error (XTE).

	ECDIS North-Up Radar North-Up	ECDIS North-Up Radar Head-Up	ECDIS Head-Up Radar Head-Up
Route #1 (Northerly)	Teams 1 & 4	Teams 2 & 5	Teams 3 & 6
Route #2 (Southerly)	Teams 3 & 6	Teams 1 & 4	Teams 2 & 5
Route #3 (Westerly)	Teams 2 & 5	Teams 3 & 6	Teams 1 & 4

Table 1. Team rotation and display modes

Data were collected on cross-track error at each waypoint and at the midpoint of each leg of the route to be used as a measure of navigational accuracy. The cross-track error was measured to the nearest 0.01 nm using measuring tools inherent in the Transas bridge simulator software.

Prior to commencing the exercise, each participant completed a 4-question survey on their preference of display mode when using radar and ECDIS. After completing the exercises, each participant completed a 10-question questionnaire on perceived situational awareness.

3. Results

3.1 Pre-exercise Questionnaire

The pre-exercise questionnaire consisted of 4 questions utilizing a Likert-type scale (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree and 1 = strongly disagree). The mean for question #1, "I feel most comfortable using radar in Head-Up display", was 2.36 (SD = 1.255), with 59% of participants disagreeing or strongly disagreeing. The mean for question #2, "I feel most comfortable using ECDIS in Head-Up display", was 2.41 (SD = 1.221), with 59% of participants disagreeing or strongly disagreeing. The mean for question #3, "I feel I can identify points of land more easily when the radar is in North-Up display", was 4.09 (SD = 0.811), with 82% agreeing or strongly agreeing. The mean for question #4, "I feel I can identify points of land more easily when the ECDIS is in North-Up display", was 4.14 (SD = 0.774), with 77% of participants agreeing or strongly agreeing and 23% neutral.

3.2 Cross-track Error by Team

The mean cross-track error was calculated for each team. (See Table 2.) Team 2 achieved the smallest cross-track error, indicating a high level of navigational accuracy. The difference in the means between Team 2 and each of the other teams was statistically significant at the 95% confidence level. The differences in the means of the other teams were not statistically significant. Because of the small sample size (n=6), the researcher deemed it appropriate to exclude the data from Team 2 from the data analysis.

Team Number	Mean Cross-track Error	Standard Deviation
1	0.0585 nm	0.05599
2	0.0323 nm	0.02411
3	0.0567 nm	0.05007
4	0.0479 nm	0.04467
5	0.0518 nm	0.04279
6	0.0605 nm	0.05934

Table 2. Cross-track error by team

3.3 Cross-track Error vs. Display Mode

The mean cross-track error for the teams that had both the radar and ECDIS displays set to North-Up (n = 5) was 0.0534 nm (SD = 0.0408). The teams with radar and ECDIS both set to Head-Up (n = 5) achieved a mean cross-track error of 0.0514 nm (SD = 0.0495) while those teams with the radar set to Head-Up display and the ECDIS set to North-Up (n = 5) had a mean cross-track error of 0.0605 nm (SD = 0.0601). (See Fig. 1.) The differences in the means were not statistically significant at the 95% confidence level.

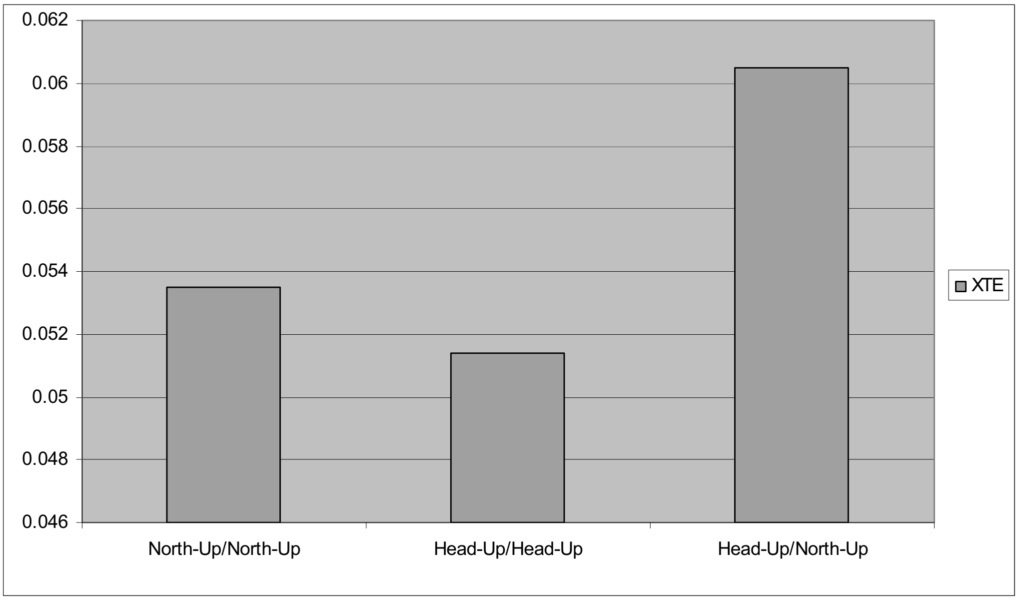

Fig. 1 Cross-track error (XTE) and display mode

3.4 Cross-track Error vs. Direction of Travel

Mean cross-track error was also calculated based on direction of travel. On Route #1, which required the vessels to proceed in a northerly direction, the teams (n = 5) achieved a mean cross-track error of 0.0545 nm with a standard deviation of 0.0460. For the 5 teams on Route #2 (southerly), the mean cross-track error was 0.0528 nm (SD = 0.0549) and for Route #3 the mean cross-track error was 0.0580 nm (SD = 0.0513). (See Fig. 2.) The differences in the means were not statistically significant.

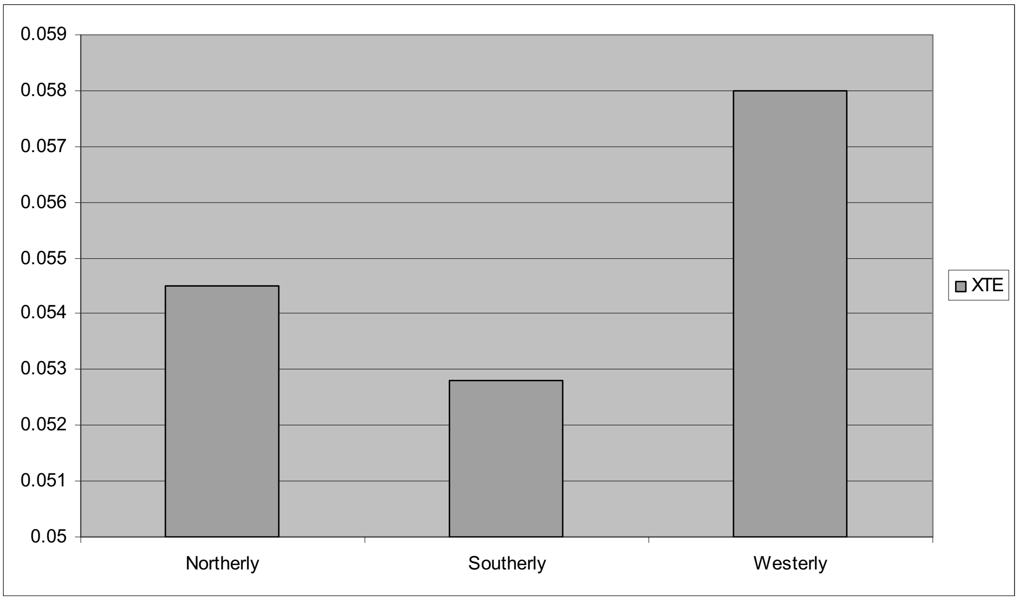

Fig. 2 Cross-track error (XTE) and direction of travel

3.5 Cross-track Error vs. Direction of Travel and Display Mode

The data were further analyzed to determine if there were any differences in cross-track error based on both direction of travel and display mode. Those teams (n = 2) on Route #1 with both radar and ECDIS displays set to North-Up achieved a mean cross-track error of 0.0542 nm (SD = 0.03951). The team (n = 1) on Route #1 with the radar on Head-Up display and the ECDIS on North-Up had an XTE of 0.0469 nm (SD = 0.03568), while those teams with both radar and ECDIS in the Head-Up mode (n = 2) had a mean cross-track error of 0.0585 nm (SD = 0.05655). The differences in the means were not statistically significant.

For the southerly route (Route #2), the two teams with both radar and ECDIS displays in the North-Up mode achieved an XTE of 0.0488 nm (SD = 0.04274). The teams (n = 2) on Route #2 with the radar on Head-Up display and the ECDIS on North-Up had an XTE of 0.0592 nm (SD = 0.06729), while those team with both radar and ECDIS in the Head-Up mode (n = 1) had a mean cross-track error of 0.0477 nm (SD = 0.05183). The differences in the means were not statistically significant.

For the westerly route (Route #3), the team with both radar and ECDIS displays in the North-Up mode achieved an XTE of 0.0608 nm (SD = 0.04132). The teams (n = 2) on Route #3 with the radar on Head-Up display and the ECDIS on North-Up had an XTE of 0.0685 nm (SD = 0.06729), while those teams with both radar and ECDIS in the Head-Up mode (n = 2) had a mean cross-track error of 0.0462 nm (SD = 0.04129). There was a statistically significant difference in the mean cross-track error of those teams using both ECDIS and radar in the Head-Up mode and those using ECDIS North-Up and radar Head-Up on Route #3. (See Fig. 3).

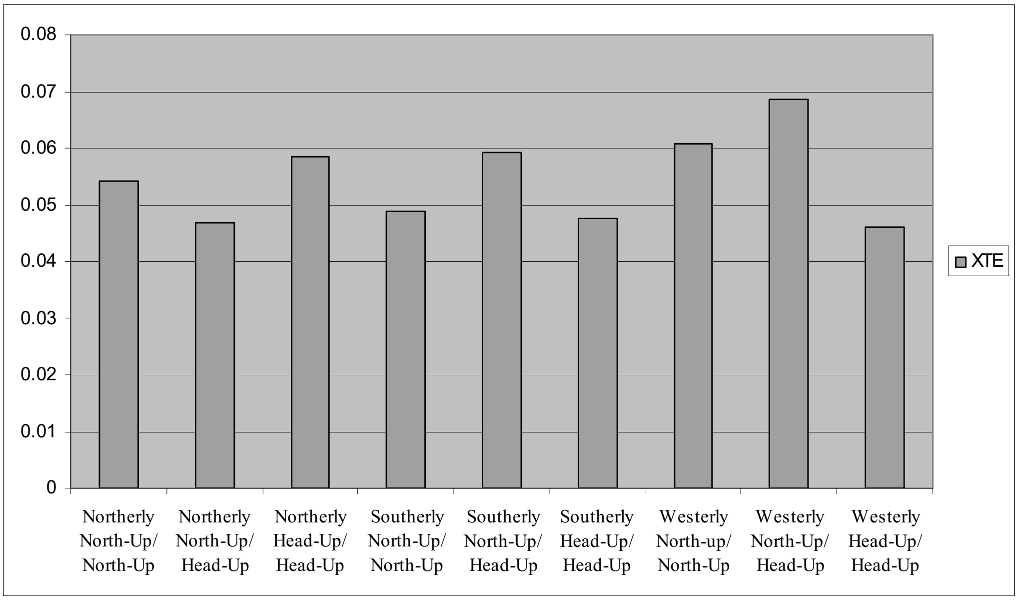

Fig. 3 Cross-track error (XTE) vs. direction of travel and display mode

3.6 Post-exercise questionnaire

The post-exercise questionnaire consisted of 10 questions utilizing a Likert-type scale (5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree and 1 = strongly disagree). The mean for question #1, "I feel that North-Up display on both the radar and the ECDIS increased my situational awareness", was 4.32 (SD = 0.839), with 86% of agreeing or strongly agreeing. The mean for question #2, "I feel that Head-Up display on both the radar and the ECDIS increased my situational awareness", was 2.64 (SD = 1.136), with 55% of participants disagreeing or strongly disagreeing. The mean for question #3, "I feel that Head-Up display of the radar and North-Up display on the ECDIS increased my situational awareness", was 2.23 (SD = 1.152), with 73% of participants disagreeing or strongly disagreeing. The mean for question #7, "I feel the best combination is for radar and ECDIS to both be North-Up", was 4.09 (SD = 1.019), with 73% of participants agreeing or strongly agreeing. The mean for question #8, "I feel the best combination is for radar and ECDIS to both be Head-Up", was 2.09 (SD = 1.109), with 64% of participants disagreeing or strongly disagreeing. The mean for question #9, "I feel the best combination is for radar to be Head-Up and ECDIS to be North-Up", was 1.95 (SD = 0.950), with 77% of participants disagreeing or strongly disagreeing.

4. Discussion

Because of the small sample size, few things in the study were found to be statistically significant and, therefore, may not be generalized. However, the general trend of the data provided some interesting results.

The pre-exercise survey indicates that, prior to the exercise, the participants did not feel comfortable using either radar or ECDIS in the Head-Up mode but they were very confident in their ability to navigate using those devices in North-Up. This is not surprising because throughout their maritime training at the Academy their instructors have emphasized the use of North-Up display modes. Prior to this study, the participants had little, if any, prior experience navigating in Head-Up.

The mean cross-track error by display mode data revealed that those teams navigating with radar and ECDIS both in Head-Up achieved the best navigational accuracy (mean XTE = 0.0514 nm), followed by North-Up / North-Up (mean XTE = 0.0534 nm) and Head-Up / North-Up (mean XTE = 0.0604 nm). These differences are not large; the mean difference between Head-Up / Head-Up and North-Up / North-Up was 0.002 nm (3.7 meters) and the difference between Head-Up / Head-Up and Head-Up / North-Up was 0.009 nm (16.7 meters). Nonetheless, the data suggests that having both radar and ECDIS set to the same display mode increases navigational accuracy and that mariners should avoid navigating with the radar in Head-Up orientation when the ECDIS is North-Up. A 16 meter increase in cross-track error could make the difference between a vessel running aground or navigating narrow waters safely.

The mean cross-track error by direction of travel was surprising. Navigational accuracy was the best when proceeding on the southerly route (mean XTE = 0.0528 nm), followed by the northerly route (mean XTE = 0.0545) and the westerly route (mean XTE = 0.0580). The differences were small and not statistically significant, yet the trend of the means was unexpected. When traveling in a northerly direction, all three display orientations (North-Up / North-Up, Head-Up / Head-Up and Head-Up / North-Up) are approximately the same. Features to the north of the vessel can be seen visually ahead of the vessel and near the top of the display screen. No mental reorientation is required to correlate the view out of the bridge window, the electronic chart and the radar. Traveling in a southerly direction requires the most mental reorientation when the radar or chart is in the North-Up mode. It was expected, therefore, that the mean XTE would be least for the vessels traveling towards the north and the greatest for those traveling towards the south.

There are several ways that the differences in mean cross-track error by direction might be explained. The teams navigated the northerly route first. Perhaps they learned from mistakes made during the first exercise and applied corrections during the second exercise that resulted in increased navigational accuracy when traveling to the south. But, the fact that they performed worse on the third exercise indicates that probably is not the case. Perhaps the participants were aware that navigating in a southerly direction can be challenging and therefore were more diligent on that route. An appropriate survey question might have been enlightening, but, unfortunately, that question was not asked. Perhaps the teams performed worst on the westerly route because it was the last exercise conducted and they were tired and less alert. An appropriate survey question might have answered that question as well. Most likely, though, the reason the mean cross-track error was different for the three routes was because the routes were not equivalent. Although each route required the same number of turns (5), the degree and direction of the turns were not the same in all cases. Also, the land features around the vessel were not consistent between routes. On Route #1, there was land on both sides of the vessel. On Route #2, there was land on the starboard side and ahead of the vessel. The vessel navigating Route #3 had land only on the port side. Because the routes were not equivalent, it is not appropriate to compare mean cross-track errors obtained and no conclusions can be drawn from those data.

The mean cross-track error by direction and display mode provided a statistically significant difference. When navigating Route #3, the teams using Head-Up / Head-Up performed significantly better than those teams using Head-Up / North-Up and North-Up / North-Up. Head-Up / Head-Up was also the most accurate display mode for vessels navigating Route #2, though the difference was not statistically significant. This finding was consistent with the research conducted by Porathe [2] and Norris' contention that using Head-Up on both the radar and ECDIS is a sensible choice [3]. The data from Route #1, however, indicate that Head-Up / North-Up was the best display combination when navigating toward the north. But, because Head-Up and North-Up displays are essentially the same when traveling north, it is likely that the small differences in the mean cross-track error are largely due to the small sample size.

The post-exercise questionnaire also provided interesting data. Though the cross-track error data indicate that the participants navigated most accurately when they used Head-Up / Head-Up mode, 86% perceived that their situational awareness was highest when radar and ECDIS were set to North-Up. In addition, 73% of participants reported that they feel that North-Up is the best mode setting for both radar and ECDIS. Perhaps this apparent discrepancy between perception and performance is due

to the fact that throughout their brief maritime careers, their instructors have routinely taught them that North-Up is the "proper" display mode.
There are several opportunities for future research in this area. This study should be repeated with a larger sample size. This would likely provide more statistically significant results. It could also be repeated with more professional mariners to see if greater experience affects the results. Because navigation isn't the only use of marine radar, it would also be important to examine the effect of radar display mode on collision avoidance decision making.

5. Conclusion

Although most of the findings in the study were not statistically significant, the data appear to indicate that use of radar and ECDIS in the Head-Up display mode contributes to increased situational awareness and navigational accuracy. The difference in navigational accuracy between those using the Head-Up display mode and those using the North-Up display mode was very small. But, few of the participants in the study had much previous experience operating radar or ECDIS in Head-Up and, as indicated by the pre-exercise survey, they felt more comfortable operating North-Up. Despite this, the best navigational accuracy was achieved by those that used Head-Up. It seems likely that if maritime cadets are given more opportunity to practice navigating using Head-Up, the level of accuracy and comfort would further improve.

It is suggested that maritime educators should no longer teach that North-Up is the "only proper display mode". Although most professional mariners routinely use the North-Up mode, Head-Up could, indeed, be a "very sensible choice" [3] for the bridge watchstander. Use of radar in Head-Up and ECDIS in North-Up, however, should be discouraged.

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ON INTERACTION OF ELEMENTS IN THE SYSTEM "MAN – NAVIGATING BRIDGE"

Chesnokova M.V.
Head of International and Economic Cooperation Department of ONMA
Topalov V.P.
ONMA Senior Lecturer
Kobylyatskiy A.A.
ONMA Senior Lecturer
Odessa National Maritime Academy 8, Didrikhson str. Odessa Ukraine 65029
onma@odtel.net

Abstract It is a generally accepted fact that the principal trend in the process of the improvement of means and methods of navigation nowadays is the transition from the automation of separate devices and operations to the complex bridge automation i.e. the creation of the integrated bridge monitoring and control systems (integrated navigation systems INS).
These systems are aimed to decrease the working load on the watch officer, to provide him with the necessary information for the fulfillment of the timely and effective actions in the quickly changing conditions of navigation. They facilitate the change of the human functions on the bridge: the watchkeeper turns into an operator who has to interact not with the objects of steering and control, but with their information models helping him to form his situational awareness. If formerly a watch officer had to effect all the measurements and calculations, necessary for the safe navigation and was able to a certain degree to form a judgment concerning the reliability of the results, nowadays he has to rely on the automated devices and often has no chance to verify their readings in an alternative method.
However, the navigation system may function erroneously, the watch officer becomes aware of that somewhat later. Apparently furnishing the ships with costly modern navigation facilities has to give certain advantages i.e. to improve the safety of navigation.
However, the practical experience shows that the improvement of the navigational aids does not result in the reduction of the accident statistics in shipping. Moreover, we may even see a growing tendency of their increase.
The investigation of some accident cases and the latest research results of the prominent maritime scientists prove that the causes of the incidents and accidents are often different failures of the interaction in the system 'watch officer – INS". It appears that as a result of a high level of bridge automation, a new factor, negatively influencing the safety of a ship arose, which should be properly investigated and taken into consideration both by the manufactures, the users of the navigation equipment.
Some aspects of the above problem and measures to be undertaken to lower the probability of failures are discussed in this paper.

Keyword :

The general direction and the principal trend in the navigation art development nowadays is the creation of the integrated systems for the information provision of the watchkeeping personnel with the most important data concerning the operation of the key devices and processes.

The bridges of modern seagoing ships are overfilled with numerous instruments, indicators and controls of the ship movement parameters and they actually resemble cockpits of modern airliners.

Such electronic complex is aimed at the solution of the problems of navigation, radio communication, control of the technical devices and its interaction with the human navigator forms the human-machine system of ship moment control. The principal purpose of this system is to render the information support to the watch officer by providing him or her with sufficient in number and properly presented data, necessary for decision-making. Furnishing the ships with modern navigation systems is also purposed to lower the working load on the watch officer, to set him free from some routine operations, to enable him to devote more time to the observation of the surroundings and to take timely measures for the prevention of the dangerous situations. Nevertheless, according to various data 70-80 percent of all accidents are referred to the human faults, and the considerable part of those is the consequence of the faulty decisions and not enough grounded actions of navigators.

The latest experience of navigation proves that the improvement of navigational means as such did not result in the reduction of the number of accidents; moreover lately there is even a tendency to its growth.

The accidents at sea became much more serious and dangerous than those that had happened two decades before. The investigation results of the accidents at sea give clear evidence that only very few of them were caused only by technical failures, the causes are mostly combined ones: machines + people. In other words drawbacks and weaknesses, inherent in the personnel and the technical devices of ships which become especially apparent in the process of their interaction, in the complicated condition of ship operation are considered to be the main causes of the disasters at sea. But still the priority role belongs to people, who not always adequately and purposely use the resources, means and methods of the effective actions aimed at the prevention of dangerous situations and accidents, which are in their disposal. A new actual problem arose: the provision of the effective interaction of the elements of the (man-machine) complex, the successful solution of which should facilitate the safety of navigation. This article is devoted to the discussion of some aspects of this problem.

First of all it is necessary to note that the sixties of the last century marked the beginning of the essentially new stage in the ship control arrangement – the transition from the automation of separate devices, processes, operations and technical components to the complex automation of a ship as a whole. This approach considerably influenced the human functions in the process of ship control, the character of the human interaction with the ship and the technical means and an individual position as a member of the crew. The principal cause of the above is the separation of a man from the technical means, as the objects of control. Now he interacts not with these objects directly, but with their information models.

Due to the automation in the ship navigation process a more adequate information model is presented as a result of the synthesis of the information presented by the sensors, characterizing the current position and the movement parameters of the ship as well as the navigation conditions. Correlating the above data with the ship control problems at the current moment, the navigator makes a decision aimed at the safety of navigation. In other words the navigator on the bridge of a modern ship has turned into an operator, the essence of whose activity consists in the interaction with the integrated navigation system (INS), the ship and the surroundings by means of the information models and the controls.

A human operator is regarded as a component of the control system providing the processing of the information and decision-making. The reliability and the efficiency of the man-machine system is to a considerable degree attributed to the professionalism and the psychological qualities of the navigator. The more complicated the ISN becomes, the higher are the requirements to the operator's qualification: his knowledge, experience and his skill in manipulating the data of the system with the purpose of the safety of navigation provision.

The investigation effected in aviation and nuclear power engineering shows that not a single man is able impeccably perform his duties all the time. Any man apprehends and acts with a certain quantity of information. If the quantity of the signals he has to receive exceeds a certain limit, the process of selective reception of information starts. As a result a man performing a certain task makes one of the following four of mistakes:

- Action omission mistakes – the man does not perform certain actions absolutely indispensable under the circumstances;
- Action mistakes – the actions performed erroneously;

- Sequence mistakes – the actions are performed in a wrong succession;
- Time mistakes – the actions are not timely performed.

All the above is often characteristic of watch officers performing multiple functions on the bridge necessary for the ship control.

The practical experience shows that a certain data array related to the internal and external information is absolutely necessary for making effective decisions in the ship control process in different situations. There is a conception "informational necessity" i.e. a certain information amount necessary for the solution of a specific problem. Both the surplus and the deficit of information negatively influences on human abilities of the man making an important decision. The first extremity causes tension, difficulties with the choice of the necessary data in the abundance of information, loss of time and, as a consequence, delayed or improper actions.

The deficit of information may cause the erroneous estimation of the situation and consequently mistakes in the choice of actions. In the ideal case it is desirable to have the quantity of information exactly necessary and sufficient for the achievement of the specific purpose. In practice a watch officer is doing his best to approach this condition addressing the information sources he regards (on the basis of his knowledge and experience) as necessary to satisfy his information needs under the circumstances. It is not an easy task to make a proper decision in the complicated conditions of navigation having deficit of time for decision making when drawbacks and errors may cause serious consequences. According to the Polish researcher T. Olchovy about 40 per cent of ship disasters in the second part of the 20^{th} century were caused by the lack or unreliability of the information available to the persons making decisions. It is also worthy to mention that the remarkable role was played by the design and poor disposition of the information sources of the bridge i.e. the disregard of the ergonomic requirements to designing and furnishing ships. For instance as it has become known the disaster of the tanker "Torry Canyon" near Scilly Isles was to a certain degree caused by the improper disposition of the autopilot switch of operation modes, a number of high-speed ship disasters are attributed to the poor ahead view from the bridge.

In 2004 the American Bureau of Shipping (ABS) concluded a large project aimed at the assessment of the "human" element role in maritime accidents. (Maritime Accidents and Human Performance: the Statistical Trail). In this project the statistic data concerning ship accident rate of British, US, Canadian and Australian safety agencies were used. The analysis of the disaster causes showed that 84 per cent of them occurred through the human fault or with the human contribution. Approximately one third of them are connected with the loss of the situation awareness, inconvenient arrangement of the instruments on the bridge, inadequate operation procedures.

That is the causes of many accident cases at sea are the drawbacks in the design and furnishing of the navigating bridges of ships.

The investigation results of a number of late ship disasters give evidence that they were caused by the loss or poor interaction of the elements in the "operator – INS" complex i.e. the conditions necessary of its successful functioning. It appears to us that one of the possible ways of determining the character of the above disorders may be the system approach. T.H. Hawkins, a British researcher suggested that in data collecting in the aircraft disaster investigation process model Shell should be used which facilitates the avoidance of the important information loss and the questions "What?", "Who?", "When?" answered with the succeeding movement to the more complicated questions: "How?", "Why?". There four components in SHEL: Liveware (L) – people, personnel; Hardware (H) – technical devices, mechanisms; Software (S) – plans, programmes, manuals; Environment (E) – working surroundings. The most important and flexible component is Liveware connected with all the other ones, which affects in conjunction with them any occurring event. (Fig.1)

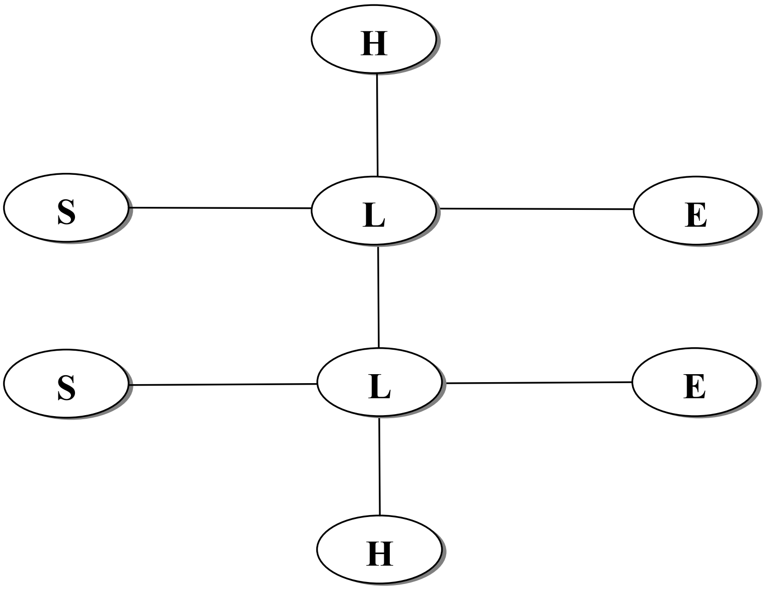

Fig.1 “SHEL” model according to Hokings

Proceeding from the above the seagoing vessel may be regarded as a compound dynamic system, comprising four interacting subsystems one of which is always a man (Fig.2)

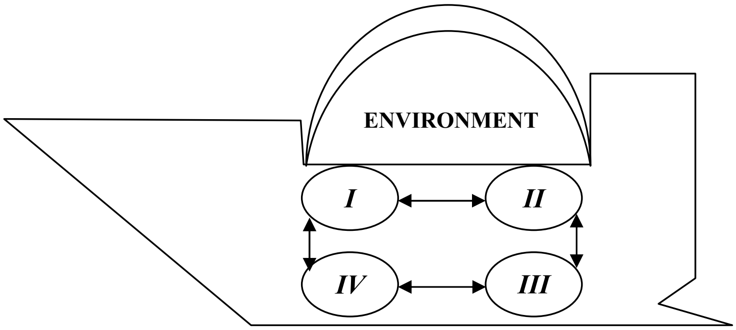

Fig. 2 Ship as a system

The following symbols are accepted for the designation of the subsystems:
I Liveware – Hardware (L – H)
II Liveware – Liveware (L – L)
III Liveware – Environment (L – E)
IV Liveware – Software (L – S)

Besides, the system as a whole undergoes the influence of the outer surroundings of the ship operation which include: sea, atmosphere, political events, terrorism, navigation equipment, instructions of the owners and charterers.

A ship as a transport facility is designed, built, equipped and manned with the regard of its destination, in order to assure the normal functioning and interaction of all the above subsystems both in the normal operational situation and in emergency. This necessitates the presence of a certain structure, elements and a proper interaction among them which requires high level of the system organization, necessary for the safe and efficient fulfillment by the ship of its working functions.

It is obvious that in practice it is hardly possible to provide continuously in full a sufficiently high level of the ship system organization. There are too many causes of deviations in the operation of certain elements and consequently the loss of the coordinated interaction of some subsystems. Usually such undesirable events are timely noted and the measures for their elimination taken, as a result the normal operation conditions are preserved and the incidents and accidents are avoided. Otherwise the development of dangerous situations with serious negative consequences for the ship, the crew and the environment is quite possible.

Thus, in the proposed conception of a ship as a complex system, a highly organized object, the accidents and incidents on board are the consequences of the loss of the element coordination within any of the working subsystem or among subsystems or both at the same time. For instance, in the subsystem "L – H" either technical devices may fail or the people operating them may err or mistake. Malfunction of "L – S" subsystem may be the result of the crew member's unfamiliarity with or wrong understanding of the standing instructions, rules or manuals aboard; also the above documents may be not adequately prepared and badly understood. In any of these cases the consequences will be the wrong assessment, decisions and actions. The above officer/operator – INS complex is an element of the "L – H" subsystem, its functional reliability affects a great deal the safety of the ship's navigation. In its turn the reliability of this complex (faultless, unfailing operation during all the cruise) preconditions a well coordinated interaction watch officer – integrated navigation system. A well known British professional in the problem under consideration, professor J Reason demonstrates in one of his works devoted to the issues of safety the evolution of the safety precautions at sea comprising three stages: first stage, the "technical age" the principal attention is devoted to the operational and engineering methods of reduction and elimination of the dangers.

The next stage to come was "human error age" (1930-1980), when it has become evident that the people are able to disarrange the operation of the most perfect technical safety systems.

Nowadays we have the sociotechnical age, the time of understating that the accidents occur not exclusively due to the technical shortcomings or human mistakes but they are often the results of the poor interaction between the technical and socials aspects of the system. In this connection J. Reason considers that it is very important to answer the question "Where and how within the system are bad decisions translated into unsafe acts capable of breaching the system defenses? By what means may we thwart potential accident pathways by neutralizing the effects of delayed action failures?"

As if an answer to these questions lately in a number of publications appeared in the maritime press devoted to the problems of the interaction of the elements in the "watch officer – INS system". Thus Madam M. Lützhof [1], a researcher of the Linküping University (Sweden) proves, that the new navigational aids, purposed to prevent accidents often cause the contrary effect and become a factor contributing to collisions and groundings. The author of the article, a former navigation officer, licensed master with 13 years of sea experience devoted a lot of time to the research of the watch arrangement on the bridge of different ship types and conditions of navigation. Her research results show that the new technology is a barrier to that essence which the great majority of the officers consider to be their principal functions. "They feel that there is an electronic filter between them and the reality". Mrs M. Lützhof explains. Today the navigating bridges of ships are overfilled with technical devices and are very much similar to the cockpits of modern airliners and there is a growing tendency to their further integration. But the result is not always advantageous for the users. The existing trends in the bridge design and furnishing it with the navigational aids result in surplus of information, and it is not always presented in a comfortable way. (Thus some data may be presented in incompatible formats, which complicates the comparison of the information in the preparation process of the plan of actions, performed by the officers.) Sometimes the problems arise because the technology producers badly realize the seamen's working conditions. The endeavour of the designers and the producers to integrate all the functions into one system of navigation not always meets the needs of those keeping watch on the bridge. In this connection the officers often do not use all the capabilities of the integrated system of the bridge although they are very well aware of them, but turn to the means and devices, they are familiar with: radar, compass, paper charts. The author makes a conclusion that it is a very difficult task to achieve a proper coordination and agreement between the people and machines, as the machines are not social, their actions are rigidly programmed and are not connected with the actual situation of the ship navigation (high seas, narrow, off shore). That is why sharing the work load between the watch officer and the INS in different conditions of navigation is determined on the ground of the awareness and experience of the officer and his confidence in the system. Nevertheless, the confidence is never a constant value, a systematic monitoring of the machinery and the situation are essential for the safety of navigation; the INS should not be the replacement of the common sense and at any time some methods of the ship’s position determination should be used and not only the automation means. Similar considerations are expressed in the article of Captain N. Jayakody and Professor Lin. Zhengiang [2]. Their investigations demonstrate some cases, when the crew was not competent enough for the provision of safe navigation because of the inability to operate the newest equipment, installed on board the ship. The modern technology should be “friendly” to the user; it should not be too complicated with the purpose of the minimization of mistakes and the performance of the necessary correction and repair actions. Although the new technology renders a great aid in the ship control, sometimes it may act erroneously. In this situation it is very important to be provided with other alternatives for overcoming the barriers and limitations of the technology.

Mr. H. Mehrkens in his article [3] states that the ships equipped with modern navigation facilities are a great challenge to the pilots. A bridge team very often is not enough prepared to their usage, in very many cases modern equipment does not solve those problems, the solution of which has been advertized. Modern bridge designs are fitted for one man’s operation with all the information displays and controls, mounted around his seat. This design type is incompatible with the accepted principles of bridge resources control such as the common awareness of the situation, mistake detection and prevention. The conclusion is that there is a growing unconformity between the modern ship equipment and the human functions in ship navigation provision. The publication of Mr. Hadnett the head of the pilots’ operations in the port of London, “A bridge too far?” [4] is devoted to the issues of the improvement of the watchkeeping standards of on modern ships. In particular it is stated that all the efforts of furnishing merchant ships with electronic navigation instruments has the purpose of enhancement of the safety of navigation, the improvement of the situational awareness. Nevertheless the experience shows that the general standard of watchkeeping on the bridge markedly deteriorated. The new equipment makes the officers to be supersure of their situational awareness and it results in much greater risk than before, when the mandatory conditions of watchkeeping were the observation and safe speed of the ship. The author believes that the presence on the bridge of the diverse complicated equipment contributed to many maritime accidents. Wishing to cut the crew expense, ship-owners pass on the fundamental knowledge concerning watchkeeping to the third party, the electronic navigation instruments. The latter reached such a degree of complexity, that only a well trained and experienced operator is able to use them successfully for the purpose of safety provision. The article makes conclusion of the necessity “to return to the essence”; meaning a profound knowledge of Collision Regulations, basic navigational habits, usage of visual bearings, radar for the determination of the ship position.

Mr. S. Ahnverjarvi [5] describes in his article the cases when drawbacks of the officer and the navigational equipment may result in a casualty. The author notes that lately quite often the cause of grounding is a failure of the navigation system and control, which is revealed too late by the watch officer. As a result he has not enough time for taking the necessary actions to avoid the accident. Five navigational accidents analyzed were caused by the malfunction of the INS elements. In all the 5 cases the starting event was the malfunction of the equipment and the delayed reaction of the watch officer to the dangerous divergences in the navigation process, which could not prevent the grounding. Many of the casualties at sea are connected with the psychological factor. The newest navigational systems used on shipboard, set the watchkeeping personnel free from some operational functions and at the same time dull the watch officers vigilance, the sense of his psychological defense and lowers the level of the subjective sense of risk.

Repeated and effective usage of these systems in various situations results in great reliance on the instruments and a sense of pseudosafety, in lowering alertness so necessary for the adequate watchkeeping, readiness to the situation changes and the immediate reaction to these changes. Consequently the probability of the erroneous actions rises. All the above proves that the failures of the proper functioning of the complex "watch officer – INS" may happen on modern ships with the navigating bridges equipped with the newest integrated systems with the consequential casualties and incidents. The main preconditions to those are:

1) Insufficient preparation of the ship officers to operating INS in different conditions of navigation;
2) Defects and faults in the systems of ship navigation and control of which the watch officer is not always informed by the selfdiagnostic appliances;
3) Improper navigating bridge design and arrangement of instruments and controls on the working place of the operator.

In this connection it is worthy to note that there are considerable changes in the watch officer interrelation with the navigation equipment formerly used by the officer: the navigation instruments and devices (sextant, chronometer, direction finder) for the purpose of navigation safety i.e. he effected the necessary measurements, calculations and could to a certain degree have his own judgment concerning the reliability of the results. Nowadays he has to rely completely on the readings of the automated devices, if there is no chance to verify them by means of traditional methods "manually". Besides, the reliability of the automation is not 100 per. cent, these instruments are influenced by outer factors such as vibration, pitch and roll, wave strokes, temperature change. They may cause failures of the INS elements, and such incidents are not very rare.

In order to minimize the probability of man-machine interaction failure, it is necessary:

1) To enhance the awareness of the navigators (knowledge and skills) concerning the usage, maintenance, potentialities and limitations inherent in the integrated systems of navigation and control by means of proper training, simulator usage, practice examples, check-up of the knowledge and skills etc. The insufficient general technical knowledge of the personnel, limiting the effective usage of modern navigational means is the cause of 35% accidents: ship officers not infrequently don't understand the principle of operation of certain devices, their operational limitations, conditions of their usage. As a result there are mistakes of the "instrument" character, erroneous calculations (measurements of parameters), and full reliance on the readings without verifying them in an alternative way, false interpretation of the obtained information. Insufficient competence of ship officers in the operation of modern INS is often the fault of those who mount the systems on board because they only superficially explain the necessary information and leave heaps of manuals and instructions (for the seamen to read). Another tendency is also marked: many navigators having no sufficient professional knowledge and experience do not realize all the advantages of the INS, i.e. do not use it to its full effectively. As the consequence of the above the costs of furnishing the ship with the newest navigation system do not bring the due effect i.e. the enhance of the navigation safety. For the purpose of the improvement of the awareness of navigators and their adaption to the new conditions of professional activity on modern ships systematic seminars are being conducted in Great Britain – SASMEX (Safety at Sea and Marine Equipment Exhibition) where such issues as "Man's role on the navigating bridge", "Interaction watch officer – INS", "Influence of the modern system on lowering casualty risks" etc. are considered. In particular it is noted that the new technology does not replace the navigation essentials that is why watch officers, especially young ones, should not fall into the trap of full confidence in the information they see on the display. Important issue is the upbringing of psychological stability allowing the officers to preserve the necessary professional qualities and skills during all the period of shipboard service. A psychologically stable operator is the one able successfully perform his professional duties in the conditions of extreme mental loads without any remarkable loss of efficiency. Man is quite a special

link in the system of ship control, he is a personality. Critical working conditions may arouse such personality qualities which have never appeared during the training process. Such a quality is of utmost importance for the ship officer, whose mental load with different level of degree of intensity and periodicity may last during the whole voyage.

2) Provide high reliability of INS elements functioning and the system as a whole, which is the duty of the system manufactures in the process of design and production taking into account the INS disposition on board (the influence of pitch and roll, vibration, changing magnetic fields, surrounding temperature etc.). It is worthy to note, that the navigation system manufacturers often do not have sufficient information concerning the conditions of their production usage (“feedback”) and proceed from their own conception of what is necessary and important for the officers on the bridge. The practical value of INS would considerably grow if experienced maritime professionals were drawn in the elaboration of the ideas and design of the systems. Besides it would be possible to change the configuration (the structure and characteristics of the elements) of the INS depending on its application and the conditions of ship operation – taking into consideration the opinions and the proposals of those, who are going to use these systems in their everyday activity. The necessity of navigation systems standardization is obvious which will allow the seamen to use the bridge equipment with better confidence on board any vessel.

3) Provision of INS with full selfdiagnostic devices for timely forewarning the watch officer of any failure or malfunction of the system elements. In view of the costs of production rise this way seems hardly practicable. In this connection the special programme including the issues of diagnostics and reaction to the deviations in the automatic systems should be a part of the bridge resource management training course for watch officers. An obvious proof of the above conclusion may be the dangerous situation which occurred on cruise liner “Crown Princess”, under the Bermuda flag. The ship sailed from the port of Canaveral (USA) having the destination for New York. There were 4545 passengers and crew members aboard. INS equipment was mounted on the ship just before leaving the port, which a badly experienced watch officer used for turning to the new course. However the speed of the circulation happened to be unexpectedly too high and resulted in the list 45º to starboard. The chief mate having come to the bridge straightened the liner but the consequence was the injuries of more than 300 passengers and crew members. The cause of the incident is bad knowledge of the INS characteristics by the ship officers.

Of course not every failure of the INS system brings to a casualty: the final result depends on many factors (narrows, high seas), speed of the ship, professional competence of the watch officer and the quality of the instructions on the actions in emergency situations. Nevertheless according to the “golden” rule of seafarers – “think that you are nearer to the danger”, it is absolutely necessary have a chance of timely detection of any abnormality in the INS functioning. That is why the principal method of prevention of emergence situations on board ships, equipped with INS, is the systematic monitoring of the state of the navigation equipment by the watch officer, not relying on the failure alarm which due to the design peculiarities, may not inform about all possible failures in the system.

4) Improvement of the navigating bridge and layout of INS elements. In December 2000 IMO MSC accepted Guidelines on Ergonomic Criteria for Bridge Equipment and Layout), and all the concerned were informed by the Circular MSC/Circ 982. These Guidelines served as an amendment and further development of the SOLAS-74 in July 2002. The purpose of these guidelines which concern only new built ships is to provide ergonomic requirements to the bridge equipment, to the layout of the instruments and controls for the reliable and effective fulfillment of all the necessary operations on the bridge. The guidelines comprise five parts which contain the recommendations concerning the position of the officer’s working place, the layout of the instruments, the provision of comfortable conditions (working surrounding), the placement of commutation means various sources of information, alarm devices, provision of conditions for visual observation etc. They also contain the list of other requirements and recommendations concerning certain systems and facilities on the bridge. Undoubtedly, observing the criteria and provisions of the above guidelines

in the processes of designing, equipping and operation of ships is to play a remarkable positive role in the enhancement of the safety of navigation. A convenient layout of the instruments and control devices of ship movement parameters, comfortable conditions for the watch officer taking into consideration all the potential requirements to visual and instrument information, unified design of different devices, provide a in great degree the adaptation of the technical means to the human inherent potentialities, i.e. facilitate the reduction a number of human mistakes and drawbacks referred to the ergonomic causes.

5) Provision of sufficient rest, physical and psychological readiness of officers taking over the watch. Elimination of all the working loads not connected with watchkeeping.

6) Working out habits of an old “cross-check” method of mistake avoidance, somewhat forgotten in our “age of automation”. It is not the redundancy of officer checks up of the data acquired by means of one system using another one if the first one is suspected to err. On the contrary it is the usual navigational practice to verify the data acquired by one system by means of another one. It is very important that such data as the ship position, course, covered distance etc should be determined by two different methods.

7) Improvement of the working surroundings of the watch officer as far as it is possible by diminishing the action of the factors unfavorable for a man: noise, high/low temperature, air humidity.

8) Thematic seminars with the officers after exercises and training with the analysis of the committed errors and taking the measures for their elimination, making the necessary, amendments to the ships SMS included.

9) Improvement of the watch arrangement on the bridge, in particular by means of creation of an atmosphere of confidence, mutual understanding and support within the crew. As a result of all the above the people on the bridge should follow the principle “people to check people” which would help timely avoid or correct a mistake of any crew member, especially when sailing in complicated conditions.

In conclusion it is worthy to note the conception of electronic navigation (e-Navigation) being now under elaboration by IMO in cooperation with AICM envisages that this system among other objectives will provide an efficient interaction of watch personnel with technical facilities in the process of navigation.

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Potential of Fast Time Simulation for Training in Ship Handling Simulators and for Decision Making On-Board Ships

Knud Benedict
Professor, Hochschule Wismar, University of Applied Sciences - Technology, Business and Design, Dept. of Maritime Studies Warnemuende, Maritime Simulation Centre Warnemuende / Germany,
Knud.Benedict @hs-wismar.de
Michael Gluch, Matthias Kirchhoff, Sebastian Klaes, Sandro Fischer
Senior Scientists, Hochschule Wismar, University of Applied Sciences - Technology, Business and Design, Dept. of Maritime Studies Warnemuende, Maritime Simulation Centre Warnemuende / Germany,
michael.gluch @hs-wismar.de
Michael Baldauf
Assistant Professor, World Maritime University WMU, Malmoe / Sweden, mbf@wmu.se

Abstract Simulation tools for Prediction of future situations of the ship manoeuvring process are very helpful and already in use on ships for a long time, beginning with trial modes in ARPA radars up to curved headline overlay in ECDIS. New concepts for on board displays were developed at Maritime Simulation Centre Warnemuende (MSCW) and presented at the last IAMU conference. In recent research projects fast time simulation tools for ships motion with complex dynamic models were used for a wider use of that technology for manoeuvring applications. These simulations allow on one hand for new type of manoeuvring design and on the other hand of unmatched monitoring of ship handling processes to follow the underlying manoeuvring concept. During the manoeuvring process the planned manoeuvres can be displayed together with the actual ship motion and the predicted future track by prediction tools. This future track is based on input from the ships actual steering and propulsion control handles.
Within this paper investigations into the feasibility of the new concept and selected results of simulation studies will be discussed. These methods are intended to be used both as an effective tool for training in ship handling simulators but also on board of real ships because the trainee or the ship officer in charge respectively can immediately see the result of the actual rudder, engine or thruster commands. Examples will be given for results from test trials in the full mission ship handling simulator at MSCW.

Keyword: *Fast time simulation, manoeuvring, ship handling, decision support*

1. Introduction – description of the Concept

Normally ship officers have to steer the ships based on their mental model of the ships motion characteristics only. This mental model has been developed during the education, training in ship handling simulator in real time simulation and most important during their sea time practice. Up to now there is nearly no electronic tool to design a manoeuvring plan effectively, even in briefing procedures for ship handling training the potential manoeuvres will be explained and drafted on paper or described by sketches and short explanations. This paper present a new method based on fast time simulation: effective tools were developed in the past for simulation of standard manoeuvring elements (basic manoeuvres) based on fixed manoeuvring elements in control files. This concept will be extended now to freely change the manoeuvring controls to design manoeuvre and sequences of manoeuvres connected to manoeuvring plans. For the execution of the manoeuvre this plan can be activated later to be superimposed in ECDIS together with the actual position of the ship and most important with the prediction of manoeuvring capabilities (see [2]) for effective steering under the actual manoeuvring and environmental conditions.

2. Math model and fast time simulation tools for optimal standard ship manoeuvring elements

2.1 Ship dynamic model

The following equation of motion was used as math model for the ships dynamic:

$$\begin{aligned} X &= m \cdot \left(\dot{u} - r \cdot v - x_G \cdot r^2\right) \\ Y &= m \cdot \left(\dot{v} + r \cdot u + x_G \dot{r}\right) \\ N &= I_z \cdot \dot{r} + m \cdot x_G \cdot \left(\dot{v} + r \cdot u\right) \end{aligned} \tag{1}$$

On the right side are the effects of inertia where u and v represent the speed components in longitudinal and transverse direction x and y, r is the rate of turn of the ship. The ships mass is m and x_G is the distance of centre of gravity from the origin of the co-ordinate system, I_z is the moment of inertia around the z-axis.
The ships hull forces X and Y as well as the yawing moment N around the z-axis are on the left side. Their dimensionless coefficients are normally represented by polynomials based on dimensionless parameters, for instance in the equation for transverse force Y and yaw moment N given as the sum of terms with linear components N_r, N_v, Y_r and Y_v and additional non-linear terms depending on speed components u, v, rate of turn r, revolution n and rudder angle δ. Other forces as for instance rudder forces and wind forces are expressed as look up tables. There are additional equations for the engine model, additionally with look-up tables to represent automation systems characteristics.
The solution of this set of differential equations is calculated every second; some internal calculations are even done with higher frequency to avoid numerical instabilities and guarantee required accuracy.
This equation of motion (1) can be written in the form:

$$x'(t) = f(x, u_c, t) \tag{2}$$

Where:

- State spaces with track co-ordinates ζ-η, heading ψ:

$$x = [u, v, r, \xi, \eta, \psi, \delta, n_{ME}, n_{TH}, ...]$$

- Controls with commanded values Cmd for main engine ME and thrusters TH:

$$u_c = [\delta_{Cmd}, n_{ME\_Cmd}, n_{TH\_Cmd}, ...]$$

- with initial conditions at: $t = t_0$: $x(t_0) = x_0$, $u(t_0) = u_{c0}$:

$$x_0 = [u_0, v_0, r_0, \xi_0, \eta_0, \psi_0, \delta_0, n_{ME0}, n_{TH0} ...]$$

$$u_{c0} = [\delta_{Cmd0}, n_{ME\_Cmd0}, n_{TH\_Cmd0}, ...]$$

This equation of motion (2) can be solved by numerical integration for the simulation time period t_0 to t_1 in the form of the general solution:

$$x(t) = x(t_0) + \int_{t_0}^{t_1} x'(t)\,dt$$

i.e. for the full set of states and controls:

$$x(t) = x_0 + \int_{t_0}^{t_1} f(x, u_c, t)\,dt \tag{3}$$

A simplified solution for a simplified simulation is used by integration of track and heading assuming only constant speed u_0, v_0 and rate of turn r_0, which results always in a circular motion with constant speed and will be used for simplified prediction with reduced accuracy or to indicate the current motion status valid only for a small time span:

$$x(t) = x_0 + \int_{t_0}^{t_1} f(u_0, v_0, r_0)\,dt \tag{4}$$

2.2 Technological setup for simulation - SIMOPT & SIMDAT as tools for fast time ship simulation and assessment

The quality of the math model for the simulation and the parameters in the equations are of high importance for the effectiveness of the dynamic prediction. There is a great need for fast and effective modelling / tuning processes not only for the predictor but also in Ship handling simulators where clients from shipping companies need to be trained on their ship types. This is the same procedure as we need for tuning the ship model parameters in the predictor.
A PC-based software package was developed at MSCW (Benedict [1]) to be used for the fast time simulation (SIMOPT) and assessment of the results (SIMDAT). The Advantage and Capabilities of this software is: The Math Model reveals same quality for simulation results as the Ship handling simulators SHS, but it is remarkably faster than real time simulation, the ratio is up to 1/1000, the steering of simulator vessels is done by specific manoeuvre-control settings / commands for standard procedures and individual manoeuvres dedicated for calculation standard ship manoeuvring elements (basic manoeuvres) but moreover for the estimation of optimal manoeuvring sequences of some characteristic manoeuvres as for instance person over board manoeuvres.
Fig. 1 show some details of the SIMOPT interface: The ships main data are displayed in the left part. The hull coefficients are displayed in the centre. Manoeuvres can be selected from the right top menu.
Manoeuvres can be selected from the right top menu. Simulations can be done either as single run or as simulation series for selection of up to 3 Parameter series to be simulated in parallel or sequential for:

- Simulation parameters, e.g. Manoeuvre series;
- Ship Parameters (L, B, T, or others);
- Hull / force parameters coefficient and
- Environmental data, e.g. wind force.

A specific new "Offline assessment tool" SIMDAT was originally designed at the MSCW to supply the instructor with semiautomatic assessment of the recorded exercise data in ship handling simulator ([1]). For the purpose of ships model parameter tuning and optimisation of manoeuvres this SIMDAT tool was extended: The Data for the manoeuvring characteristics can now be automatically retrieved for all manoeuvres used for simulator ships tuning; enhanced Graphic tools are available for displaying various types of results. The results of a particular evaluation are shown in Fig. 2 and Fig. 4. Additionally to the different graphical presentations specific overviews on the results are provided when series of manoeuvres have been simulated. This figure shows e.g. a comparison of simulation series results for turning circle with respect to Transfer, Advance, and Diameter. It can be presented in tables or in diagrams or used for optimization algorithms.

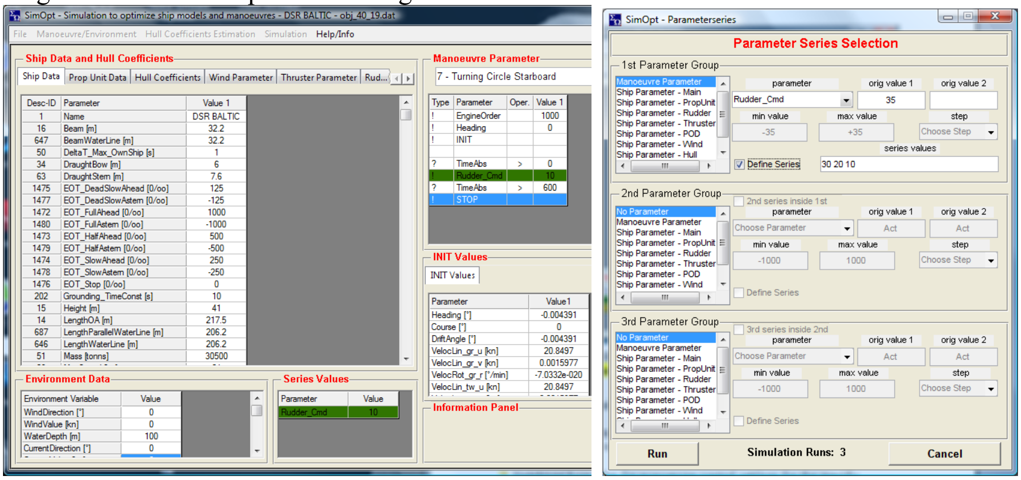


Fig. 1 SIMOPT Interface Elements – Overview (left): Ship Data / Hull Coefficients, Manoeuvre Commands as well as Manoeuvre Optimisation criteria and Parameter series values (right)

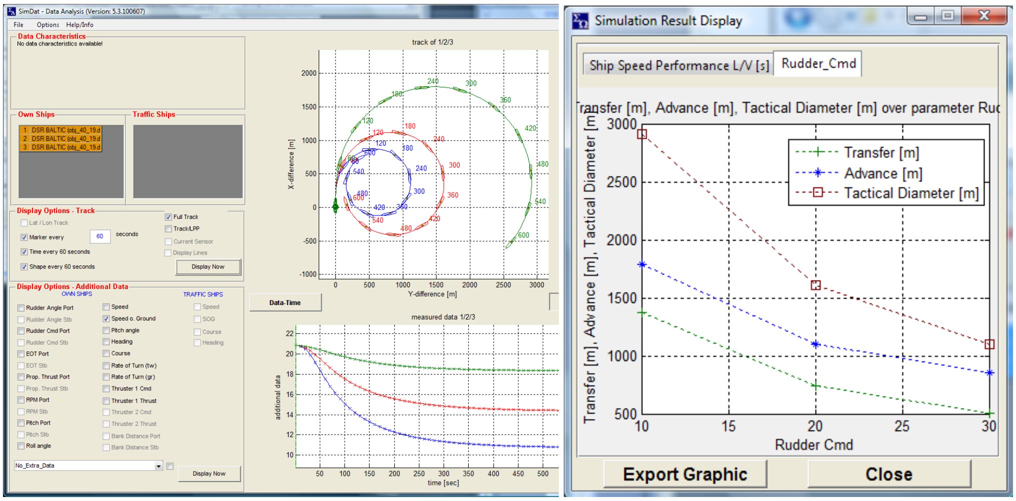


Fig. 2 SIMDAT Interface Elements – Overview with tracks and time histories (left) and extracted results in tables or here in graphs respectively (right)

2.3 Sample of a Manoeuvre Optimisation

The objective of the manoeuvre optimisation process is to find suitable procedures which can be used in the simulator or in reality with the real ships.

In the beginning there are standard files for manoeuvre control settings for the specific manoeuvres. By means of the SIMOPT program the fast time simulation produces various results of manoeuvres which are retrieved by SIMDAT and compared with Manoeuvre-Quality Criteria. By changing the Manoeuvring-Parameters the manoeuvring performance can be improved. The final goal is to achieve an Optimised Manoeuvre control setting for training & research in SHS. The biggest problem is that there are many options possible and the effect of the changes of the parameters is not very clear; some changes may even have effects which counteracts the results of the others. Therefore it is very important to know about the parameters which have a clear impact on the manoeuvring characteristic. Results have to be applicable as reference manoeuvre for training & assessment e.g. in SHS. An example is given below to indicate the need and the effect of manoeuvring optimisation by means of an Emergency Return Manoeuvre.

The STCW Code emphasises a thorough knowledge of and ability to apply the procedures of search and rescue operations. The following extract is an example Fig. 3 of an emergency return manoeuvre in Fig. 3, well known as the “Scharnow-Turn” (see [3][4]).
The main aim of this person over board manoeuvre is to return the vessel to the original track by the shortest route and with minimum loss of time. In practice the vessel initially follows the turning circle, and after shifting the rudder by a course change of about 240°, finally turns to counter rudder and amidships, the vessel then swings back to the opposite course at a certain measurable distance from the original track, respectively at a certain distance from the reference manoeuvre.
The problem is how to get the “Optimal reference manoeuvre” because the heading change of 240° is an average only and can differ among ships between 225 up to 260° in the same way as for the Williamson Turn which can vary from 25° to 80° instead of the standard average value of 60°.

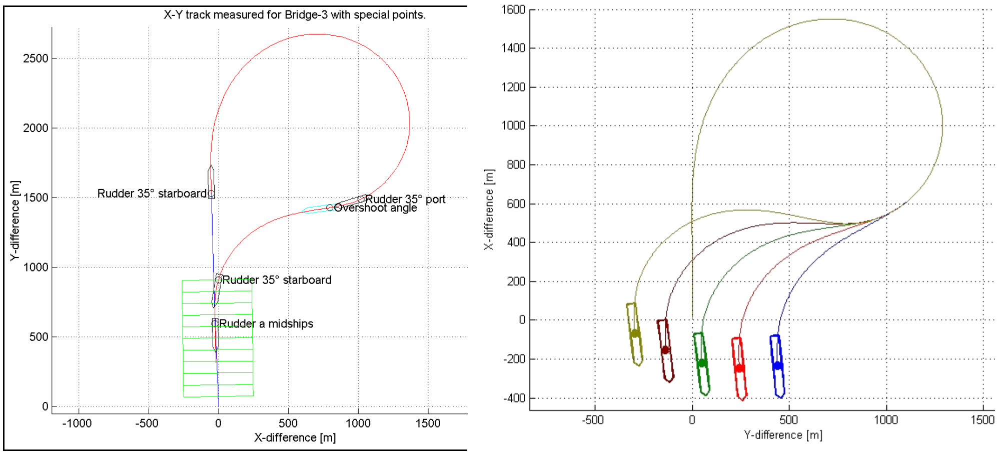
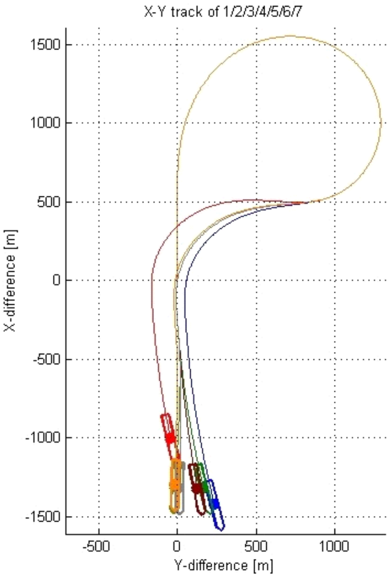


Fig. 3 Reference outline for the Scharnow–Turn (left) and Optimisation Series for different heading changes 220°, 230°, 240°,250° and 260° for counter rudder (right)

Using the SIMOPT and the SIMDAT programs there are two ways to come to the optimal result:

- The 1st Option is to simulate series of manoeuvres using standard „Scharnow-Turn“ manoeuvring commands in automated simulation series: This method can be seen in Fig. 3 (right) where several heading changes were used as parameter to vary final result of distance between the initial track and return track.

- The 2nd Option is to start with a Standard „Scharnow-Turn“ manoeuvring command series for automated simulation (centre right) together with optimisation procedure: An optimising algorithm is used to find suitable heading change for counter rudder as parameter to achieve smallest distance (limit=10m) between initial track and return track on opposite heading (limit=2°). The Optimal track is indicated by yellow colour in Fig. 4. The main parameters of the optimised manoeuvre procedure are given in the table format.



*********** Manoeuvre information***********************
main parameter for emergency return manoeuvre
with starting speed of 25.5 kn
****

TYPE: port Scharnow turn	
initial approaching heading	: -0.0 °
initial approaching course/track	: 0.0 °
time of hard rudder port	: 0 min 1 sec
hard counter rudder to starboard after	: 233.1 °
time of hard rudder starboard	: 5 min 20 sec
overshoot angle	: 24.7 °
opposite course/track (+180°)	: 180.0 °
hard counter rudder to port after	: 204.5° at 155.5°
time of hard rudder port	: 8 min 3 sec
time of rudder a midships	: 8 min 40 sec
cross distance to original track	: 3.9 m
final heading	: 179.4 °
final course/track	: 179.0 °

Fig. 4 Tracks of SIMOPT Emergency Return Manoeuvre Optimisation procedure (left) and Display of manoeuvring details for Optimised manoeuvre by SIMDAT (right)

3. Fast time simulation for manoeuvring design in sea chart

3.1 Presentation of fast time simulation of manoeuvres in ECDIS environment

The same fast time simulation tools were used to find out efficient manoeuvres for the design of manoeuvring plans. Some basic functions are shown in the next figures.
Fig. 5 explains the method in a sea chart environment present by an interface which combines the electronic navigational chart ENC window (centre), the status of the current actual ship manoeuvring controls (left) and the interface window for the steering panel of the ship (right). The ship was positioned in a certain place to demonstrate the ships motion for a very simple manoeuvre kick turn from zero speed. The ships motion can be controlled by the settings in the control panel window where any manoeuvre can be generated and will be immediately displayed in the ENC in less than one second with full length. The length of the track corresponds to the settings in the prediction window (left top corner): the range value represents the duration of the manoeuvre; the interval value controls the number of displayed ship contours on that manoeuvre track. The sample represents a kick turn from zero speed to full ahead with one rudder (PT).

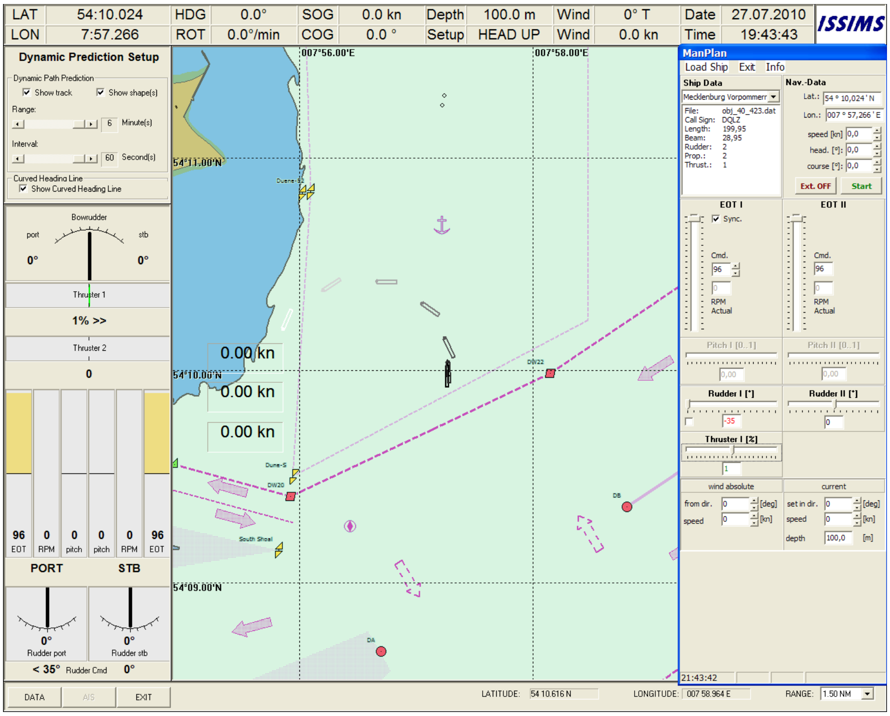


Fig. 5 Kick turn from zero speed to port as sample for potential ships manoeuvring capabilities

Fig. 6 show a specific manoeuvring situation: a ship is positioned in a fairway and is going to enter the harbour basin. This shall be done using a Kick turn from zero speed to port: the suitable rudder is found 10° and also the thruster is used adequately.

Fig. 7 presents the situation after execution of the manoeuvre previously planned – the ship is entering the moles and it is time to plan the following manoeuvre. This is to be seen in Fig. 8: starting with the initial conditions from the previous manoeuvre the control settings have to be found for bringing the ship alongside the berth. This can be done very easily by trial an error varying manually the rudder, thruster and engine order values until the result is acceptable. The different settings of the controls and the track of the planned manoeuvre sequences are stored in a manoeuvre planning file to be displayed in the ENC.

For the execution of the manoeuvre this plan can be activated later to be superimposed in ECDIS together with the actual position of the ship and most important with the prediction of manoeuvring capabilities (see [2]) for effective steering under the actual manoeuvring and environmental conditions. This concept will be explained more detailed in samples in the presentation at the IAMU 2010 Conference.

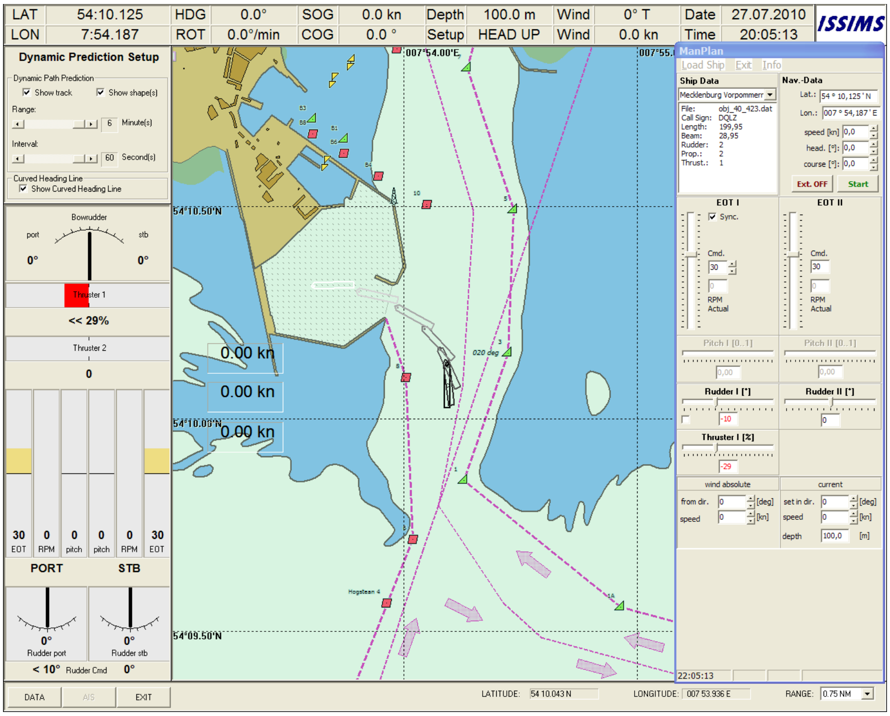


Fig. 6 Kick turn from zero speed to port adjusted for entering a specific port from initial conditions in a fairway

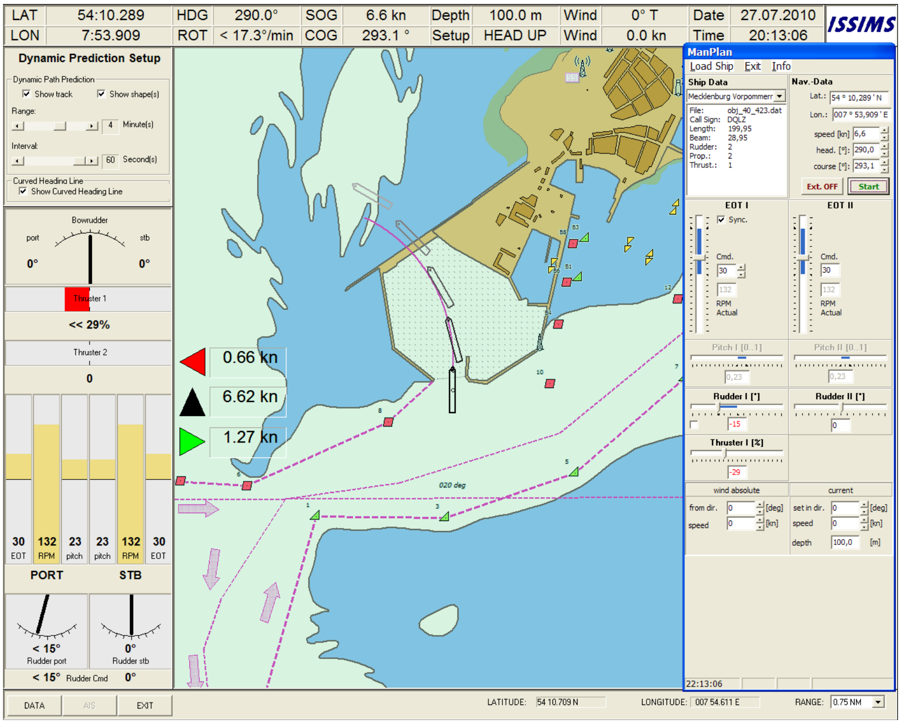


Fig. 7 Execution of the manoeuvre previously planned - Position of ship entering when the moles

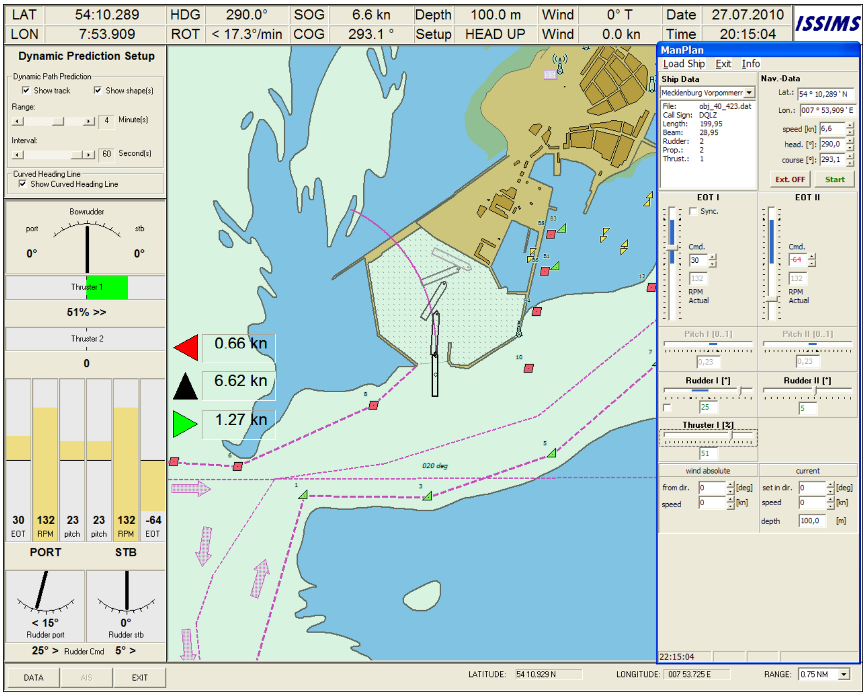


Fig. 8 Planning of the next manoeuvre starting with the initial conditions from the previous – adjustment of manoeuvre details for bringing the ship alongside the berth

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Ship control optimization in heavy weather conditions

Aleksandr D. Pipchenko
PhD Student
Capt. Dmytro S. Zhukov
Senior Lecturer
Odesa National Maritime Academy (ONMA)8, Didrichson str., 65029, Odessa, Ukraine
aldpi@rambler.ru d_zhukov@mail.ru

Abstract The task of ship ocean routing efficiency improvement was defined. This is done by optimizing the ship voyage planning and on-scene control procedures. Optimization goal is reached for the account of improvement of methods for ship dynamics computation and operative route adjustment. To reach the prescribed goal the appropriate set of problems was defined. To reach the solution of the first problem, which is devoted to development of ship motion mathematical model, two models were developed: basic linear model – for calculation of motion parameters in irregular seas in relatively small oscillation range, and non-linear model – for calculation of complicated rolling regimes: simple and parametric resonances, reduce of stability in waves.

Second task is devoted to the development of specific ship state in waves parameters computation techniques, particularly: definition of unsafe rolling zones, intensity of slamming, green water and propeller immersion, speed reduction due to wind and waves.

The result of third task solution is came as the complex two-level multi-criteria ship state assessment system, modeled on the basis of fuzzy logic theory. For the formation of prescribed system the risk assessment concept was applied. All that gave the possibility to obtain the integral ship state assessment in form of generic risk level from heterogeneous data.

The fourth task is devoted to optimal control regime and transoceanic route search method. The search is performed by genetic algorithms method. As objective function in first case the integral assessment of safety and economical efficiency of selected control regime is used. In second case for this purpose the minimum of additional voyage costs, caused by environmental influence with preliminary calculated minimal costs in calm water is used.

The solution of the above mentioned tasks allowed the developing of a complex method for searching the optimal route and control regimes in heavy weather conditions.

For the approval of correctness and efficiency of results proposed in this work, corresponding algorithms and programs were developed. Check computations on the developed programs and models of voyage planning and on-scene control in heavy weather allowed to confirm the reliability and efficiency of obtained results.

Keyword: *ship, waves, control regime, voyage planning.*

1. Introduction

The success of ship sea passage greatly depends on the weather conditions. If the ship is going to pass the area of storm or due to prevalent circumstances she's found herself in adverse weather conditions, a navigator gets a task to find optimal from points of safety and efficiency ship's speed and heading.

Relatively high accident rate and weak navigator's informational support of decision making in waves stipulate the necessity of development of the automated methods aimed to find an optimal ship control regime in waves.

2. Risk assessment

The first stage in choosing the ship control regime, from our opinion, should be assessment of the risks conducted with her activity in heavy weather conditions. Mathematically the risk level can be defined as product of probability of hazardous occurrence P and it consequence A.

In our case we define P as the probability of reaching defined dynamical motion parameters that may lead to the series of negative consequences, conducted with ship's operation in storm.

Making the risk assessment of ship operation in heavy weather conditions one can define the situations connected with damages to hull structure, ship's systems and machinery and the situations arising due to violations of cargo handling technology.

For instance, the achievement of defined high amplitudes of roll may lead to the series of situations with different levels of consequences, such as shifting or loss of cargo, flooding of ship's compartments, capsizing.

Therefore, by defining function $R = f(P,A)$, we can build the corresponding *risk matrix* (fig. 1).

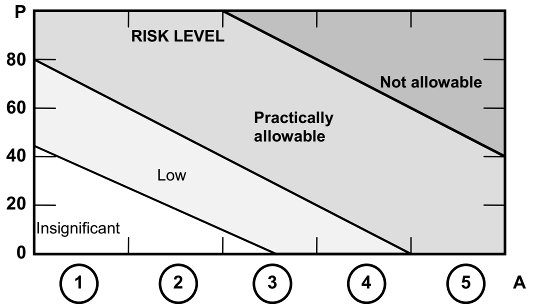

Fig. 1 Risk matrix

Let's highlight next risk levels: insignificant, low, practically allowable and not allowable. The risk management should cover such measures which allow to vary the probability of definite event or to reduce the degree of its consequence. When solving the problem of optimal ship control regime selection in heavy seas we assume the degree of consequence as constant. From the other hand by altering ship control parameters operator can affect the probability of reaching such ship motion parameters that lay beyond the limits of practically allowable risk. In this case the risk level can be given as

$$R = f\left(P_1, P_2, \ldots, P_n\right), \qquad (1)$$

where $P_1, P_2, \ldots, P_n$ - probabilities of reaching the ship motion parameters, that may lead to definite hazardous occurrence.

3. Seaworthiness criterions

To perform the risk assessment and to find the optimal control regime in given weather conditions it's necessary to define the criteria that allow to evaluate it efficiency, in other words to define the safe and economical control regime.

During development of corresponding criteria following factors should be taken into account:

- frequency and force of slamming;
- frequency of green water;
- motion amplitudes;
- hull stresses;
- propeller racing;
- accelerations in various ship points;
- forced and controlled speed redaction;
- deviation from planned route.

First six factors define safety of ship operation, other two – the efficiency. The table of general operability limiting criteria for ships in waves are given down below (*Lipis, 1972; Stevens, 2002)*:

Criterion	Cruikshank & Landsberg (USA)	Tasaki et al. (Japan)	NORDFORSK, 87 (Europe)	NATO STANAG 4154 (USA)
RMS of vertical accelerations on forward perpendicular	0.25 g	0.8 g / P = 10^{-3}	0.275g (L_{pp} < 100 м) 0.05g (L_{pp} > 300 м)	-
RMS of vertical accelerations on the bridge	0.2 g	-	0.15g	0.2g
RMS of transverse accelerations on the bridge	-	0.6 g / P = 10^{-3}	0.12g	0.1g
RMS of roll motions	15°	25°/ P = 10^{-3}	6°	4°
RMS of pitch motions	-	-	-	1.5°
Probability of slamming	0.06	0.01	0.03 (L_{pp} < 100 м) 0.01 (L_{pp} > 300 м)	-
Probability of deck wetness	0.07	0.01	0.05	-
Probability of propeller racing	0.25	0.1	-	-

*The significant motion amplitudes ($X_{1/3}$) can be obtained by doubling the corresponding RMS (root mean square value).

Table 1. General operability limiting criteria for ships

In table 1 the operability criteria for wide spectra of ships are given. However criteria of NORDFORSK and NATO STANAG appear to be too strict, and in series cases when ship proceeds through a heavy storm the motion parameters may exceed these criteria.

According to inquiry of 100 management level navigators (captains and chief mates) passing the Ship Handling course in Training & Certifying Centre of Seafarers of Odessa National Maritime Academy (TCCS ONMA) following operability criteria were obtained:

	Roll motion amplitude, °	Slamming, intensity per hour	Deck wetness, intensity per hour	Speed reduction, %	Deviation from course, °
Small	< 7	< 5	< 5	< 13	< 20
Not dangerous	< 14	< 11	< 10	< 24	< 38
Substantial	< 23	< 19	< 20	< 46	> 40
Dangerous	> 26	> 23	> 23	> 58	-

*The average values of inquiry data are given.
** Example: slamming probability with period of pitch 5 sec and intensity 20 times/hour: **0.028**

Table 2. Management level navigators inquiry data

In table 2 the empirical values of ship operability criteria are given. Usage of last gives possibility to perform more detailed, supported by personal seagoing experience of navigators, assessment of ship state in waves.

It should be noted that risk assessment by only threshold values, defined for the series of criteria is ineffective. Therefore in this case we suggest to apply not two-valued state function, but numerical or linguistic function, defined in range between two extreme values: «0» - «1», «best» - «not allowable» (minimal – maximal risk level).

In the capacity of limiting value in each case we take the *generalized safety criterion* –marginal risk level at which the ship operation is safe in defined conditions.

4. Fuzzy logic assessment system

To implement above mentioned suggestion on the basis of fuzzy logic multicriterion seakeeping efficiency assessment system was built (fig. 2). As the data used to generate

corresponding fuzzy inference subsystems (FIS) existing international ship operability criteria and expert inquiry results were taken.
The seakeeping efficiency assessment algorithm works in the following way. Parameters, taken as the system input, passing the FIS structure of the 1st level. As the result on the output we receive series of rates on each criterion (for instance, roll amplitude: "small", "substantial" or "dangerous"). Rates may be given either as linguistic terms or in defined numerical range.

In course of definition system's membership functions (MF) it suggested to form boundary conditions on the basis of existing international operability criteria, and MF's intermediate values by approximation of preliminary transformed expert inquiry data.
After that obtained rates pass the FIS of the 2nd level, on the output of which the general assessment on the set of conditions is obtained (risk level, efficiency). The estimation of the objective function is done on the last stage by transformation of local safety and economy rates through the FIS of the 3rd level.

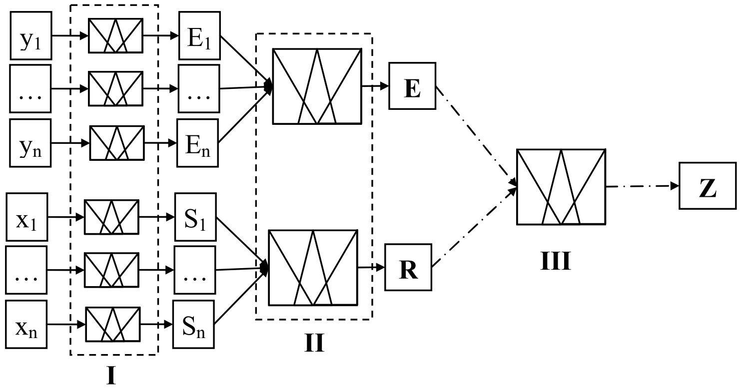

Fig. 2 Multicriterion seakeeping efficiency assessment system

$x_1 \ldots x_n$ – motion parameters, $S_1 \ldots S_n$ – corresponding rates, $y_1 \ldots y_n$ – economical parameters, $E_1 \ldots E_n$ – corresponding rates, R – risk level, E – level of economic efficiency, Z – objective function.

The FIS subsystem development process can be divided on the next stages:

STAGE 1. Definition of membership functions μ of deterministic input x and output y variables to fuzzy linguistic sets A and B. This includes formation of simple statements in antecedents and rules conclusions, and statistical membership estimation of defined parameters to the corresponding linguistic terms.

STAGE 2. The fuzzy rules Π database formation on the basis of fuzzy linguistic ensembles A and B. On this stage is important to provide completeness and consistency of the database.

STAGE 3. Definition of the fuzzy inference algorithm, such as algorithms of Mamdani, Takagi-Sugeno, Tsukamoto, Larsen and others.
In our case all three FIS modules appear as MISO (multi-input-single-output) structures and built on the basis of Mamdani fuzzy inference algorithm (*Borisov et al., 2007)*.
More detailed membership functions and rules databases formation process is described in *Pipchenko (2010).*

5. Decision evaluation

Research results obtained in woks *(Pipchenko, Zhukov, 2008; Nechaev, Pipchenko, Sizov 2009; Pipchenko, 2010)*, and arrangement of above described ship seaworthiness assessment system allowed to develop the ship optimal control regime selection method for adverse weather conditions (fig. 3).
The method can be described in following way. Before the voyage with known load condition ship motion parameters X are calculated in all range of wavelength's, ship speeds and courses

(λ, U, μ). By the actual wave spectra S_ζ and X the diagrams of motion in irregular waves $\tilde{X}$ should be obtained. For defined motion parameters (U,μ) the objective function Z (level of efficiency reasonable risk) should be defined. Here optimization goal is to find minimal value of Z in prescribed weather conditions that corresponds to the minimal possible risk and deviation from the planned route. It's suggested to perform the search of optimal control regime by genetic algorithms (GA) method.

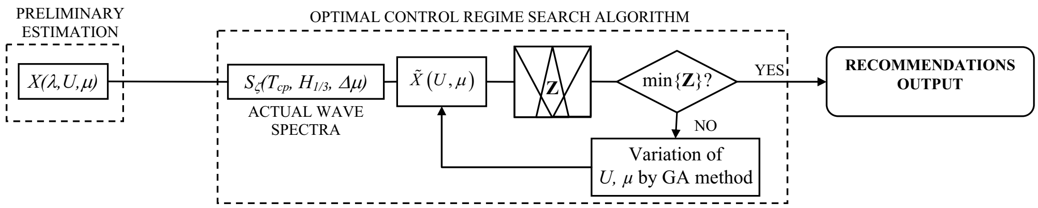

Fig. 3 The flowchart of optimal ship control regime selection method for adverse weather conditions

On the fig. 4 the working example of suggested algorithm is given. Container carrier proceeds in following waves (wave is encountering from the starboard aft quarter, 135°) undergoing significant rolling motions with amplitude up to 36°. Such ship dynamic state is assessed by the system as *not allowable*. From navigators inquiry data determined that there two classical solutions of this task. First is to turn into the head waves and to slow down depending on slamming and green water intensity. Second is to come into clearly following waves (μ = 180°) and increase speed. The machine decision in this case is to put the wave on the course angle of 160° and increase speed up to 25 knots. By analyzing storm diagram on fig. 2 it can be concluded that such solution of this task is the most efficient as with small course alteration and speed increase ship will encounter much smaller rolling motion (amplitude 10°).

6. Conclusion

In this article the multilevel ship seaworthiness assessment system built on the basis of fuzzy logic theory and risk assessment concept is represented.

The advantages of the developed system are: multi-level open structure, ability to adapt, usage of navigator's practical experience, convenience of results interpretation.

On the basis of obtained system the ship optimal control regime in storm search method was developed, implementation of which may significantly simplify the process of selection of safe and efficient ship control regime in adverse weather conditions.

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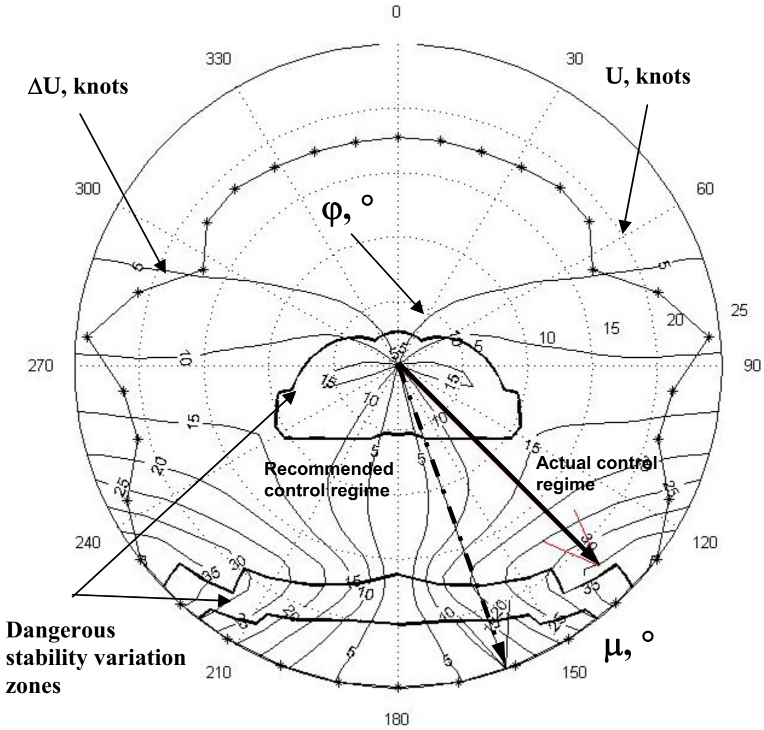

Ship state assessment in waves form

Vessel parameters: L = 200 m, B = 30 m, GM = 1.0 m; **Wave parameters**: $H_{1/3}$ = 10 m, Tcp = 11.5 s					
Control regime Actual / Recommended					
Wave encounter angle			Ship speed (U_P = 25 knots)		
135 / 160°			22 / 25 knots		
Operability state assessment					
Significant rolling amplitude	Green water: Probability// Intensity	Slaming Probability// Intensity	Speed reduction	Deviation from course	
36 / 10°	0// 0 times/hour	0// 0 times/hour	**0 knots**	0/25°	
Not allowable/Not dangerous	**NA**	**NA**	**NA**	**Moderate**	
Is the vessel in resonance zone?			No		
Risk level			0.88/0.1	Not allowable / Allowable	
Economic efficiency assessment			0.26/0.29	Economical / Economical	
General assessment			**0.88/0.33**	**Not allowable / Good**	

Fig. 4 Optimal ship control regime selection algorithm performance illustration

Meeting the Future Need for Teaching Strategic, Shore-Based International Maritime Human Resource Management

Dr. Maria Anne WAGTMANN
Associate Professor, Danish Maritime University (Univ. of Southern Denmark), maw@sam.sdu.dk
Dr. Thomas PAWLIK
Professor & Dean of Studies, Hochschule Bremen (Germany), thomas.pawlik@hs-bremen.de

Abstract A globally-oriented e-textbook on strategic, shore-based maritime human resource management (HRM) is being developed in the EU-financed Northern Maritime University (NMU) project, by faculty members of the Centre of Maritime Research and Innovation of the Danish Maritime University and the Centre of Maritime Studies at Germany's Bremen University of Applied Sciences (*Hochschule Bremen* or HS). NMU is a research and common curriculum development project, having the global objective to build up a strong transnational network of universities in the North Sea Region, which intensively and continuously integrates relevant stakeholders from the maritime business sector. The e-textbook seeks to take into account the future scenario where shipping industry actors have to work to ensure global efficiency in operations, yet are also subjected to on-going scrutiny of their practices by flag states, labour supplying states, unions, industry organisations, etc. In this scenario, shore-based HRM personnel in maritime organisations need to have an increased level of knowledge about variations between flag and labour supplying states and individual employees relating to, e.g., motivation, assessment and management of employees both on ships and shore, labour relations, the implementation of major International Labour Organisation (ILO) and International Maritime Organisation (IMO) conventions and the regulation of occupational safety and health. This paper presents the textbook's objective, content and teaching methodologies and assesses the potential contribution it can make to ensuring good global HRM practice in the maritime sector.

Keyword: *maritime human resource management, strategic management, textbooks, pedagogy, structured assignments, globalisation, Northern Maritime University*

1. Introduction

In high GNP maritime nations, an ever-increasing number of officers and ratings employed in the nationally-controlled fleet come from third countries [1]; in certain countries, e.g., Germany, persons without shipboard experience are also sometimes employed to manage ships and crews [2]. Moreover, officers from third countries remain underrepresented in senior positions on ship and in land-based work [1]. Based on these developments, a globally-oriented e-textbook on strategic, shore-based maritime human resource management is being developed in the EU-financed Northern Maritime University (NMU) project. NMU is a research and joint and common curriculum project, having the global objective to build up a strong transnational network of universities in the North Sea Region which intensively integrates relevant stakeholders from the maritime business sector. Therefore Section 2 of this paper will present the main ideas behind and features of the NMU project and elaborate on the efforts within this project to create joint and common curriculum offerings.

Section 3 of this paper presents the textbook's objective, content and teaching methodologies. The e-textbook is built up around core text, which provides a global overview. Open access websites and texts written by stakeholders and academics are used in structured assignments, to provide authentic pictures of practice from over 30 flag, port and/or labour supplying states; here, several texts are authored by IAMU member institution academics. Additionally a large number of structured assignments allow for students' independent study; they can be solved based on either the text alone or based on the text combined with other readings. These features of the textbook will be explained further in Section 3, which will also look at features included in the textbook which are intended to make it truly adaptable to teaching students from a wide variety of countries or who will be potentially deployed in foreign countries to work with crewing or more general ship management-related HRM issues.

Finally, the concluding Section 4 provides our summary assessment of the potential need and the potential contribution of this textbook to maritime education and training (henceforth: MET).

2. The Northern Maritime University (NMU) Project

The Northern Maritime University (NMU) Project, funded by the EC Interreg IVB Programme, is an education and research initiative, which includes partners from several major Northern European universities who teach and research on maritime transport. The aim of the NMU is to develop ideas, to create a joint curriculum, and hence a virtual university, delivering courses to undergraduates, postgraduates, and industry. A further aim will be to influence policymakers.[3]

The NMU service product portfolio aims at increasing the mobility of students and lecturers and embraces the following five basic service products: 1. Exchange of Students: The NMU network enhances the possibilities for students to spend a certain period at another NMU university. Within the framework of the agreed curricula, the exchange can be organised very smoothly. 2. Joint Courses: The NMU will offer a range of joint modules. Modules and elements thereof will be delivered in various modes (campus-based, blended and e-learning, summer schools, and short courses). The teaching content developed for module elements can be easily transferred into small textbooks. 3. Virtual Competence Centre: Within the NMU a virtual competence centre will be developed that integrates and organises skills, experience and competences of members for undertaking common research projects in the maritime sector. 4. Travelling Lecturer Concept: Faculty members of the NMU partners will teach not only at their home universities but also at the campuses of other NMU partners or, for example, during NMU summer schools, at specific venues. Thus, those NMU students who are not able to study abroad can have access to an international learning experience and can gain from the diversity of the NMU staff. 5. Knowledge Sharing and Creation: Each individual NMU partner university has close relations with maritime companies and other relevant organisations. The NMU network enhances the options for the creation and sharing of knowledge by expanding the geographical coverage of individual institutions and by adding specific content. [4]

3. The E-Textbook in Strategic HRM in the Maritime Industries

3.1 The Objective of the Maritime HRM Textbook

As mentioned in the introduction, the production of the textbook must been seen in connection with the likely future scenario of hyper-competition [see 5], where the shipping industry has to work to ensure global efficiency in operations, yet is also subjected to on-going scrutiny of their practices by flag states, labour supplying states, unions, industry organisations, etc. In this scenario, the authors perceive that also shore-based HR personnel in maritime organisations need to have an increased level of knowledge about variations between flag and labour supplying states and individual employees relating to, e.g., motivation, assessment and management of employees, labour relations, the implementation of major ILO and IMO conventions and regulation of occupational safety and health. Moreover, the HR personnel will to an increasing extent have to compare the strengths, weaknesses and future potentials of national MET systems for crewing supply country choices and possibly also assess whether a company should provide monies for MET and, if so, which MET institution(s) and underlying labour market(s) match the company's needs.

To date, although a few public universities and private sector maritime education providers such as Lloyd's have provided courses on, e.g., "Crewing and manning", many shipping, ship management and crew management companies appear to have in practice mainly used the "learning by experience" approach in their shore-based units that deal with maritime human resources, and there has also been a lack of strategic focus on HRM in many of these companies, especially among the small and medium-sized actors [6,7]. Here, it is also worth noting from a regional competitive perspective concerning the North Sea Region that the European actors are not necessarily generally at the forefront of development of strategic practices [see 8]. Thus, the textbook aims to both meet the needs of local North Sea Region industry stakeholders and also of industry stakeholders in other regions.

Both the strategic management of human resources on board ships, in port areas and in shore-based maritime industry companies are covered by the e-textbook. This has been chosen because studies of the career paths of maritime personnel [9, 10] show that ship officers often move to shore-based positions in the maritime transportation firms or in ports. At Hochschule Bremen (HS), potential target groups for a final year elective module using the textbook were specified as students of Bachelor-level "Nautical Studies" (in German: "*Diplom-Wirtschaftsingenieur für Seeverkehr (NAUTIK)*", see: http://www.hs-bremen.de/internet/de/studium/stg/) and "International Shipping and Chartering" (in German: "*Internationaler Studiengang Shipping and Chartering B.A*., see *ibid*.). study programmes. In Denmark, the plan has been to approach Danish (including Greenland), Faroese and Icelandic maritime interest organisations, and maritime schools and other educational units to find potential students. Among this population, there are a number of past graduates of navigation and marine engineering study programs who have only received a vocational degree – and thus not the current "Professional Bachelor" level of training that Danish-educated navigation, marine engineering and dual purpose officers now commonly receive. Based on previous research [11], it is known that some of these past graduates from Danish MET institutions work with shore-based HRM. Moreover, as they have vocational degrees, the text level of a third or final year Bachelor level textbook would also be suited for these students, and some current students in both the coming shore-based maritime business administration program and in the current Danish officer training study programs interested in such an elective might also take the course.

Here, it is to be stressed that for current navigation and marine engineering officer students, this course and the e-textbook are not viewed as a replacement of existing courses in, e.g., human element issues, which are commonly designed to fulfil the STCW Convention and ISM Code requirements. Instead this course is planned as a supplementary elective. Here, it is also strongly advised that students in shore-based maritime business administration programs who would like to work with crewing and ship management afterwards also take the obligatory courses for ship officers that have been designed to fulfil these IMO international agreements, in addition to taking this elective. The relation between covered themes of such obligatory courses and this elective is depicted in Figure 1, which also shows that the obligatory courses have to account for specific flag and/or labour supplying state interpretations of the underlying IMO agreements, whereas this strategic course provides the global overview.

About the courses required by STCW & ISM	This course focuses on strategic HRM
• These are subject to flag and/or labour supplying state scrutiny and thus much more difficult to standardize internationally. • They focus less on strategic management issues	1. Introduction to HRM on shore, including especially in ports and transportation firms 2. HRM intro to ship-board management 3. Labour economics and industrial relations 4. Safety, occupational health and other regulations in ports and regarding ships 5. Personnel selection, retention, career planning, education & investment in education

Fig. 1 Comparison of the obligatory STCW/ISM courses in MET and this course

3.2 The content of the e-learning textbook

First, the e-textbook is built up around a core text, which provides a global overview. The covered themes of the e-textbook are depicted in Table 1.

1. Shore-based HRM (1.5 ECTS, 0.5 ECTS based on external content)
A. Role of HRM – ideal and true roles, operational tasks, possible strategy implementation
B. Organisational structure and culture
C. Variation according to maritime firm type, with focus on ports and port firms
D. Variation of HR practices across regions and firms
E. International HR and HR coordination
F. Ethical issues and corporate social responsibility
2. HRM on board ships, including occupational safety, psychological and health issues (1.5 ECTS, 1.0 ECTS based on external content)
3. Wage and benefit creation, role of unions and employers organisations (1.5 ECTS, 1.0 ECTS based on external content)
A. Neo-classical wage equilibrium models
B. Wages and benefits as motivation factors
C. Performance-based pay
D. Unions in general, in maritime transport, national variations and ITF
E. Employers organisations in maritime transport, national variations and global organisations
F. Collective bargaining at national level and in the international bargaining forum
4. Labour conditions regulation on land and on board ship (1.5 ECTS, 1.0 ECTS based on external content)
A. ILO, EU and national regulation of labour conditions on land, including the roles of occupational health and safety authorities and other authorities and institutions
B. ILO's 2006 Maritime Labour Convention
C. Other relevant IMO and ILO Conventions concerning shipboard work
5. Personnel selection, retention and career planning, planning and investment in education and training (1.5 ECTS, 0.5 ECTS based on external content)
A. Variations in selection processes and legislation for shore and ship-based positions
B. Assessing personal and professional qualifications, including psychological, cognitive and skills tests
C. Employee retention and career planning plans
D. Planning education and training
E. Investing in education and training at home and abroad, with focus on MET in economies of transition and developing countries

Table 1. Overview of the content of the e-textbook

The text includes the basic fundamental information about the issues at hand. However, as this is an e-textbook, at times the core text also requires the students to read documents such as legal texts, academic articles or reports written by other maritime or port industry business leaders, academics or other experts. In this way, the e-textbook becomes the "nexus of linking of information" but much space is allowed for other industry and academic experts.

Open access websites and texts written by stakeholders and academics are used in structured assignments. This is illustrated by Table 2, on the next page, which depicts the geographical distribution of the included cases in the above module elements 1 and 3.

The structured assignments allow for students' independent study; they can be solved based on either the text alone or based on the text combined with other readings. Moreover, some structured assignments are also adaptable to national circumstances; the student can choose the country(-ies) to focus on and to also use other languages than English in solving the assignments, if local instructors allow for this. Finally, the e-textbook is suited for so-called e-based learning, with only internet-based

1. Shore-based HRM	**Cases based on texts from/about:**
A. Role of HRM – ideal and true roles, operational tasks, possible strategy implementation	UK and country of own choice
B. Organisational structure and culture	Croatia, Italy, Turkey, World Bank Port Reform Toolkit
C. Variation according to maritime firm	Nigeria, Spain
D. Variation of HR practices across regions	Australia, Latin America, Turkey, country of own choice
E. International HR and HR coordination	Germany, Australia,
F. Ethical and CSR issues	Greece, Norway
3. Wage and benefit creation, role of unions and employers organisations	
A. Socio-economics of maritime labour markets	Germany, Global (concerning female seafarers), Italy, Hong Kong, Latvia, Netherlands, Spain, South Africa, Sweden, World Bank Port Reform Toolkit
B. Wages and benefits as motivation factors and performance-based pay	Germany, Kiribati, Shiptalk Life at Sea Survey, South Africa
D. Unions in general and in maritime transport	Brazil, China, Denmark, Germany, Japan, Korea, Malaysia, Philippines, Russia, Singapore, Viet Nam, USA
E. Employers organisations in maritime transport and ports industries	Canada, Phillipines
F. ITF efforts, International bargaining forum and the future	ISF's Guidelines on Good Employment Practice, ITF & Chinese seafarers, Netherlands & UK (Nautilus)

Table 2. The geographical and thematic coverage of the structured assignments

interaction among the course instructor and students, and “blended-learning”, with face-to-face interaction as well as e-learning.

3.3 The underlying pedagogical principles of the e-learning textbook

The e-textbook is made based on the first principle that the student is an independent learner, who bears the fundamental responsibility for his or her own level of learning. Thus, it is made such that it can be used in a situation in which the only interaction with the course instructor is internet-based and, in this case, will mainly centre on the structured assignments and any other questions to the material that the student has. However, the e-textbook is also suited to a classroom situation as well, yet in contrast to many English-language business administration textbooks, a standard package of overheads is not provided with the textbook. The reason for this is that it is the authors’ experience that if classroom interaction is conducted in a native language of the country in question, while using an English-language textbook, as is commonplace in, e.g., the Nordic countries and the Netherlands as well as parts of, e.g., China, India and the Philippines, the instructors in many cases prefer to make their own overheads in the language of oral classroom communication.

Secondly, the course aims to provide a global overview of key themes, such as to provide an introduction to the main issues and also, through the links to the external texts, and also the provision to the students of the now around 120 page international maritime HRM literature list of the author of most of the module elements (i.e., the first author of this paper) to encourage independent study by the students on issues that either interest them or that they know will be needed in their future career (or both). For mature students already in their maritime career, it is the first author’s experience that such students when taking such a course often have a list of issues that they wish to learn more about during the course. Thus, in planning the course in this way, one allows for students’ independent study.

However, for the less mature younger full-time Bachelor students, it is probably equally important to remind some of them that they are not (yet) experts after just one overview course. Therefore at the conclusion of each chapter, there are summarising statements such as the following from the Module Element 5 [12]:

> "Through the completion of this Module Element, you have learned about personnel selection, retention and career planning in the maritime transport and ports sectors. Beyond this, you have learned about planning and investment in education and training. Section 1 dealt with variations in selection processes and legislation for shore and ship-based positions, whereas the theme of section 2 was assessing personal and professional qualifications, including psychological, cognitive and skills tests. In section 3, employee retention and career planning plans were discussed for the case of port workers, seafarers and shore-based employees, whereas section 4 dealt with planning education and training. Finally, for the specific case of seafarers, investing in maritime education and training for seafarers at home and abroad was the focus on Section 5, and here focus was especially placed on MET in economies of transition and developing countries.
>
> The organisation, economic and sociological considerations about personnel selection, retention, career planning and investment in education and training were supplemented by structured assignments which took their points of departure in local circumstances in many different countries around the world as well as global labour market and educational market issues. Each assignment was connected to external textual readings, most of which were written by stakeholders or academics who presented the viewpoints of stakeholders in real-life situations. Thus, based on the completion of this module element, you should have a solid overall understanding of these issues. However, in specific job-related situations, it may be necessary to work with navigation and marine engineering experts to assess the quality of seafarers or maritime education and training from specific countries. Similarly, you may need to consult lawyers, economists and accounting experts concerning firm-specific policies and cost and efficiency calculations with regard to policies and investments and policies in personnel selection, retention, career planning and education."

In university education in many countries, both critical thinking skills and a basic introduction to methodological (here understood as both quantitative and qualitative methods as well as the scrutiny of fundamental theoretical assumptions for their logic and applicability to a specific part of reality) and validity issues occurs already at the Bachelor level of studies, as this is perceived as necessary to ensure the quality of paper writing assignments to be submitted by the student. This is also the case in the Northern Maritime University countries. Thus, the analysis required in the majority of the structured assignments also presupposes these skills. Below, three sample structured assignments are provided from [12].

3.4 Structured Assignment 1.5 Organisation of shore-based ship management tasks

"For this assignment, first read Celik, M. and Er, I.D., 2008. Exploring the Key Aspects of Management Organizations in Shipping Business. *Lex et Scientia*, No. XV (Bucharest, Romania). Available at: http://lexetscientia.univnt.ro/ufiles/11.%20Turcia.pdf. Then answer these questions:

1. Please list the six key aspects in the five mentioned areas of management (executive management, personnel management, operational management, technical management, and safety management) which were perceived as being most significant issues in this research. Then list the six key aspects that were perceived as being the least significant.

2. Table 1-5 on pages 4-5 lists all key aspects for the five areas of management, in the viewpoint of Celik & Er (2008). Please rearrange all key aspects so that you place them where you believe they would be placed, in relation to the following five organisational structure parts of Mintzberg (1983) [13]:

- The operating core
- The strategic apex
- The middle line
- The technostructure
- The Support staff"

3.5 Structured Assignment 3.21 The Employers' Association at Canada's Port of Halifax

"For this assignment, you must first access and read the following six web pages at the Halifax Employers Association: 1. Welcome page, with a message from the President, at: http://www.halifaxemployers.com/, 2. About us/History of the Association, at: http://www.halifaxemployers.com/history.asp, 3. About us/Organizational chart, at: http://www.halifaxemployers.com/officers.asp, 4. About us/Bylaws – Articles of Associations, at: http://www.halifaxemployers.com/bylaws.asp, 5. Employee relations/Policies – Procedures, at: http://www.halifaxemployers.com/policies.asp, and 6. Employee relations/EmployeeAssistance Program, at: http://www.halifaxemployers.com/eap.asp. You are of course also free to examine any other web pages on the website, if you would like to do so.

1. Based on the above information as well as the text of this module element up to this point, including the previous structured assignments, discuss the potential benefits of membership in the Halifax Employers Association for a stevedoring company present in the Port of Halifax. Here, you may write up to 600 words in your answer. Beyond the 600 word limit, you should also provide supplementary references with full bibliographical data to relevant works you have read and also used in answering this question, if you choose to take these works into consideration in answering the question.

2. Based on the above information as well as the text of this module element up to this point, including the previous structured assignments, discuss the costs and opportunity costs of membership in the Halifax Employers Association for a stevedoring company present in the Port of Halifax. Here, you may write up to 600 words in your answer. Beyond the 600 word limit, you should also provide supplementary references with full bibliographical data to relevant works you have read and also used in answering this question, if you choose to take these works into consideration in answering the question.

3.6 Structured Assignment 5.16 Technology and Organisational Culture Variables in relation to Knowledge Management in Shipping Firms

"For this assignment, you must first read Fei J, Chen S, and Chen S. L., 2009. Organisational Knowledge Base and Knowledge Transfer in the Shipping Industry. *Electronic Journal of Knowledge Management*, 7(3), pp. 325 – 340. Available at: http://www.ejkm.com/volume-7/v7-3/v7-i3-art3.htm.

1. Choose a major shipping actor, e.g. a shipping firm, ship management firm or crewing firm, from your home country or a neighbouring country, about which you have some knowledge and which has an internet site. Here, you must write the name of the firm and then state the internet site.

2. Discuss, based on Figure 3 and the discussion of Figure 3 (pp. 330-1) in this article, which specific factors and institutions you believe especially influence the organisational knowledge based of the chosen firm. Here, you may write up to 600 words in your assessment. You may also refer to external sources, if you choose to include these in your answer. If you do so, list the full references; these will not count toward the 600 word total.

3. In relation to Figure 5 of this same article (see p. 335), discuss (a) which knowledge transfer mechanisms are technically feasible in relation to the ships on which crews related to your firm work and (b) which knowledge transfer mechanisms you would deem especially suitable based on your knowledge of the chosen firm's organisational culture and the common employee preferences and expectations in the home country of the firm. In answering this question, you may

write up to 750 words. Here, you may similarly refer to external sources, if you choose, provided that you list the full references to these sources. These references will not count toward the 750 word limit."

4. Conclusions

Based on the ever-increasing level of competition in the shipping business and the increasing demands put on crews and port employees and the efficiency of crew and port employee management practices, we believe that there is a need for a textbook in strategic maritime HRM. We are seeking to address this need in the Northern Maritime University project through a globally oriented e-textbook, which will also be useable in other world regions as well. The e-textbook is built up in a flexible manner, with links to important legal texts, articles and reports written by industry stakeholders and with structured assignments that can be adapted. In this way, the e-textbook also has the potential to become a dynamic "nexis of information" that also can be used to teach students to gather needed HRM information and assess and update it independently.

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The Urgent Need of Creating the World's Webometrics Ranking of Maritime Universities, Academies and Colleges Associated in IAMU

Adam Weintrit
Professor, Gdynia Maritime University
weintrit@am.gdynia.pl

Abstract In the paper the author argues that it can be useful to create the official global Webometrics ranking of maritime universities associated in IAMU (International Association of Maritime Universities). The original aim of the World's Webometrics ranking of maritime universities is to promote leading universities associated in IAMU, international cooperation for maritime education and training, maritime job and web publication. Supporting open access initiatives, electronic access to scientific publications and to other academic material are the primary targets. However web indicators are very useful for ranking purposes too as they are not based on number of visits or page design but on the global performance and visibility of the universities. The ranking shouldn't be only focused on research results but also in other indicators which may reflect better the global quality of the maritime scholar and research institutions worldwide. The official global Webometrics ranking of maritime universities should be establish on the base of Webometrics Ranking of World Universities. The author pressed in order to create the official ranking of maritime universities associated in IAMU already in 2001 in Kobe, during IAMU AGA2 [16]. Now he consistently is repeating his appeal.

Keyword: *IAMU, Webometrics Ranking, World's Webometrics Ranking of Maritime Universities*

1. Introduction

The university rankings are lists of universities or equivalent institutions in higher education, an order determined by any combination of factors. Rankings can be based on subjectively perceived "quality," on some combination of empirical statistics, or on surveys of educators, scholars, students (cadets, trainees), prospective students or others. Rankings are often consulted by prospective students and their parents in the university, academy and college admissions process. In addition to rankings of institutions, there are also rankings of specific academic programs, faculties, departments, colleges and schools. Rankings are conducted by magazines and newspapers (e.g. *Newsweek, The Economist, Times, Scientometrics*) and in some instances by academic practitioners and international associations, among others: the *Academic Ranking of World Universities* compiled by the Shanghai Jiao Tong University, *Global University Ranking* compiled by the RatER, a Russian-based non-commercial independent rating agency supported by the academic society of Russia, bibliometric based ranking *HEEACT (Performance Ranking of Scientific Papers for World Universities)* produced by the Higher Education Evaluation and Accreditation Council of Taiwan, and *Times Higher Education - QS World University Rankings*.

Web indicators are very useful for ranking purposes as they are based on the global performance and visibility of the universities. As other rankings focused only on a few relevant aspects, especially research results, web indicators based ranking reflects better the whole picture, as many other activities of professors, lecturers, researchers and students are showed by their web presence.

The Web covers not only formal (e-journals, repositories) but also informal scholarly communication. Web publication is cheaper, maintaining the high standards of quality of peer review processes. It could also reach much larger potential audiences, offering access to scientific knowledge to

researchers and institutions located in developing countries and also to third parties (economic, industrial, political or cultural stakeholders) in their own community.
The ranking shouldn't be only focused on research results but also in other indicators which may reflect better the global quality of the maritime scholar and research institutions worldwide.
The author intends to motivate both institutions and scholars to have a web presence that reflect accurately their activities. If the web performance of an institution is below the expected position according to their academic excellence, university authorities should reconsider their web policy, promoting substantial increases of the volume and quality of their electronic publications. Candidate students should use additional criteria if they are trying to choose university. Webometrics ranking correlates well with quality of education provided and academic prestige, but other non-academic variables need to be taken into account.
The World's Webometrics Ranking of Maritime Universities (WWRMU) should be conceived to present a multi-faceted view of the relative strengths of the world's leading maritime universities, academies, colleges and faculties.
The ranking should be compiled based at least in six distinct indicators: academic peer review, employer review, faculty student ratio, citations per faculty, international faculty, and international students. As the specific indicators the IAMU should take into consideration also:

- international cooperation for maritime education and training,
- cooperation between maritime univerities and industry,
- qualified human resource in maritime industry,
- innovative approach to MET (Maritime Education and Training),
- number of published academic books,
- number of students,
- number of simulators and professional laboratories,
- number of accessible specialities to studying,
- number of well educated and experienced academic staff,
- development of new trends and technologies in MET,
- train-the-trainer related issues,
- quality assurance for MET institutions,
- other matters related to MET.

2. Background of the Project

2.1. Berlin Principles on Ranking of Higher Education Institutions

Rankings and league tables of higher education institutions (HEIs) and programs are a global phenomenon. They serve many purposes: they respond to demands from consumers for easily interpretable information on the standing of higher education institutions; they stimulate competition among them; they provide some of the rationale for allocation of funds; and they help differentiate among different types of institutions and different programs and disciplines. In addition, when correctly understood and interpreted, they contribute to the definition of "quality" of higher education institutions within a particular country, complementing the rigorous work conducted in the context of quality assessment and review performed by public and independent accrediting agencies. This is why rankings of HEIs have become part of the framework of national accountability and quality assurance processes, and why more nations are likely to see the development of rankings in the future. Given this trend, it is important that those producing rankings and league tables hold themselves accountable for quality in their own data collection, methodology, and dissemination.
In view of the above, the International Ranking Expert Group (IREG) was founded in 2004 by the UNESCO European Centre for Higher Education (UNESCO-CEPES) in Bucharest and the Institute for Higher Education Policy in Washington, DC. It is upon this initiative that IREG's second meeting (Berlin, 18 to 20 May, 2006) has been convened to consider a set of principles of quality and good practice in HEI rankings - *the Berlin Principles on Ranking of Higher Education Institutions* [8].

2.2. Webometrics

The science of webometrics (also cybermetrics) tries to measure the World Wide Web to get knowledge about the number and types of hyperlinks, structure of the World Wide Web and usage patterns. According to Björneborn and Ingwersen [6], the definition of webometrics is "the study of the quantitative aspects of the construction and use of information resources, structures and technologies on the Web drawing on bibliometric and informetric approaches". The term *webometrics* was first coined by Almind and Ingwersen [4]. A second definition of webometrics has also been introduced, "the study of web-based content with primarily quantitative methods for social science research goals using techniques that are not specific to one field of study" by Thelwall in 2009 [15], which emphasises a small subset of relatively applied methods for use in the wider social sciences. The purpose of this alternative definition was to help publicise appropriate methods outside of the information science discipline rather than to replace the original definition within information science.
Similar scientific fields are Bibliometrics, Informetrics, Scientometrics, Virtual ethnography, and Web mining.
Since 2004 the Webometrics ranking of world universities is offering information about more than 6,000 universities ranked according to indicators measuring Web presence and impact (link visibility).
One relatively straightforward measure is the "Web Impact Factor" (WIF) introduced by Ingwersen [11]. The WIF measure may be defined as the number of web pages in a web site receiving links from other web sites, divided by the number of web pages published in the site that are accessible to the crawler. However the use of WIF has been disregarded due to the mathematical artifacts derived from power law distributions of these variables. Other similar indicators using size of the institution instead of number of webpages have been proved more useful.

2.3. Webometrics Ranking of World Universities

The Webometrics ranking formally and explicitly adheres to the *Berlin Principles on Ranking of Higher Education Institutions*. The ultimate aim is the continuous improvement and refinement of the methodologies according to a set of agreed principles of good practices.
The "World Universities' ranking on the Web" is an initiative of the Cybermetrics Lab, a research group of the Centro de Ciencias Humanas y Sociales (CCHS), part of the National Research Council (CSIC), the largest public research body in Spain.
Cybermetrics Lab is devoted to the quantitative analysis of the Internet and Web contents specially those related to the processes of generation and scholarly communication of scientific knowledge. This is a new emerging discipline that has been called Cybermetrics or Webometrics.
With these rankings they intend to provide extra motivation to researchers worldwide for publishing more and better scientific content on the Web, making it available to colleagues and people wherever they are located.
The "Webometrics Ranking of World Universities" was officially launched in 2004, and it is updated every 6 months (data collected in January and July and published one month later). The Web indicators used are based and correlated with traditional scientometric and bibliometric indicators and the goal of the project is to convince academic and political communities of the importance of the web publication not only for dissemination of the academic knowledge but for measuring scientific activities, performance and impact too.

3. Justification and Objectives of the Ranking

The Webometrics University Ranking is a ranking system based on university web presence, visibility and web access. This ranking system measures how strongly a university is present in the web by its own web domain, sub-pages, rich files, scholarly articles etc, that is an indirect way to measure all the university missions (teaching, research, transfer).
Central hypothesis is that web presence is a reliable indicator of the global performance and prestige of the universities. Although the Web is universally recognized as the one of the most relevant tools for scholarly communication, it is still very rare these indicators are used for the evaluation of the scientific research and the academic performance of universities

Top universities are publishing millions of pages produced by dozens of departments and services, hundreds of research teams and thousands of scholars. Strong web presence informs of a wide variety of factors that are clearly correlated with the global quality of the institution: widespread availability of computer resources available, global internet literacy, policies promoting democracy and freedom of speech, competition for international visibility or support of open access initiatives, among others.
Web publication is frequently questioned about quality of the contents, not taking into account that besides research results published in prestigious journals, the same authors develop a wide range of activities reflected on the web pages. Teaching material, raw data, drafts, slides, software, bibliographic or links lists are also relevant and inform of the commitment of the professor to their students. The structure, composition and all kind of administrative information provided by the institution itself is valuable and again when is made available through the web speaks of the high academic level of the university.
Granting access to and promoting web publication among the faculty members means other colleagues know about the scientific results produced, more candidate students know about the university, the companies can find suitable partners for industrial projects, and organizations could easily access to experts contact data.
Most of the institutions on the distribution tail of the rankings only publish a few dozens or hundreds of pages, probable not amounting more than several Megabytes of space in the hard disk of the web server. This output is similar to those provided by teenagers at a cost similar to their weekly stipend. Even in most of the developing countries this human and economic effort is affordable. If you consider most of the Web information is currently recovered through search engines it is possible that data of an even obscure institution of a remote corner of the world can be easily accessed. Having a web presence is easy and cheap and the potential audience is in the order of millions.
Webometric indicators are provided to show the commitment of the institutions to Web publication. If the web performance of an institution is below the expected position according to their academic excellence, university authorities should reconsider their web policy, promoting substantial increases in the volume and quality of their electronic publications.

4. Proposed Metodology of World's Webometrics Ranking of Maritime Universities

4.1. Presentation

Although Webometrics ranking formally and explicitly still adheres to the *Berlin Principles*, the IAMU would make some points to add to these principles:

- A World's Webometrics Ranking of Maritime Universities (WWRMU) should be a ranking of maritime universities from all over the world, covering hundred of them, not only a few tens universities from the developed world, associated in IAMU.
- A ranking backed by a for-profit company exploiting rank-related business should be checked with care.
- Unexpected presence of certain universities in top positions is a good indicator of the (lack of) quality of a ranking, independently on how supposedly sound methodologies are used.
- Rankings favoring stability between editions and not publishing explicitly individual changes and reasons for them (correcting errors, adding or deleting entries, changing indicators) are violating the code of good practices.
- Research only (bibliometrics) based ranking are biased against technologies, computer science, social sciences and humanities, disciplines that usually amounts for more than half of the scholars in a standard comprehensive university.
- Rankings should include indicators, even indirect ones, about teaching mission and the so-called third mission, considering not only the scientific impact of the university activities but also the economic, social, cultural and also the political ones.
- World-class maritime universities are not small, very specialized institutions.
- Surveys are not a suitable tool for World rankings as there is no even a single individual with a deep (several semesters per institution), multi-institutional (several dozen), multidisciplinary (hard

sciences, nautical sciences, social sciences, technologies) experience in a representative sample (different continents) of maritime universities worldwide.
- A World's Webometrics Ranking of Maritime Universities should be one ranking: publishing a series of completely different classifications with exactly the same data is useless and confusing.
- Link analysis is a far more powerful tool for quality evaluation than citation analysis that only counts formal recognition between peers, while links not only includes bibliographic citations but third parties involvement with university activities.

4.2. Purposes and Goals of Ranking

There are the following purposes and goals of ranking:

1. *Assessment of higher education (processes, and outputs) in the Web.* The Web indicators are already publishing comparative analysis with similar initiatives. But the current objective of the Webometrics ranking is to promote Web publication by maritime universities, evaluating the commitment to the electronic distribution of these organizations and to fight a very concerning academic digital divide which is evident even among world universities from developed countries. However, even when we do not intend to assess universities performance solely on the basis of their web output, Webometrics ranking is measuring a wider range of activities than the current generation of bibliometric indicators that focuses only in the activities of scientific elite
2. *Ranking purpose and target groups.* Webometrics ranking is measuring the volume, visibility and impact of the web pages published by universities, with special emphasis in the scientific output (referred papers, conference contributions, key-note speeches, reprints of the articles published in professional magazines, pre-prints, monographs, thesis, reports, …) but also taking into account other materials (courseware, seminars or workshops documentation, digital libraries, databases, multimedia, personal pages, …) and the general information on the institution, their departments, research groups or supporting services and people working or attending courses.
   There is a direct target group for the ranking which should be the maritime university authorities. If the web performance of an institution is below the expected position according to their academic excellence, they should reconsider their web policy, promoting substantial increases in the volume and quality of their electronic publications.
   Faculty members are indirect target groups as the IAMU should expect that in a near future the web information could be as important as other bibliometric and scientometric indicators for the evaluation of the scientific performance of scholars and their research groups.
   Finally, candidate students should not used this data as the sole guide for choosing university, although a top position means that the institution has a policy that encourages new technologies and it has resources for their adoption.
3. *Diversity of institutions: missions and goals of the institutions*. Quality measures for maritime research-oriented institutions, for example, are quite different from those that are appropriate for institutions that provide broad access to underserved communities. Institutions that are being ranked and the experts that inform the ranking process should be consulted often.
4. *Information sources and interpretation of the data provided.* Access to the Web information is done mainly through search engines. These intermediaries are free, universal, and very powerful even when considering their shortcomings (coverage limitations and biases, lack of transparency, commercial secrets and strategies, irregular behaviour). Search engines should be key for measuring visibility and impact of university's websites.
   There are a limited number of sources that can be useful for webometric purposes: 7 general search engines (Google*, Yahoo Search*, Live (MSN) Search*, Exalead*, Ask (Teoma), Gigablast and Alexa) and 2 specialised scientific databases (Google Scholar* and Live Academic). All of them have very large (huge) independent databases, but due to the availability of their data collection procedures (Apis), only those marked with asterisk are used in compiling the Webometrics ranking.
5. *Linguistic, cultural, economic, and historical contexts.* The project intends to have true global coverage, not narrowing the analysis to a few tens of institutions (world-class maritime universities) but including as many organizations as possible. The only requirement in the IAMU international ranking should have an autonomous web presence with an independent web domain. This approach allows a larger number of institutions to monitor their current ranking and the evolution of this position after adopting specific policies and initiatives. Universities in developing

countries have the opportunity to know precisely the indicators' threshold that marks the limit of the elite.
Current identified biases of the Webometrics rankings include the traditional linguistic one (more than half of the internet users are English-speaking people), and a new disciplinary one. Since in most cases the infrastructure (web space) and the connectivity to the Internet already exits, the economic factor is not considered a major limitation.

5. Design and Weighting of Indicators

5.1. Methodology Used to Create the Ranking

The unit for analysis should be the institutional domain, so only maritime universities and research centres with an independent web domain should be considered. If an institution has more than one main domain, two or more entries should be used with the different addresses. About 5-10% of the institutions have no independent web presence, most of them located in developing countries. The IAMU catalogue of maritime institutions should include not only universities but also other higher education institutions following the recommendations of IAMU, IMO, UNESCO, etc. Names and addresses were collected from both national and international sources including among others:

International Association of Maritime Universities	http://www.iamu-edu.org/
All Universities around the World	http://www.bulter.nl/universities/
Maritime Schools	http://users.hal-pc.org/~nugent/school.html
Universities Worldwide	http://www.univ.cc/world.php

Maritime university activity is multi-dimensional and this is reflected in its web presence. So the best way to build the ranking is combining a group of indicators that measures these different aspects. Almind & Ingwersen [4] proposed the first Web indicator, Web Impact Factor (WIF), based on link analysis that combines the number of external inlinks and the number of pages of the website, a ratio of 1:1 between visibility and size. This ratio should be used for the ranking but adding two new indicators to the size component: number of documents, measured from the number of rich files in a web domain, and number of publications being collected by Google Scholar database. As it has been already commented, the four indicators were obtained from the quantitative results provided by the main search engines as follows:
Size (S). Number of webpages recovered from four engines: Google, Yahoo, Live Search and Exalead. For each engine, results should be log-normalised to 1 for the highest value. Then for each domain, maximum and minimum results should be excluded and every institution should be assigned a rank according to the combined sum.
Visibility (V). The total number of unique external links received (inlinks) by a site can be only confidently obtained from Yahoo Search. Results should be log-normalised to 1 for the highest value and then combined to generate the rank.
Rich Files (R) – the total number of documents. After evaluation of their relevance to academic and publication activities and considering the volume of the different file formats, the following were selected: Adobe Acrobat (*.pdf*), Adobe PostScript (*.ps*), Microsoft Word (*.doc*) and Microsoft Powerpoint (*.ppt*). These data were extracted using Google and merging the results for each filetype after log-normalising in the same way as described before.
Scholar (Sc). Google Scholar provides the number of papers and citations for each academic domain. These results from the Scholar database represent papers, reports and other academic items.
The four ranks were combined according to a formula where each one has a different weight:

WEBOMETRICS RANK		
VISIBILITY (external inlinks) 50%	SIZE (Web pages)	20%
	RICH FILES	15%
	SCHOLAR	15%

G-Factor. A ranking of university and college web presence, the G-Factor methodology counts the number of links only from other university websites relying solely on Google's search engine. The G-Factor is an indicator of the popularity or importance of each university's website from the combined perspectives of the creators of many other university websites. It is therefore claims to be a kind of extensive and objective peer review of a university through its website –the G-Factor measures the centrality of each university's website in the network of university websites.

5.2. Relevance and Validity of the Indicators

The choice of the indicators should be done according to several criteria, some of them trying to catch quality and academic and institutional strengths but others intending to promote web publication and Open Access initiatives. The inclusion of the total number of pages should be based on the recognition of a new global market for academic information, so the web should be the adequate platform for the internationalization of the institutions. A strong and detailed web presence providing exact descriptions of the structure and activities of the university can attract new students and scholars worldwide. The number of external inlinks received by a domain should be a measure that represents visibility and impact of the published material, and although there is a great diversity of motivations for linking, a significant fraction works in a similar way as bibliographic citation. The success of self-archiving and other repositories related initiatives can be roughly represented from rich file and Scholar data. The huge numbers involved with the pdf and doc formats means that not only administrative reports and bureaucratic forms should be involved. PostScript and Powerpoint files are clearly related to academic activities.

5.3. Measure Outcomes in Preference to Inputs Whenever Possible

Data on inputs should be relevant as they reflect the general condition of a given establishment and should be more frequently available. Measures of outcomes provide a more accurate assessment of the standing and/or quality of a given institution or program.

5.4. Weighting the Different Indicators: Current and Future Evolution

The current rules for existing ranking indicators including the described weighting model has been tested and published in scientific papers [4],[11],[12],[16]. More research should be still done on this topic, but the final aim is to develop a model that includes additional quantitative data, especially bibliometric and scientometric indicators.

6. Collection and Processing of Data

6.1. Ethical Standards

Existing Webometrics Ranking of World Universities identified some relevant biases in the search engines data including under-representation of some countries and languages. As the behaviour is different for each engine, a good practice consists of combining results from several sources. Any other mistake or error is unintentional and it should not affect the credibility of the ranking.

6.2. Audited and Verifiable Data

The only source for the data of the Webometrics ranking is a small set of globally available, free access search engines. All the results can be duplicated according to the describing methodologies taking into account the explosive growth of the web contents, their volatility and the irregular behaviour of the commercial engines.

6.3. Data Collection

Data should be collected during the same week, in two consecutive rounds for each strategy, being selected the higher value. Every website under common institutional domain should be explored, but no attempt has been done to combine contents or links from different domains.

After automatic collection of data, positions should be checked manually and compared with previous editions. Some of the processes should be duplicated and new expertise should be added from a variety of sources. Pages that linked to the Webometrics ranking should be explored and comments from blogs and other fora are taken into account. Finally, the IAMU experts mailboxes will receive a lot of requests and suggestions that should be acknowledged individually.

6.5. Organizational Measures to Enhance Credibility
The ranking results and methodologies should be discussed in scientific journals, and presented in international conferences. The IAMU should expect international advisory or even supervisory bodies to take part in future developments of the ranking.
The published tables should show all the Web indicators used in a very synthetic and visual way. Rankings should be provided not only from a central top classification but also considering several regional rankings for comparative purposes. The listings should be offered from asp dynamic pages build on several databases that can be corrected when errors or typos are detected.

7. IAMU Ranking

7.1. International Maritime Universities Ranking Expert Group (IMUREG)
In view of the above, it is strongly recommended that the International Maritime Universities Ranking Expert Group (IMUREG) should be founded in 2010 in Pusan, Korea by the IAMU AGA 11. It is expected that on the base of this initiative the IMUREG's second meeting (to be held in Gdynia, 12 to 14 June, 2011 during IAMU AGA12) should be convened to consider a set of principles of quality and good practice in IAMU ranking – to be called *the Gdynia Principles on Ranking of IAMU Institutions***.**
It is expected that this initiative will set a framework for the elaboration and dissemination of maritime institutions rankings - whether they are national, regional, or global in scope - that ultimately will lead to a system of continuous improvement and refinement of the methodologies used to conduct these rankings. Given the heterogeneity of methodologies of rankings, these principles for good ranking practice will be useful for the improvement and evaluation of ranking.

7.2. Decription of World's Webometrics Ranking of Maritime Universities (WWRMU)
The IAMU rankings and league tables should:
A) Purposes and Goals of Rankings
1. *Be one of a number of diverse approaches to the assessment of higher education inputs, processes, and outputs.* Rankings can provide comparative information and improved understanding of higher education, but should not be the main method for assessing what higher education is and does. Rankings provide a market-based perspective that can complement the work of government, accrediting authorities, and independent review agencies.
2. *Be clear about their purpose and their target groups.* Rankings have to be designed with due regard to their purpose. Indicators designed to meet a particular objective or to inform one target group may not be adequate for different purposes or target groups.
3. *Recognize the diversity of institutions and take the different missions and goals of institutions into account*. Quality measures for research-oriented institutions, for example, are quite different from those that are appropriate for institutions that provide broad access to underserved communities. Institutions that are being ranked and the experts that inform the ranking process should be consulted often.
4. *Provide clarity about the range of information sources for rankings and the messages each source generates*. The relevance of ranking results depends on the audiences receiving the information and the sources of that information (such as databases, students, professors, employers). Good practice would be to combine the different perspectives provided by those sources in order to get a more complete view of each higher education institution included in the ranking.
5. *Specify the linguistic, cultural, economic, and historical contexts of the educational systems being ranked.* International rankings in particular should be aware of possible biases and be precise about their objective. Not all nations or systems share the same values and beliefs about

what constitutes “quality” in tertiary institutions, and ranking systems should not be devised to force such comparisons.

B) Design and Weighting of Indicators

6. *Be transparent regarding the methodology used for creating the rankings*. The choice of methods used to prepare rankings should be clear and unambiguous. This transparency should include the calculation of indicators as well as the origin of data.
7. *Choose indicators according to their relevance and validity.* The choice of data should be grounded in recognition of the ability of each measure to represent quality and academic and institutional strengths, and not availability of data. Be clear about why measures were included and what they are meant to represent.
8. *Measure outcomes in preference to inputs whenever possible*. Data on inputs are relevant as they reflect the general condition of a given establishment and are more frequently available. Measures of outcomes provide a more accurate assessment of the standing and/or quality of a given institution or program, and compilers of rankings should ensure that an appropriate balance is achieved.
9. *Make the weights assigned to different indicators (if used) prominent and limit changes to them*. Changes in weights make it difficult for consumers to discern whether an institution’s or program’s status changed in the rankings due to an inherent difference or due to a methodological change.

C) Collection and Processing of Data

10. *Pay due attention to ethical standards and the good practice recommendations articulated in these Principles.* In order to assure the credibility of each ranking, those responsible for collecting and using data and undertaking on-site visits should be as objective and impartial as possible.
11. *Use audited and verifiable data whenever possible.* Such data have several advantages, including the fact that they have been accepted by institutions and that they are comparable and compatible across institutions.
12. *Include data that are collected with proper procedures for scientific data collection*. Data collected from an unrepresentative or skewed subset of students, faculty, or other parties may not accurately represent an institution or program and should be excluded.
13. *Apply measures of quality assurance to ranking processes themselves*. These processes should take note of the expertise that is being applied to evaluate institutions and use this knowledge to evaluate the ranking itself. Rankings should be learning systems continuously utilizing this expertise to develop methodology.
14. *Apply organizational measures that enhance the credibility of rankings.* These measures could include advisory or even supervisory bodies, preferably with some international participation.

D) Presentation of Ranking Results

15. *Provide consumers with a clear understanding of all of the factors used to develop a ranking, and offer them a choice in how rankings are displayed*. This way, the users of rankings would have a better understanding of the indicators that are used to rank institutions or programs. In addition, they should have some opportunity to make their own decisions about how these indicators should be weighted.
16. *Be compiled in a way that eliminates or reduces errors in original data, and be organized and published in a way that errors and faults can be corrected.* Institutions and the public should be informed about errors that have occurred.

8. Conclusions

In the paper the author tried to present the urgent need of creating the World’s Webometrics Ranking of the Maritime Universities. It is strongly recommended that the International Maritime Universities Ranking Expert Group (IMUREG) should be founded as soon as possible. The methodology should use the pool of maritime universities from what it will be determined by IMUREG and should utilize a pool of "experts" formed by project officials and managers to determine the rating scales for every indicator of performance of the maritime universities in main areas including academic performance, research performance, faculty expertise, resource availability, socially significant activities of graduates, number of students, scientific potential and number of well educated and experienced academic staff, quality and number of simulators and professional laboratories, international activities of the university, and international opinion of foreign universities. The ranking shouldn't be only focused on research results but also in other indicators which may reflect better the global quality of the maritime scholar and research institutions worldwide. The official global Webometrics ranking of maritime universities should be establish on the base of Webometrics Ranking of World Universities.

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The Importance of Non-Technical Skills in the Maritime Education

Farhan Saeed

MICS, MNI, MSc, Master Mariner
Liverpool John Moores University, James Parsons Building, Byrom Street, Liverpool, UK,
f.saeed@ljmu.ac.uk

Abstract In many high reliability organisations safe and effective crisis management is dependent on both, technical and non-technical skills. The importance of non-technical skills, such as leadership, teamwork, communication, stress management/personal limitations, decision making and situation awareness, is now being realised in addition to subject knowledge and technical expertise to deal with emergency situations. Response to escalating emergencies in large organisations and industries require co-ordination of actions, communications, and a high level of decision making under pressure. The significance of technical skills is accepted; the importance of non-technical skills is now being recognised.

The need for the training and assessment of main non-technical skills of co-operation, leadership and management skills, situation awareness, and decision making in MET is to be established. The distinction between technical and non-technical skills is accepted in the aviation industry where European legislation now requires that pilots in multi-crewed cockpits are trained and assessed in technical and non-technical skills. Critical incident reporting has identified nontechnical skills to be major determinants of successful anaesthesia crisis management. Most literature in this subject has focused on assessment of knowledge and technical skills during anaesthesia simulation, nontechnical skills have become a recent area of interest for researchers and now a comprehensive and reliable nontechnical skills assessment tool called the Anaesthetists' Non-Technical Skills (ANTS) has been developed. In commercial shipping individual companies like Maersk send their Chief Officers for a three day leadership course before promoting them to take the responsibility of the command of a ship, but there is no legislative requirement of such training.

A review of the maritime accidents databases from UK, USA, Norway and Canada conducted by Professor Michael Barnett and others in 2006 confirms that human error is the main contributing factor in the maritime accidents. This study illustrates that major maritime accidents are not caused by technical problems but by non-technical skills failure. The Crew Resource Management (CRM) course has been developed to address the non-technical aspects of ship operations. The course contents are focused towards those skills assumed to be essential in assisting in the detections and management of errors in the crisis. Barnett et al (2006) think that one week's course provided by a training college is not enough to fix the "problem employee". A greater need is realised to follow up the training after effects, by seeing how effective it has been on board the vessel itself.

A review of other safety related industries' recent involvement towards non-technical skills training and assessment will be carried in this paper and a comparison will be made with current maritime education.

Keyword :

1. Introduction

Accidents in maritime industry are not new and a major contributing factor to most of these accidents is human error. In 1997 a P&I club reported that human error was responsible for 58% of all claims made. This figure has not reduced since but the other major contributing cause to accidents, the technical failures, has reduced by two thirds since then [1]. Human error cannot possibly be eliminated altogether but measures can be taken to reduce it. Many safety related industries, such as aviation, medical, nuclear power and fire fighting, are now focusing on integrating non-technical skills into the main technical training. The present maritime education system is heavily focused on technical skills and we have to learn lessons from other safety related organisations.

2. Aviation - Crew Resource Management (CRM)

The concept of non-technical skills generated from the aviation industry when the National Transportation Safety Board in USA investigated a number of airline accidents in 1960s and 1970s. As a result of the following accident and others, the concept of Cockpit/Crew Resource Management (CRM) was born [2].

"On December 28, 1978, as a result of a relatively minor landing gear problem, a United Airlines DC-8 was in a holding pattern while awaiting landing at Portland, Oregon. Although the first officer knew the aircraft was low on fuel, he failed to express his concerns convincingly to the captain. The plane ran out of fuel and crashed, killing 10."

A workshop was held in 1979 called, Resource Management on the Flightdeck, sponsored by the National Aeronautics and Space Administration (NASA). Human error aspects of a majority of air crash accidents were identified in this meeting as failures of interpersonal communication, decision making and leadership. It was suggested that the training of non-technical skills of pilots was required to reduce the "pilot error" by making better use of human resources on the flight deck. Since that time Crew Resource Management (CRM) training programmes have evolved in the United States into five generations [3].

CRM training can be defined as "a set of instructional strategies designed to improve teamwork in the cockpit by applying well-tested tools (e.g., performance measures, exercises, feedback mechanisms) and appropriate training methods (e.g., simulators, lectures, videos) targeted at specific content (i.e., teamwork knowledge, skills, and attitudes)"[4]. CRM training is mainly non-technical skills training integrated into a technical training course of the flight crew. The CRM or non-technical skills include situation awareness, decision making, leadership, teamwork and communications.

2.1 First Generation of CRM

The first comprehensive CRM (Cockpit Resource Management) programme was initiated and developed by United Airlines in 1981 in the US and the course was called Command, Leadership and Resource Management [5]. The consultants who had developed training programmes for corporations trying to enhance managerial effectiveness were part of the development of the CRM. This was a seminar style training programme where participants diagnosed their own managerial style. First generation CRM training programmes were psychological in nature. The focus was on general concepts of leadership and general strategies of interpersonal behaviour but failed to provide definitions of appropriate behaviour in the cockpit. It was recognized that annual recurrent training in CRM was necessary. However, many of these courses encountered resistance from some pilots who accused these courses of seeming to manipulate their personalities [3] [6].

2.2 Second Generation of CRM

NASA held a workshop in 1986 to discuss the progress of the CRM training programmes offered by that time by many airlines in the United States and around the world that had initiated the CRM training. One of the conclusions drawn at this meeting was that CRM training would disappear as a separate component of training when it became part of flight training and flight operations [7]. At this time a second generation of CRM training programme emerged. The name was changed from cockpit to crew to focus on cockpit group dynamics [3].

2.3 Third Generation of CRM

In the early 1990s a new shape of CRM introduced which integrated CRM with standard technical training. The idea was to focus on specific skills and behaviours that pilots could use to operate in a more effective and safe manner. Many airlines at this stage included modules focusing on CRM issues in the use of flight automation [3]

2.4 Fourth Generation of CRM

The Advanced Qualification Programme (AQP) was introduced by the Federal Aviation Administration as a major change in the training and qualification of the flight crew. AQP was a voluntary programme which required carriers to provide both CRM and LOFT (Line Oriented Flight Training) for all flight crews. This also required integrating CRM concepts into technical training. To complete the shift to AQP, carriers had to complete detailed analysis of the training requirement for each aircraft. The carriers were required to develop programmes that address the human factors (CRM) issues in each aspect of the training. [3]

It would seem that the Fourth generation of CRM has solved the problems of human error by making CRM an integral part of all flight training. There was general consensus among US airlines that AQP approach has produced improvements in the training and qualification of flight crews [6].

2.5 Fifth Generation of CRM

The Fifth generation of CRM outlines the fact that human errors are inevitable and CRM can be seen as a set of error countermeasures with following three lines of defence;

1. The avoidance of error.
2. The trapping incipient errors before they are committed.

3. Mitigating the consequences of those errors that occur and are not trapped.

In addition to error management, organizations were required to take steps to identify the nature and source of error in their operations. An Aviation Safety Action Programme was announced by US FAA to encourage incident reporting within organizations to deal with safety issues proactively [8]. The programme proved to be a success with about 6000 incident reports received in first two years. The data generated by the system helped companies to take steps to prevent or minimize the recurrence of the incidents. [3][6].

2.6 NOTECHS

The international aviation regulators have generally dictated CRM courses. The Federal Aviation Administration in the USA introduced the Advanced Qualification Program (AQP) in 1990s and in the UK Civil Aviation Authority required a formal incorporation on non-technical (CRM) skills evaluation into all levels of flight crew training [9]. The European Joint Aviation Authorities (JAA) has introduced the regulation, *"The flight crew must be assessed on their CRM skills in accordance with a methodology acceptable to the Authority and published in the Operational Manual. The purpose of such an assessment is to: provide feedback to the crew collectively and individually and serve to identify retraining; and be used to improve the CRM training system"* [10].

Based on this legislation a research project, JARTEL (Joint Aviation Translation – Translation and Elaboration of Legislation) was initiated by the JAA Human Factors group in 1996 to identify or develop a feasible and efficient method for assessing an individual pilot's non-technical (CRM) skill. The project was sponsored by four European CAAs, a research consortium consisting of pilots psychologists from Germany, France, Holland and the UK was established to work on the NOTECHS (Non-Technical Skills).The system was to be used to assess the skills of an individual pilot and it was to be suitable for use across the Europe [5].

The development method included a detailed examination of existing behavioural marker system to assess pilot's CRM skills. The experts who advised on the final design on the NOTECHS systems were airline captains who had considerable experience of using behaviour rating methods. The resulting NOTECHS system has four categories, each with component element of behaviour as shown in the following table;

Category	Element
1. Co-operation	Team-building and maintaining Considering others Supporting others Conflict solving
2. Leadership and Managerial Skills	Use of Authority and assertiveness Providing and maintaining standards Planning and co-ordination Work load management
3. Situation awareness	Awareness of aircraft systems Awareness of external environment Awareness of time
4. Decision Making	Problem definition and diagnosis Option generation Risk assessment and option selection Outcome review

Source: [11]

Table 1. NOTECHS system

The four primary categories subdivide into two social skills (Co-operation and Leadership and management) and two cognitive skills (Situation awareness and decision making). Social skills' behaviours are generally observable in the form of communication but cognitive skills are non-observable since they do not directly materialise. Hence for evaluation purpose, these cognitive processes must be inferred from observable behaviour (eg. Specific actions or verbalisation) [11].

Five operational principles were established with the aim of ensuring that each crewmember would receive as fair and as objective an assessment as possible with the NOTECHS system as follows;

Design Principles for NOTECHS
1. *Only observable behaviour is to be assessed – The evaluation must exclude reference to a crewmember's personality or emotional attitude and should be based only on observable behaviour. Behavioural markers were designed to support an objective judgement.* 2. *Need for technical consequence – For a pilot's non-technical skills to be rated as unacceptable, flight safety must be actually (or potentially) compromised. This requires a related objective technical consequence.* 3. *Acceptable or unacceptable rating required – The JAR-OPS requires the airlines to indicate whether the observed non-technical skills are acceptable or unacceptable.* 4. *Repetition required – Repetition of unacceptable behaviour during the check must be observed to conclude that there is a significant problem. If, according to JAR paragraph concerned, the nature of a technical failure allows for a second attempt, this should be granted, regardless of the non-technical rating.* 5. *Explanation required – For each Category rated as unacceptable the examiner must: (a) Indicate the Element(s) in that Category where unacceptable behaviour was observed. (b) Explain where the observed NTS (potentially) led to safety consequences. (c) Give a free-text explanation on each of the Categories rated unacceptable, using standard phraseology.*

Source: [5]

Table 2. Design Principles for NOTECHS

The main JARTEL study was an experimental rating task using NOTECHS based on eight video scenarios filmed in a Boeing 757 simulator. The scenario simulated realistic flight situations with predefined behaviours from the NOTECHS element. The pilots' behaviours were rated ("very poor" to "very good") using NOTECHS system by 105 instructors, recruited from 14 airlines in 12 European countries. Each session began with a briefing on the NOTECHS method and a practice session. The instructors were asked to rate captains' and first officers' behaviours in each of the eight cockpit scenarios using the NOTECHS score forms [5] [11]. In the evaluation questionnaire, the instructors were very satisfied with the NOTECHS rating system [12].

The users of NOTECHS are expected to be certified flight instructors and authorised examiners, who have been trained in the application of the method for rating performance. NOTECHS was designed as a professional tool for instructors and authorized examiners. It was written in common professional aviation language with the intention of debriefing pilots and communicating clear advice for improvements. From the experimental and operational trials of NOTECHS system it was indicated that the basic psychometric properties were acceptable and that the method was accepted by practitioners [11].

Clearly, a more extensive test of the psychometric quality of NOTECHS would be desirable but this would require a large set of data collected under standardized conditions. An observational study was carried out for Southeast Asian Airlines involving crews from 323 flight sectors. A set of four categories and 16 behavioural markers was adapted from the existing LOSA (Line Operation Safety Audit) and the NOTECHS methods to evaluate the crews' non-technical performance and to compare them against error and threat management. It was found that crews who showed better decision-making skills were more likely to trap errors during the flight. A higher level of error trapping during the flight was found in the crews who showed an increased co-operation in pre-departure phase. In the pre-departure phase the vital behaviour for threat management were briefing and planning [13].

3. Anaesthesia - ANTS (Anaesthetics non-technical Skills)

Critical incident reporting has identified nontechnical skills to be major determinants of successful anaesthesia crisis management. Most literature in this subject has focused on the assessment of the knowledge and technical skills during anaesthesia simulation, nontechnical skills have become a recent area of interest for researchers and now a comprehensive and reliable nontechnical skills assessment tool called the Anaesthetists' Non-Technical Skills (ANTS) has been developed [14] The system of anaesthesia non-technical skills, a behavioural marker system, was developed in a project between the University of Aberdeen Industrial Psychology Research Centre and the Scottish Clinical Simulation Centre. The system includes the main non-technical skills linked with good anaesthetic practice [15]. The programme was developed after reviewing Crew Resource Management (CRM) designed to increase the use non-technical skills to improve the safety in the aviation industry [16].

The project was commissioned by the Scottish Council for Postgraduate Medical and Dental Education to investigate non-technical skills in anaesthetists, 'The Identification and Measurement of Anaesthetists' Non-Technical Skills'. The main aim of the project was to discover the non-technical skills, both cognitive and social skills, required by the anaesthetists during the operation. The project was divided into the following seven work packages;

1. Review of Human Factors Research in Anaesthesia. Review of Behavioural Marker Systems in Anaesthesia.
2. Interview study to Identify Anaesthetists' Non-Technical Skills.
3. Review of Incident Data - Confidential
4. Development of a Prototype Behavioural Marker System for Anaesthetists' Non-Technical Skills (ANTS).
5. Preliminary Evaluation of the Prototype Behavioural Marker System for Anaesthetists' Non-Technical Skills (ANTS).
6. Experimental Report.

The first work package [17] of the project reviews the human factors in anaesthesia. It describes the background of such study of human factors in anaesthesia as 80% of anaesthetic incidents are due to human error and up to a large degree avoidable.

In UK there were no formal obligations to report anaesthetic incidents, apart from death; hence not enough data was available. Confidential incident reporting programmes, where anonymous information is collected, have been set up in several countries such as Switzerland, Australia and The Netherlands. A Critical Incident Reporting System (CIRS) is found at the University of Basel, Switzerland; AIMS, the Australian National System; and Faults, Accidents and Near Accidents (FONA) at the University Hospital Leiden, The Netherlands [18].

The aim of the third work package of the University of Aberdeen's study of ANTS [17] was to collect the information from experienced anaesthetists to determine the non-technical skills being used in support of the clinical tasks. To do these three methods of collecting data were considered initially; surveys, simulation observations and interviews. The surveys or questionnaire method was immediately rejected as the data required were qualitative and not quantitative. Observations is a useful way of finding out about such skills, but a large component of anaesthetics' activities is cognitive, and therefore unseen and thus the only way to investigate these skills was through getting the experts to talk about them. Therefore, it was decided that most suitable method of collecting information regarding anaesthetics non-technical skills would be interviews.

A semi-structured interviewing technique was used out of many interviewing methods available. In a semi-structured interviewing technique there is more flexibility for interviewer to investigate issues that arise during the interview and questions can be adapted to individual circumstances. There is a disadvantage in this technique that interviewer need to have a good subject knowledge to be able to know when to probe further and what to ask. The researchers working exclusively on the project had observed in the theatre and at the simulator a number of times and had attended an Advanced Trauma Life Support course and a Basic Obstetrics Life Support course. Thus it was considered that the researchers had a thorough subject knowledge and would not pose too much of a problem [17]

A review of Cognitive Task Analysis (CTA) methods was conducted and three main techniques were adapted; Critical Decision Method (CDM), knowledge audit and a sorting task. It was then decided that interviews would have three parts to cover each of the above chosen technique of CTA.

The first part of the interview was the main source for information about non-technical skills and was developed around the Critical Decision Method. The participants were asked to describe a challenging and difficult case from their past experience. A case could be a real incident or near miss or may be a normal case that just really tested their skills and for which their expertise was important for the outcome. This part of the interview was conducted in three stages: (i) the interviewee would tell the unstructured story, (ii) and then interviewer would repeat the case back to check everything was understood and finally (iii) the interviewee would represent the case again in more detail with probing used where more information was required. The time allowed for this part of the interview was 45 minutes.

A Knowledge audit formed the second part of the interview. In this part interviewees were asked what skills and behaviour they considered important for good anaesthetists. After compiling a list of skills they were asked how the skills are currently developed by trainees and if there were any differences in the skills needed for normal and crisis situations [17].

A final part of the interview was the sorting task. The interviewees were given following 19 skill items to sort and rate. The skill items have been identified from the literature.

Communication style	Allocation of attention
Information sharing	Monitoring
Feedback	Recognition
Leadership	Situation Awareness
Team Building	Decision Making
Maintaining Team Climate	Re-evaluation
Preparation	Teaching
Planning	Initial Crisis Management
Workload Management	Declaring Emergency
Prioritisation	

Three pilot interviews were undertaken with a senior anaesthetist to support the development of the interview. The questions were structured after the first trial interview. The remaining two pilot interviews were conducted once a draft interview schedule was established. The recruitment of the participants was not a problem as many experienced consultants volunteered to take part in the project [17]

This project has identified the non-technical skills for successful operation of anaesthetics (ANTS) and outlined behavioural markers system for the assessment of the ANTS.

4. Non-Technical Skills for Surgeons (NOTSS)

Surgeons became interested in non-technical skills in 2003 after the analysis of adverse events in surgery found that many underlying causes originate from failures in non-technical aspects of performance. In one study it was observed that failure in communication was the main cause in 47% of cases in the surgery. It was deemed necessary in order to achieve and maintain high standards of the surgical performance attention must be paid to non-technical skills such as team working, leadership, situation awareness, decision making, task management and communication [19].

A research group at the University of Aberdeen has conducted a research to develop the Non-Technical Skills for Surgeons (NOTTS). The Cognitive Task Analysis (CTA) method was used by structured interviews, literature review, attitude survey, analysis of surgical mortality reports and observations in theatres. 27 consultants in general, cardiac and orthopaedic surgery, invited for the interview to draw up the taxonomy of non-technical skills for surgeons. The purpose of the interviews was to identify key non-technical skills from the discussion of real life critical incidents in the operating theatre [19]

The following sources were used to develop the NOTTS [20];

a) Questionnaire and interview studies with surgeons
b) Observational studies of Surgeos (Videotaped, simulated)
c) Surgical adverse event analysis
d) Surgical education, training and competence
e)

A STAR (Surgical Team Assessment Record) questionnaire was designed to study the role of human factors in surgical outcomes and measures the situational, organisational, team and personal factors thought to contribute the surgical performance. A survey instrument, OMRAQ (Operating Room Management Attitudes Questionnaire), was designed to measure the attitudes of the operating theatre personnel toward safety, error, teamwork, leadership and authority. Observations of 243 neonatal arterial switch operations performed by 21 cardiac surgeons in 16 UK centres as part of the study.

5. Maritime

From year 2001 to 2005, an average of 18 ships met accidents like collision, fire, explosion or grounding everyday and two of them sank every single day [1]. A research conducted by Professor Michael Barnett in 2006 confirms that human error is the main contributing factor in maritime accidents. This study illustrate that major maritime accidents are caused by failure of crew to respond to the situation appropriately. Following conclusions were drawn [21];

1. *While the total number of accidents is declining, human error continues to be the dominant factor in 80 to 85% of maritime accidents.*
2. *Failures of situation awareness and situation assessment overwhelmingly dominate.*
3. *Human fatigue and task omission seem closely related to failures of situation awareness.*

Warsash Maritime Centre, UK, has developed a Crew Resource Management (CRM) course to address the non-technical aspects of ship operations. The course curriculum is dedicated to social and cognitive aspects of seafarer's performance. The course contents are focused to those skills assumed to be essential in assisting in the detections and management of errors in the crisis. But the authors [21] think that the one week's course provided by a training college is not enough to fix the "problem employee". A greater need is realised to follow up the training after effects by seeing how effective it has been on board the vessel itself.

6. Conclusion

Although some major shipping companies have recently adopted crew resource management training for their crew there is no regulation for such training as yet. Presently the standard seafarer training is heavily focused on technical training. The '*application of team working and leadership*' has recently been included in the STCW Convention and the STCW Code which would mean that future seafarer training would benefit from non-technical skills. There still seem in depth research necessary in the area of the non-technical skills required by seafarers to deal with crisis and emergencies onboard ships.

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Leadership styles: Some evidence from Turkish Maritime Business

Leyla Tavacioglu
Assistant Professor, Istanbul Technical University, Maritime Faculty, 34940 Tuzla, Istanbul, Turkey,
tavaciog@itu.edu.tr
Emel Yilmaz*
Istanbul Technical University,Science Center, 34437, Taskısla,Istanbul, Turkey
yilmazemel@itu.edu.tr
Selahattin Dinler
Istanbul Technical University,Suny Student, 34940, Tuzla, Istanbul, Turkey
sleboy_ksk@yahoo.com.tr
Saliha Gunduz
Istanbul Technical University,Science Center, 34437,Taskısla,Istanbul, Turkey,
salihagunduz@itu.edu.tr

Abstract For a long time leadership has been a subject that is studied many times for scientists and businesses. A leader is described as a person who gives his own potential powers to others and direct them to reach the goal. In everywhere leadership can be talked about because of the sociality of human being. An effective leadership has an importance of the success and progress of businesses especially in the global world nowadays. The result of past and present surveys to describe leadership behaviors tells that although many approaches come out, in present by the help of six well known and accepted leadership styles, it fixed that every leader own style. These leadership styles are affected from many conditions. Our study leadership styles of managers that have different cultures is searched and the effects of cultural differences on Leadership styles is tried to studied. A leader, because of a human being that is a social existence and people are affected from the cultural values of their societies so that in this research in order to see the effect of the cultural differences on leadership styles Turkish and International societies are used as an example. In the result of this research, we have seen that the Turkish managers plan to the all activity of businesses and managements carefully and lead the employers in the all level, but the other side, then Italian managers appropriate the leadership style that is listen employers, consider their thoughts and thinking's and include them in the decision process and believe in team working. The Maritime Business provides an interesting research alternative to other sectors because of its unique characteristics. For this reason, this paper aims to explore and compare the leadership styles of managerial personnel in the maritime industry. The study focuses on the empirical evaluations of the similarities and differences in leadership styles of maritime professionals. A managerial-style questionnaire is developed based on the review of relevant literature. Questionnaire data obtained from 100 participants show that the authoritative style is more frequently performed than all other styles. Results also indicate differences in terms of gender and managerial hierarchy. Implications of the results are discussed.

Keyword : *Leadership, Leadership styles, Maritime Business, Ship Managers, Joint venture,*

1. Introduction

Managament; The process of administering and coordinating resources effectively and in an effort to achieve the goals of the organization. **Management Theory :** It is critical for managers to be able to lead people through the fast pace of change. Leadership is about coping with both complexity and change. As change becomes more dynamic and rapid, managers at all levels must hone their leadership skills. Therefore, leaders are managers and managers are leaders. Scientific Management: Taylor Frederick W. Taylor (1856-1915) Father of “Scientific Management., attempted to define “the one best way” to perform every task through systematic study and other scientific methods and he believed that improved management practices lead to improved productivity. **Leadership;** The capacity to direct and motivate the members of work groups toward the accomplishment of organizational goals[1]. **Leadership Skills;** Understanding individual/group behavior dynamics. Having the ability to motivate employees being an effective communicator [2]. Being able to envision future and share that vision **Leadership Significance;** Leadership is a social influence process. A responsibility and a process; It’s not a position, title, or privilege. An observable, understandable, learnable set of skills and practices available to everyone, anywhere in the organization. The indirect ability to influence people by inspiring them to pursue goals for the benefit of the organization[3]. **Leadership and Vision ;** Leadership involves that creating a vision of the future. In addition to devising strategy for achieve that vision. There is an other factor that we need to consider is communicating which is the vision so that everyone understands and believes in it. **Leader-Centered Approaches;** The assumption that some people are born with certain physical characteristics, aspects of personality, and aptitudes that make them successful leaders.

Physical characteristics: height and appearance

Personality: self-esteem, dominance and emotional stability

Aptitudes: general intelligence, verbal fluency and creativity[4].

Traits of Successful Leaders ; *Drive: Achievement, sense of responsibility, ambition, energy, tenacity and initiative. *Motivation is a especially power. *Honesty and integrity *Self confidence is persuasive, diplomatic and socially skilled. *Conceptual ability *Business knowledge *Leadership Behavior Focus are examines what effective leaders do rather than what effective leaders. Defines a leader’s effectiveness based on two orientations: Task orientation: Setting performance goals, planning and scheduling work, coordinating activities, giving directions, setting standards, providing resources, and supervising performance. Relations orientation: Behavior that shows empathy for concerns and feelings, supportive of needs, showing trust, and similar attributes [5]. **Leadership Behavior;** Effective leaders use a range of behaviors. Leadership behaviors can be learned. Effective leaders have the ability to change and adapt to organizational settings in which they manage. It is still not obvious which behaviors are most effective because numerous other factors can influence performance and success. Leadership Power Focus on power which is the ability to use human, informational, or material resources to get something done to get results. Authority means the officially (organizationally) sanctioned right to get something done. **Leadership Substitutes;**

Variables such as individual, task, and organizational characteristics that tend to outweigh the leader's ability to affect subordinate satisfaction and performance. Also known as neutralizers is a condition that counteracts leader behavior and/or prevents the leader from having an effect on a follower or a specific situation.

Styles of Situational Leadership Behavior

Telling style: the leader provides specific instructions and closely supervises performance.

Selling style: the leader explains decisions and provides opportunities for clarification

Participating style: the leader shares ideas and maintains two-way communication to encourage and support the skills subordinates have developed.

Delegating style: the leader provides subordinates with few task or relations behaviors.

Empowerment is the interaction of the leader giving away or sharing power with those who use it to become involved and committed to independent, high-quality performance. Successful empowerment means that everyone has been convinced that he or she makes a difference to the success of the organization [6].

2. Current Perspectives on Leadership

Gender and Leadership; Transformational Leadership is a leader's ability to influence employees to achieve more than was originally expected, or thought possible. Generates feelings of trust, admiration, loyalty and respect from followers through: * Idealized influence * Inspirational motivation * Intellectual stimulation * Individualized considerations. **Leaders of the future will Implications for Leaders ;** 1-) Know yourself. 2-) Be a role model. 3-) Learn to communicate effectively. 4-) Know your team and be a team player. 5-) Be honest with yourself as well as to others. 6-) Do not avoid risks. 7-) Believe in yourself. 8-) Take the offense rather than the defense. 9-) Know the ways of disagreement and the means of compromise. 10-) Be a good follower [7].

3. SURVEY RESULTS

Today, the leadership of the concept only in Maritime business management activities continue to provide, rather than business continuity of employee motivation and consequently the productivity and profitability affect the global world to exist to ensure the important aspects, one is seen. Global world enterprises to survive make and effectiveness in order to increase the global world of the real and trying to keep pace with the requirements of the administrative capacity in the loop with the leaders will take part in this process to share.

Businesses to survive can, effectiveness increases when trying to now the local company by the presence of too much right can not be understood and multinational companies today, success rates and coefficients to other firms is higher than was assumed. Of course, companies also get a larger slice of the pie to the global market for international joint ventures, distributorships and multinational firms tended to.

It is exactly here that we also emphasize the importance of leadership, especially against the more important as we are out. Because these multinational companies have their administrative capacity of leaders on how much globalization requirements in line with the leadership approach adopted, though, a social existence as a culture and upbringing of the reflection of the leadership styles to see the inevitable truth. Operating in Turkey Turkish-International joint venture carried out to 54.8% of the research results with Turkish leaders have adopted a systematic style of leadership with 32.3% followed by 12.9% as vibrant and enthusiastic leadership, and leadership as a percentage explained by the approach we have adopted.

As well as suggested in the Turkish manager has chosen the correct style of leadership is the most systematic. The frequency of using the SPSS 16.0 program, looking at the overall average and standard deviation of 2.73 in the Turkish manager of leadership styles most preferred style of leadership seems to be systematic. According to the survey of Turkish managers, none, employees listen carefully that all employees are in compliance with their thoughts and feelings about the other leaders more sensitive than the thoughtful leadership style most preferred style of leadership adopted as did not.

Overall average and standard deviation of data, thoughtful and respectful leadership style also has the lowest average is seen. Considerate and respectful leadership style surveyed Turkish managers by none most preferred leadership model Although each of the survey scores data is taken into account only one survey in the second or third, the preference is in question. The latter, not the mean and standard deviation in the 0.07 to have the lowest average is explained.

But on the procedures to be connected with the employees a comfortable working environment and work to achieve the most accurate way to detect attempts to thoughtful and respectful leadership approach, the International manager of the% 41.6 with a best by adopting a style of leadership as we have encountered. Group of studies that support this leadership style is most preferred by 33.3% with this system of leadership and leadership is followed by alive with 25.1%. 12.9% for managers, such as Turkey with a very small percentage of open leadership style preferred by most of the International manager none of the preferred leadership style is not seen. Overall average and standard deviation of 2.8958 in the data of the thoughtful and respectful leadership style between the International manager is seen as the most preferred .

Survey results when we look at the Turkish admins considerate and respectful leadership style, the International manager of an open leadership style under any circumstances, the most preferred style of leadership is not seen. Basically, both systematic and thoughtful as we have defined leadership styles too much assertiveness in question is not asked for, but more impressive than the thoughtful leadership has systematically leaders.

4. CONCLUSION

Differences between leaders and executives are concepts of leadership and management is seen close to each other are not synonyms.

The concept of leadership is the future. Create a vision of the leaders in the organization and to adopt processes that are responsible for vision in the organization. Set goals that serve their leaders.

Management concept is the static, only today is related to the owner is responsible for the realization of the vision. Managers, such as the formal structure of power are the law-regulation.

Leadership can be defined as a process of influence on individual and group behaviors to reach determined objectives. An effective leader is someone who is open-minded, takes risks, has a power to effect others and is communicative an administrative ability to solve disagreements.

Besides, an effective leader does not waste time on details; instead, focuses on outcomes. S(he) has always communication with his/her colleagues and tries to overcome the hard and complicated problems but does not attempt to solve them by himself/herself.

In addition, s(he) is aware of the importance of the staff potential. Leaders are vital for the future of the professions. While training our new leaders, it will be to be able to understand our former leaders profoundly by detecting their ways of performance. In my opinion the laissez faire style is more effective on Maritime industry and also the survey shows managers favorable style is laissez faire.

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Transformational Leadership and Its Implication for Leadership at Sea

Nan Xiang
PhD Student, Department of Maritime Research and Innovation, University of Southern Denmark
Niels Bohrs Vej 9, DK-6700 Esbjerg, Denmark, nx@sam.sdu.dk

Abstract With more and more seafarers of different ethnic, cultural and national groups working together on board vessels in international trade, it is a growing conviction that managing a multicultural crew has become a pressing concern for maritime industry. Shifts in demographics over the past decade combined with increasing globalization are creating significant challenges for shipping companies. Perhaps the greatest challenge in dealing with a multicultural crew is leading in a way that effectively motivates and inspires those with different work-related values and beliefs. However, most researches concerning human behavior on board have put emphasis on human factor and safety culture, little has been written on the subject of leadership practice. In recent years, transformational leadership has received considerable attention in the area of leadership research. Therefore the objective of this paper is to draw parallels between the transformational leadership literature and organizational literature in the maritime domain and discuss the applicability of transformational leadership at sea. This paper presented the potential of the application of transformational leadership to promote effective performance and improve quality of life at sea.

Keyword: *Transformational leadership, Maritime moderators, Education and training*

1. Introduction

Results from BIMCO/ISF Manpower Updates (2005) confirmed that 'the centre of gravity of the labor market for seafarers has continued to shift from the traditional maritime countries of Western Europe, Japan and North America towards the Far East, Indian sub-continent and Eastern Europe'. Findings from Marcom Project (1998) demonstrated that approximately 80% of the world's merchant fleets are manned by mixed nationality crews. The scale of ethnic heterogeneity in the population of worldwide shipboard crews has expanded. There is a variety of crew composition. For example, it could be a single nationality crew recruited from the ship-owner's country, or officers from the ship-owner's country and ratings from a third world country. The crew could also be composed of senior officers from the ship-owner's country, or the master could come from the owner's country and all the rest of the officers and ratings from a wide range of countries (Devanadera & Espiritu, 2003).

With more and more seafarers of different ethnic, cultural and national groups working together on board vessels in international trade, it is a growing conviction that managing a multicultural crew has become a pressing concern for maritime industry (Horck, 2005). Shifts in demographics over the past decade along with increasing globalization are creating significant challenges for shipping companies. Perhaps the greatest challenge in dealing with a multicultural crew is leading in a way that effectively motivates and inspires those with different work-related values and beliefs.

Most researches concerning human behavior on board have put emphasis on human factor and safety culture, little has been written on the subject of leadership practice. It is for this reason the focus of this paper is to discuss leadership at sea. Over the past two decades, transformational leadership has emerged as one of the most important leadership concepts and there is still a growing interest in the functioning of this kind of leadership style (Felfe & Schyns, 2010). Numerous literatures have demonstrated positive connections between transformational leadership and desirable outcomes. Specifically, in the area of cross culture studies, researchers try to bridge culture and leadership and test the effectiveness of transformational leadership (Jung et al., 1995).

The objective of this paper is to draw parallels between the transformational leadership literature and organizational literature in the maritime domain. Classical theories of transformational leadership are reviewed in the paper. Following the discussion of leadership-outcome linkage, this paper analyzed possible situational factors which may hinder the effectiveness of performance on board. The applicability and impact of transformational leadership in the maritime context is discussed along with leadership education and training issues.

2. The full range of transformational leadership

Burns (1979) is the first scholar who differentiated transformational leadership from transactional leadership. Exchange process is the basis of transactional leadership. Transactional leaders manage followers by expectation and provide appropriate rewards for attaining agreed-upon objectives. The contingency model (Fiedler, 1967), path-goal theory (Evans, 1974) (House, 1971), vertical dyad linkage theory (Dansereau, Graen, & Haga, 1975), and the Vroom-Yetton model (Vroom & Jago, 1974) are examples of leadership theories which are compatible with transactional leadership. Transformational leadership put emphasis on individual development by raising the interests and needs of followers and providing them with confidence to perform beyond the expectations. Burns (1979) treated transactional and transformational leadership as two extremes. Bass (1985), on the other hand, suggested that transactional leadership behaviors can also be employed by transformational leaders when these are considered to be suitable for the situation. Bass (1985&1994) expanded the paradigm of leadership proposed by Burns, developed Multifactor Leadership Questionnaire (MLQ), offering an operational definition of transformational leadership and conceptualizing six measured factors of leadership behaviors.

Idealized influence is the extent to which leaders behave in charismatic ways, which has great power and influence over followers. Charismatic leaders excite, arouse, and inspire their subordinates (House, 1977). A high degree of trust and confidence is instilled among the followers. Subordinates want to identify with these leaders, make attributions to them, and endow them as having extraordinary capabilities, persistence, and determination (Yammarino, Spangler & Bass, 1993).

Inspirational motivation is the extent to which leaders formulate and articulate visions/challenges that will energize followers. Transformational leaders instill pride and team spirit in others for being involved in envisioning attractive future states, encourage followers to go beyond self-interest for the good of the group, create clearly communicated expectations that followers want to meet, and demonstrate commitment to goals and the shared vision (Bass& Riggio, 2006).

Intellectual stimulation is the extent to which leaders question assumptions, reframe problems, and solicit followers' ideas. Transformational leaders stimulate followers' efforts to be creative and innovative. Leaders are willing and able to show subordinates new approaches of looking at old methods. Not only is an awareness of problems and followers' own thoughts and imagination aroused, but also the recognition of their beliefs and values. Followers are encouraged to seek new perspectives when completing assignments, and their ideas are not criticized because of the differences (Bass, 1985, 1990; Yammarino, Spangler & Bass, 1993).

Individualized consideration is the extent to which leaders listen to followers' concerns, attend to followers' needs for development and growth, and act as mentors or coaches. Leaders recognize and accept individual differences in followers' needs and desires, encourage two-way exchange in communication, personalize interaction, provide for continuous follow-up and feedback, link individuals' current needs to the organization's mission, and elevate those needs when it is appropriate (Bass, 1985, 1990; Bass & Avolio, 1989; Bass& Riggio, 2006).
Contingent reward is a constructive transactional component which has been found to be reasonably effective in motivating others to carry out assignment satisfactorily. Transactional leaders clarify expected achievement of followers' performance, and obtain followers agreement on the enactment of their work role by promising to attend to their needs and desires or offering actual rewards. In some

occasions, contingent reward is not necessarily a constructive transaction. For example, when the exchange of reward is intangible, such behavior can be considered as transactional.

Management by exception (MBE) is a corrective transaction which involves two forms of transactional leadership, namely active MBE and passive MBE. In active MBE, leaders take active supervision and correct mistakes/errors occurred in followers' assignment when it is necessary. Passive MBE leaders wait for the mistake/error to occur and then take action to rectify the mistake (Bass, 1985, 1990; Yammarino, Spangler & Bass, 1993; Bass& Riggio, 2006).

With regard to the universality of transformational leadership, Bass (1997) argued that transformational leadership can be found in ordinary places and in all forms of organizations. Meantime, transformational leadership should be globally endorsed because it matches people's ideal leadership prototype.

3. Transformational leadership and performance

The past few decades have witnessed the growing research attention on leadership-outcome connection. Many researchers have proposed well established models, which indicate positive relationships between transformational leadership and a series of desirable outcome variables (Bass, 1985; Avolio & Bass, 1988; Sosik et al., 1997; van Knippenberg et al., 2004; Yukl, 2010).
A large proportion of these researches focused on the individual level. For example, empirical evidence (Yammarino, Spangler & Bass, 1993) provided support for the positive interplay of transformational leadership and leaders' performance. Yukl (2010) also demonstrated that transformational leadership has a profound optimistic influence on leaders' behaviors. Besides the leader oriented researches, others put emphasizes on followers perspectives. Followers' psychological processes, such as self concept and identity, are considered of great importance in the translation of leader behavior into follower action (Shamir, et al., 1993; van Knippenberg & Hogg, 2003). Podsakoff et al. (1990) conducted an empirical study and found a strong link between transformational leadership and followers' job satisfaction. Both experiments and field studies have found significant relationships between transformational leadership and subordinate creativity under certain conditions (Kahai et al., 2003; Sosik et al., 1998; Shin & Zhou, 2003; Wang & Rode, 2010). Lowe et al. (1996) reviewed previous leadership researches and found positive relationship between transformational leadership and conceptually related variables such as individual performance.
In the team level, emerging researches suggested that organizations may improve team performance through effective leadership. Schippers et al. (2008) used empirical data to test the hypothesis of whether transformational leadership is positively related to team reflexivity and performance. Their research findings support the notion that transformational leaders will stimulate the formation of a shared mental model within teams and, subsequently, increase reflexivity within teams. There also has been some effort on the theoretical development of transformational leadership and team performance linkage. Bass (1994) discussed that transformational leaders may improve team decision-making skills. Waldman (1994) found the reliance on transformational leadership may improve multi-functional team innovation processes. Atwater and Bass (1994) developed a conceptual model of the interaction between transformational leadership and team factors such as cohesion and conflict management. Kahai et al. (2003) stated in their research that transformational leaders are more likely to increase group performance through overcoming social loafing among group members. Additionally, Bass et al. (2003) found that transformational leadership ratings of platoon leaders and sergeants in the U.S. army predicted unit performance in combat simulations. Lim and Ployhart (2004) demonstrated in their empirical study that followers' ratings of transformational leadership were positively related to team performance. Therefore they come up with the conclusion that "leadership may have its most important consequences for teams and thus a focus on the team level is also important" (Lim & Ployhart, 2004, p. 610). There are also some literatures introducing various mediating variables into the linkage between team performance and transformational leadership. For example, Schaubroeck et al. (2007) argued that transformational leadership influenced team performance through the mediating effect of team potency. Dionne et al. (2004) examined the possible role of teamwork processes on performance and established a conceptual model of transformational leadership and team performance.

There have been studies of transformational leaders in a variety of settings, including the military (Kane & Tremble, 2000), health care (Avolio et al., 2004), education (Kirby et al., 1992), and business (Howell & Avolio, 1993). One of the early empirical studies of transformational leadership was conducted in the context of United Stated Navy, using a representative sample of 186 navy officers (Yammarino, 1993). Research findings included the positive relationship between the attributed effectiveness of officers' behavior and transformational leadership. More recently, Eid et al. (2004) demonstrated that transformational leadership among naval and air force officers can emerge as a predictor of situation awareness and interpersonal influence. Olsen et al. (2006) explores the utility of transformational leadership and moral indicator in Norwegian naval officer cadets. These empirical researches account for a small proportion of transformational leadership studies in special working environment settings, more specifically, noisy, vibrant, mobile and stressful working places (e.g. vessels, airplanes) These small samples show the utility of transformational leadership under certain context: a) Transformational leadership can have positive influences on followers' development and performance; b) Transformational and transactional leadership can both contribute to desirable outcomes; and c) Transformational leadership can be exercised at many different rank levels (Bradley & Charbonneau, 2004).

4. Transformational leadership in maritime context

4.1 Leadership at sea

A vast majority of ship management literature concerned about safety culture and human errors on board, very few have been written about the practice of leadership at sea. However the few literature existed demonstrates pressing needs for effective leadership under the changing crewing and ship management patterns. Leadership issues in a multiethnic maritime context have received growing attentions among researchers.

Horck (2004) developed a lab experiment to investigate the decision making process on board vessels, using a sample of maritime students from Malmo University. The objectives of the research include examining the role of senior officer in the process of decision making. Research findings demonstrated that the behavior of idea exchanging along with attitude towards participative leadership styles seems to differ by culture. Horck discussed communication problems existed among multiethnic crew members. Ineffective communications originated from cultural variances may endanger safety and efficiency on board. Therefore, a leader must be prepared with culture awareness in order to articulate missions and express intended objectives properly to subordinates.

In another paper, Horck (2005) also demonstrated the importance of communication in the management of shipboard crew, which is no surprise since a starting point of effective leadership is to 'mitigate communication so that people can freely speak to each other.' Horck pointed out that ineffective leadership styles maybe one of the reasons why multiethnic crew has become a challenge. On the other hand, the practice of democratic leadership style may not be the resolution as people expected. Given the relatively hierarchical working environment on board, structured and clear orders from supervisors may be more welcome among seafarers.

Knudsen (2004) explored leader - follower relationships in a multiethnic crew setting, namely Danish officer and Filipino ratings. The research voyage observed certain cultural barriers on board such as different perceptions of hierarchy and social relations, which in turn affected crew members' commitment and attitude towards job assignment. For example, interviews with Filipinos suggested their tendency to overplay the shipboard hierarchy, which subsequently leads to one way communication and retention of separation between two nationalities. Research findings also include the pragmatic attitude held by both Danish officers and Filipino ratings. In other words, although they prefer to work with people from their home countries, multiethnic crews seems to be 'that one has to fit in and accept things as they are.' It can be deducted from the results that officers feel reluctant to invest efforts to motivate shipboard crews. Management by expectation is the common practice in multiethnic maritime context.

Survey (Theotokas & Progoulaki, 2007) conducted among Greek seafarers found that crew performance are more likely to be effective if crew members work under a flexible leadership and management style. From the perspective of leadership and communication system, conclusions

deducted from survey data included extreme leadership styles may have negative impact on desired outcomes, and communication problems between crew members and third parties may be partially eliminated through democratic leadership.
Multicultural crewing patterns and current practice of leadership on board give room to the development of transformational leadership theories in maritime context.

4.2 Situational moderators

Emerging evidences suggest that situational factors such as organizational climate and external environment play a crucial role in the delivery of transformational leadership (Bass, 1990; Yukl, 2010; Wang & Rode, 2010). Much has been written about how the task design and followers' demographic statistics moderate the effectiveness of transformational leadership. Organization's legitimate principles, normative values and social structures can determine leadership in an organization. Leading on board is nothing like common practice of leadership in business organizations ashore. A vessel is mobile, with frequent turnover of personnel and emergency like work conditions. Therefore, situational factors must be taken into consideration while examining the applicability of transformational leadership in maritime context.

Team cohesiveness

Team cohesiveness is vital to team performance. Zander (1979) stated that team cohesiveness is one of the essential concepts for understanding group dynamics. It has been defined in a variety of ways, such as the degree to which team members are motivated to remain in the team (Shaw, 1976), the average member's attraction to the group (Bass, 1960), the resultant of all forces acting on all the members to remain in the group (Cartwright, 1968). Additionally, Mudrack (1989) identified team cohesiveness with other concepts such as team spirit, interpersonal attraction, and sense of belongingness. Team cohesiveness can be considered as a causal mechanism that determines individuals' attitude and behavior towards membership. Therefore, highly cohesive team members are more concerned with their membership, and subsequently are more strongly motivated to contribute to the team's welfare, to coordinate during team tasks, to achieve team objectives, and to be involved in team activities (Cartwright, 1968).
Team cohesiveness of shipboard crew is always considered relatively low. Recruitment and retention of seafarers has become a serious problem for ship owners worldwide. Dropout and turnover rate of registered officers is increasing. Despite the continuing expansion of world fleet volume, there is a modest shortage of officers worldwide and the shortfall is expected to be more severe in the future (BIMCO/ISF Manpower Update, 2005). Gekara (2009) pointed out that the growth rate of junior officers graduated from UK MET has almost remained the same over the past few years. The willingness of choosing seafarer as a lifetime profession among young people has significantly declined. On the other hand, as previously discussed, within the remaining seafarer labor market, multicultural manning is prevailing in the industry. Researchers (Kahveci & Sampson, 2001; Knudsen, 2004) suggested that this multiethnic composition of shipboard crew leads to a segregated social environment on the vessel. Østreng (2000) found that despite the fact that sailors stay together in the same social setting for a long period of time, intergroup contact and elimination of stereotype rarely take place. Another problem brought by mixed crew composition is the unequal social status of the crew members. In Knudsen's (2004) report, the superiority of OECD countries in the economy may be one explanation of the ethnic hierarchy on board. Meantime, ethnic identities are reflected upon task distributions. In other words, Danish seafarers relatively rank higher than their Filipino colleagues. Status inequality has given rise to intergroup hostility and conflicts among crew members.
Empirical evidences demonstrated that transformational leadership can be instrumental in organizations and help to mitigate the tension in teams by enhancing team cohesiveness (Carless, 1998). Transformational leaders articulate goals of the team and vision of the organization that is congruent with values of crew members. Establishment and communication of a shared vision, which is of mutual interest for individuals in the team, can motivate crews' desire to make extra efforts and achieve team success. The ability of transformational leader to recognize individual differences in followers' needs and desires can create loyalty and cooperativeness. A considerate leader, who always attend to followers' needs for development and growth, will more likely to be accepted by followers. Therefore, despite the existence of ethnic identification distinctions among shipboard crews, a shared

organizational identity can be created on board. Instead of alienating themselves from their subordinates, officers on board can be perceived as in-group members by ratings. In-group perception of followers also facilitate leadership acceptance, which subsequently enhance followers' commitment to the team. Therefore, in-group favoring of followers contributes to the promotion of team cohesiveness.

Job assignment

The characteristic of navigation and cargo handling determine the high level of task interdependence on the vessel. Each deck officer is assigned with at least one rating. They perform routines such as watch keeping, mooring, and anchoring together as a team. Meantime, almost all the operations of ship are carried out under a cooperative structure between deck department and engine department. High degree of interdependence requirement of tasks demand leaders on board not only to pay more attention to judgment and development of individual performance in the whole process, but also on the planning and preparation of task schedules, satisfactory mutual adjustment among team members, and relationships and cooperation (Keidel, 1984). Lord and Rowzee's (1979) lab experiment demonstrated that participative and directive leadership behaviors such as facilitating the orientation, developing working plans, and advocating coordination emerged in certain conditions when job assignments are interdependent on each other. Schaubroeck et al. (2007) suggested that transformational leaders promote cooperation among team members. Combined concern about task as well as relations of transformational leaders will stimulate a conviction among team members that any objections that arise within the team will be settled without damage team performance. Schaubroeck et al. (2007, p.1021) explained that this conviction will reinforce 'team members' confidence in their ability to complete their work successfully without being derailed by destructive intra team conflict'.

Another feature of tasks on board is the routineness. Job assignment on the vessel consists of uniform, recurring and repetitive tasks. Therefore, communication between officers and ratings tend to become task oriented, one way exchange. Individualized considerations enhance followers' commitment to orders by providing them a sense of fulfillment of career needs and increased competence to complete orders (Bass, 1998, p.22). As previously described, transformational leadership reinforce followers' mental identification with leaders. If a rating identifies himself with officer's vision, value, and interest, there is a less chance of this rating to lose his ego and self esteem while taking orders and commands. On the contrary, Bass (1998) suggested that self esteem is more likely to be strengthened with a shared organizational identification.

Shipping technology

Shipping industries continue to adopt new systems as advanced technology solutions become available. The past few decades have witnessed the deployment of automation on the vessel. On one hand, new technology altered the flow of organization information system and brought changes in organizational arrangement; on the other hand, as Bainbridge (1983) pointed out, the introduction of automation encountered negative operator attitudes such as mistrust, resentment, and resistance to change. Moreover, a wide range adoption of automation reduced the size of shipboard crew. Labor intensive and repetitive tasks are replaced by automotive systems. As described in the book of Human Factors in the Maritime Domain (2008, p. 116),

> *For example, deck officers are now expected to spend long periods on the bridge alone or with just a helm, with little to do other than monitor an increasing number of automated systems both on the bridge and some in the engine room, resulting in the removal of the human operator from the control loop of a particular system. Deck officers must be aware of the various functions of the different modes of the ARPA (Automated Radar Plotting Aid) display and how each mode is set up to navigate the ship safely, as well as keep track of which mode is active. In these conditions, the safety of the ship and its crew depends on the ability of the deck officer to maintain appropriate levels of alertness and vigilance. This can be very difficult, considering that the supervisory control task is specifically ill-suited to the cognitive capabilities of humans.*

Shipboard crews' task structure has been drastically influenced by the smaller crew size and increased automation systems. New technology brings challenges for crew members' learning orientation as well as leadership responsibilities. Leaders on board are required with a number of new functions, including monitoring learning process and implementing industrial standards for technology application (Potter, 2003). Yurov and Potter (2006) discussed the interaction between transformational leadership and followers' learning orientation, and came up with the conclusion that transformational leaders' behaviors can affect subordinate's intention to enhance the mastery of knowledge. Yurov and Potter argued that employees would be more motivated to learn and accept new deployment of technology when leaders attend to individual concerns about operation changes, and stimulate followers' commitment for proposing technology enhancements.

Work related stress

Many studies have been conducted concerning work related stress at sea. Jezewska et al. (2006) identified three factors which are strongly connected with work related stress on board vessel, namely work environment, psychological factors, and job responsibility. Long working hours and irregular hours of working time, constrained and isolated environment, and potential exposure to hazardous physical conditions on the vessel add to stress and anxiety of seafarers. Home sickness and long separation from home, lack of intimate social communication, and absence of stimulation and prospect for future development can be considered as psychological factors, which not only endanger seafarers' health, but also compromise task performance. Seafarers bear huge responsibility for cargo, ship operation, and most importantly safety at sea. Such work liability may impose pressure and add to mental stress.

Transformational leader may provide social support and solicitude through recognizing and accepting crew members' frustration and need for social identification, converting individual crisis into development opportunities, and migrating followers' attention from individual safety to self achievement and fulfillment (Bass, 1990). Such a leader can stimulate subordinates' contribution to creative solutions to stressful situation. Transformational leader can also inspire subordinates to look beyond self interest, transcend immediate predicament, raise awareness of the lager organizational picture and search for adaptive methods.

Physical and social distance

Leader- follower distance and its linkage to leadership outcomes has been studied implicitly as well as explicitly by a variety of theorists. Antonakis and Atwater (2002) proposed an integrated multi level model of leader distance based on review of available literature. They categorized leader distance into three dimensions (i.e. perceived social or psychological distance, physical distance, and perceived frequency of leader- follower interaction). Social distance can be referred to the perceived differences in status, privileges, ranking and power. Yagil (1998) noted that social proximity can be considered as being beneficial for leader- follower relationship. Physical distance can be referred to respective physical locations of individuals or seating arrangement. Researches argued that distance between leader and follower may act as a neutralizer, impose negative effects on the quality of leadership outcome, and subsequently reduce leader' influence (Kerr & Jermier, 1978; Bass, 1990).

Visible physical positions of shipboard crew are highly structured due to characteristics' of task design. Deck officers usually stay on the bridge, while the activity sphere for ratings is practically limited on the deck or down the engine room. Physically higher location of the bridge, to some extent, unintentionally amplifies the social status differences between officers and ratings. Different arrangement in cabins and mess room also reflect social status differences on board. Cabins are furnished and located according to ranking of the crew. Equally, crew members usually have their regular position in the mess room. In the case of multiethnic crews, people with the same nationality dine together. Additionally, people address captain and other senior officers by their title. Some researchers argue that distance can ensure legitimacy of captain on board and proper social order is necessary to operate a vessel. However, as discussed before, the cost of leader distance can also be high. Maintaining distance may lead to a series of negative outcomes such as defensive attitude by crew members. Fostering effective communication may be one possible approach to mitigate the negative effects caused by distance. By delivering considerate, individual tailored conversation, leaders can increase the proximity of distance and open a channel for interactions.

4.3 Training and education

There have been some literatures supporting the effectiveness of leadership training. Barling et al. (1996) demonstrated in a field experiment that bank managers assigned in experimental group for transformational leadership training resulted in higher branch level financial performance than those in control group. Evidence shows that the ability to identify effective behaviors, which are beneficial for achieving organizational goals, can be systematically learnt through appropriate training and education. Avolio and Gibbons (1988) argued that behavior skill training alone is not sufficient for transformational leadership training. More attention should be put on leadership education and development. Bass (1990) discussed possible methods for leadership coaching, including lectures and discussion, role playing, simulation, behavioral modeling and sensitivity training.
In recent years, leadership training and education for competent seafarers started to become of interest to maritime stakeholders. For example, in Denmark, the Danish Maritime Authority issues regulations and orders on crew certification and quality management pertaining crew resource management and communication skills in compliance with STCW95. MET institutions for deck and engine officers in Denmark have incorporated leadership courses into the training program. Ship owners also bear the responsibility for promoting continuous career training and development program for seafarers. Some intensive bridge tem management courses as well as people skill training programs have been introduced in training centres financed by ship owners. Training agencies in Denmark provide consultancy and leadership coaching for officers in cooperation with industry associations. However, the efforts made to promote leadership effectiveness at sea in response to the changing labour market are not rigorous. Instead of stepping up and playing as the salient role in the delivery of leadership knowledge and skills, MET institutions act only as facilitators. Courses design and structures in MET institutions, which are highly affected by training policies of ship owners, only meet the entry requirement of certification regulations. Comprehensive leadership training methods and concepts are needed to be introduced into MET.

5. Conclusions

On the basis of existing literature review, this paper concluded that there are potential for exploring transformational leadership on board vessel. Through identification of situational moderators of effective crew performance, this paper argued that transformational leadership may be instrumental for promoting team cohesion, providing social support for crew members, eliciting extra effort in goal achievement, and subsequently improving the occupational health and safety and quality of life on board vessel.
The discussion of transformational leadership in maritime context enables further studies in relation to leadership issues on board. There is need for empirical investigation of the relationship between transformational leadership and desirable outcome at sea. Furthermore, the moderating effect of situational factors along with mediating effect of contingent variables should also be looked into during empirical investigation. In addition to examination of current situation of leadership education and training establishment in maritime sector, a thorough literature review of teaching materials in use may be beneficial for better understanding and addressing maritime leadership training issues. In order to enhance quality of education and training, all principal stakeholders in MET should be encouraged to establish coordination mechanism and actively carry out leadership training.

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Generation of intercultural awareness system in a multinational crew on board of the training ship and this factor influence on interaction on board, safety, efficiency and leadership system generation

Elena. Kozlova,
Head of International Relations Department, Admiral Makarov State Maritime Academy,
E.Kozlova@gma.ru

Natalia Tsepkova,
Lecturer of English language Chair, Admiral Makarov State Maritime Academy
Natasha-tsp@yandex.ru

1. The State Maritime Academy collaborates with a number of European shipping companies in various fields, including issues to organize navigation practice for students of different educational institutions on board of MIR training ship.
2. The State Maritime Academy collaborates with maritime educational institutions worldwide.
3. For many educational institutions one of the problems is to provide their students with navigation practice, as not all the institutions possess their own vessels, and at operating vessels there is not enough space to meet all the demands in navigation practice.
4. Shipping companies pay great attention not only to competence and high qualification of their young professionals, but also to their intercultural awareness, as almost every crew being multinational, the awareness of culture and traditions of each nationality has a direct effect on such important characteristics as leadership system generation on board, ship and environmental safety, efficiency of ship operation.
5. "Intercultural awareness" project within collaboration of maritime educational institutions and shipping companies has been implemented in the State Maritime Academy since 2008.

Its participants

From the industrial side - STENA AB company (Sweden)
Boskalis company (Netherlands)

Educational institutions:

- Admiral Makarov State Maritime Academy
- Gdynia Maritime Academy (Poland)
- Glasgo College of Nautical Studies (UK)
- Tolani Maritime College (India)
- Mapua-PTC College of Maritime Education and Training (Philippines)

- University of Rijeka (Croatia)
- SONANGOL (Angola)
- Goteborg Maritime Collage (Sweden)

6. Within the project the participating parties have developed materials of practical importance for crew members awareness of cultural characteristics and traditions of main nationalities working at STENA ships which can be also used as teaching aid in maritime educational institutions.
7. The way others estimate our culture – materials have been collected to demonstrate how representatives of different nations estimate typical characteristics and national peculiarities of other cultures and nations. Herewith the participants have mentioned both positive and negative characteristics of cultures (nations).

The results are given in Table 1.

How others see our Cultures			
Croatian Culture	**UK Culture**	**Swedish Culture**	**Indian Culture**
Easy-going Friendly (4) Straight Forward Relaxed Skilled Open Opinionated Like good wine Like good food Proud Not punctual Meticulous Professional Masculine/patriotic Good practical skills Humble Respectful Delicate/sensitive Well educated Hard working	Conservative (2) Imperialistic Hierarchical Talkative Impartial (2) Systematic Punctual Snobbish (2) Practical Respectful Honest Friendly Beer Drinkers Rock music Confident (2) Managers Diplomatic Caring Clever Neutral Pragmatic Open minded	Egalitarian Calm/Cool/Cold Reserved (2) Friendly Assertive Hard Working Multi-lingual Forthright First name basis Efficient Sincere Blond hair Traditional (2) Dedicated Polite Positive attitude Punctual Appreciative Understanding Motivator	Very religious (3) Structured Peaceful Diffident Traditional Friendly Family-orientated (3) More British than Brits Humble Negotiators Not timely Savers Reserved Adaptable Hierarchical Curry culture (2) Polite (2) Romantic Software Creative Confident Well-educated Assertive Co-operative
Angolan Culture	**Polish Culture**	**Philippines Culture**	**Russian Culture**
Easy-going Friendly (2) Polite Hard-working Religious Dancing/music Business/traders Adaptable English difficulties Sincere	Withdrawn No emotion Hard Working (3) Insular Determined Polite Easy-going Proud Reliable (2) Friendly (3)	Family (3) Good sea-farers Sensible Polite (2) Diffident Religious (3) Hard-working (4) Good singers Good humour Yes-Can Do Culture	Sombre (2) Tough (2) Serious Dutiful Efficient Friendly (3) Strict Practical Disciplined Inflexible

Open to learn Unknown (2) Shy Determined Skilled	Sympathetic Flexible with rules and regs Open minded Very religious (2) Sincere	Disciplined (2) Fun Loving (2) Honest Humble Rice Eaters Long stayers Closely connected Peaceful Co-operative	Inviting/Warm Well Educated Not punctual Rough and ready Good trouble shooters Patriotic Confident Determined Easy going Entertainer Artistic Culture Strong Don't share problems

8. Within this project presentations have been developed on main cultural characteristics and peculiarities of nations working at sea containing information on the way different nations representatives see themselves. For example, one can have a look at the Philippines presentation. In particular, it can be seen that the main values of the Philippines culture are religious and family ones. The positive points of a Filipino are delicacy, responsibility, adherence to established rules. The negative points are being not precise about time and unable to say "NO" when necessary.
9. Similar materials have been prepared for every nationality/culture mentioned above. Considering this data captains and ship officers would much easier adjust ship interaction system and organize efficient ship operation using strong national characteristics of each crew member and neutralizing or smoothing weak points.

   It is especially interesting to compare the results of the first investigation "The Way Others Estimate Us" with the ones of the second investigation "The Way We Estimate Ourselves". Such analysis proves that objective (external) and subjective (internal) estimates are not always the same.
10. Within the project for 2 years the MIR training ship of Admiral Makarov State Maritime Academy has been used as a place for practical investigation of a multinational crew atmosphere by the example of the multinational students team.
11. Location and period of navigation – April-October, the Baltic sea, The North sea, the Mediterranean sea

    Crew: 42 people

    Students: 144 people
12. Ship functions:
    – the location for the first navigation practice of students where the first test of their professional characteristics, solidarity, team work skills takes place.
    – MIR sailboat is a regular participant and winner of international regattas.
    – MIR is a frequent and welcome guest in European ports, a participant and honored representative of the Russian Federation at naval and cultural festivals, cities' days.
13. With assistance of Stena and Boskalis amicable companies and a few educational institutions of Europe and the USA the atmosphere of "multinational crew" has been created on board of MIR training ship (45 people of 26 nationalities, boys, girls).

14. All the students came on board in order to take part in the "Historical Seas International Regatta" that took part in the Mediterranean sea with a route Volos (Greece) – Varna (Bulgaria) – Istanbul (Turkey) – Lavrion (Greece).
15. The fact of uniting young future officers of so many nationalities in regatta extreme conditions was a certain risk, challenge, as success in regatta depends on crew integration, mutual understanding and support of all the crew members. We wanted to estimate how fast and easy mutual adaptation would happen, the role of each member and general team objectives would be understood, how closely-connected, smooth and effective would representatives of such different cultures work hand-in-hand. The result of such estimate was winning the regatta which proves.
16. Besides this purely practical test the project participants planned and implemented a few social and psychological tests evaluating adaptation rate from a more scientific point of view.
17. Such investigation of a multinational students team has been held for the first time. This is the first experience of such kind of researches, and we can present the first results.

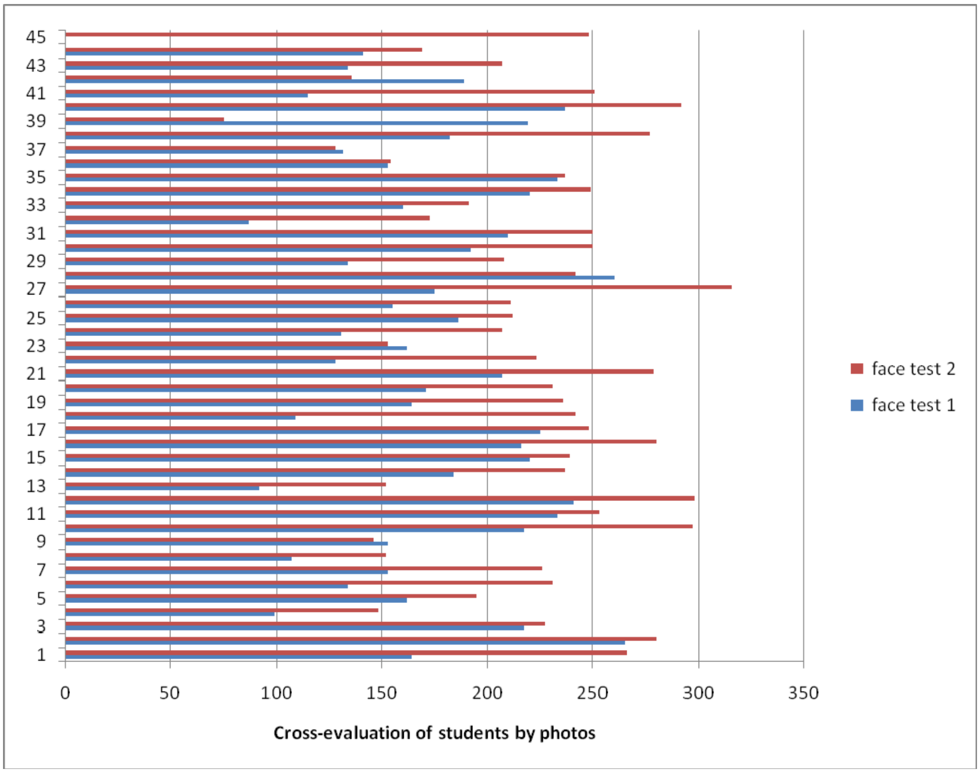
    The first test held on board was made in two steps – in the beginning and at the end of the students' staying on board. It may be called a Face test or Acquaintance.

    The matter of the test was as follows: each student out of 45 those present on board was shown pictures of all other students one by one and he/she was to estimate them with the following scale:

    – acquaintance and communication rate with each student
    – sociability(asociability) , positive (negative) attitude of each student using + or – indexes.

    The test was performed individually and anonymously.

    The results analysis shows that during a month the level of psychological compatibility increases (sociability estimates are higher and there are more estimates with + index).
18. The vertical axis of the chart depicts identification number of a student in the multinational team of 45 people. The horizontal axis depicts sum of each student's grades given to all students (45 people, including himself. If one estimated everyone as +10, it would give maximum result of 450 scores – ideal team. It is the ideal team for the student and he sees himself in this team from +10 to -10. In principle, this value represents personal psychological picture of the crew from the point of view of each of 45 students. The beginning of the practice is marked with blue and the end – with red. As we can see, most of the students treated each other better at the end of practice. In general, the team members became friends (except 28, 39, 42) and can form a more reliable crew. If there were more time, the situation could also change to the worse – it should be investigated further and deeper.

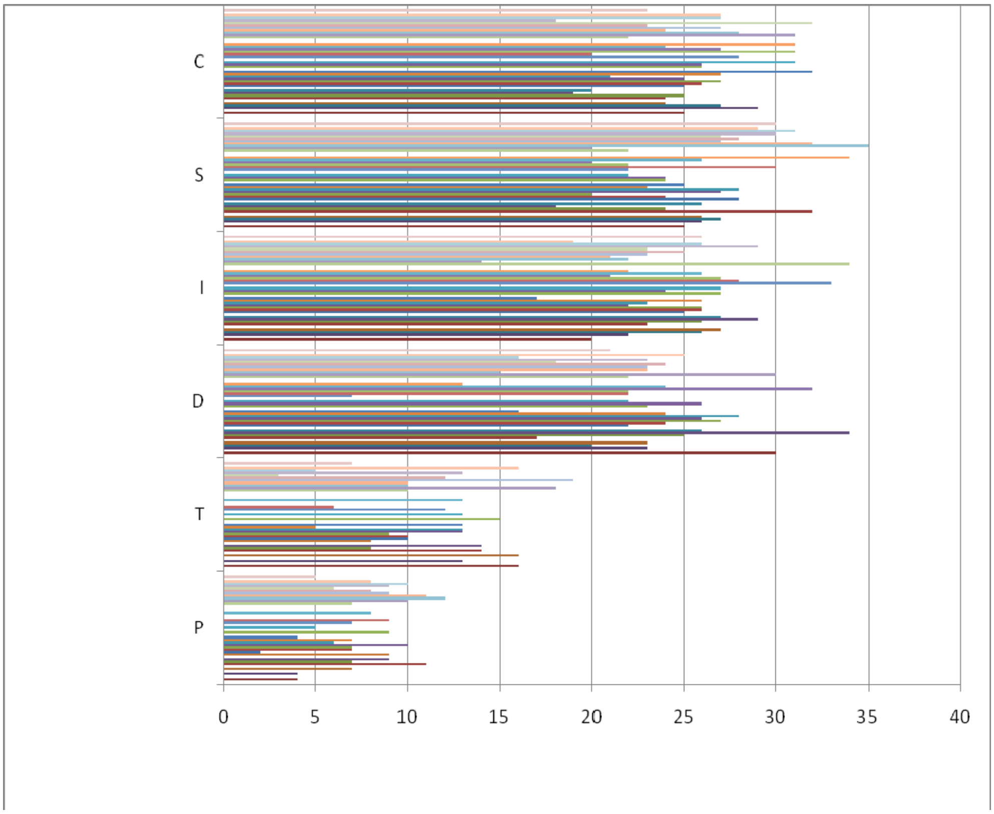


19. In this test each of 45 students of the multinational team assessed his leadership skills within a 40-score scale (horizontal scale). On the vertical scale the following behavior styles are depicted as per the questionnaire: D = dominance style, I = influencing style, S = steadiness style, and C = cautious style), as well as P and T self-ratings, where P:Concern for People dimension – shows self-appraisal of each student in terms of social leadership characteristics at a 20-score scale.

    T: Concern for Task dimension - shows self-appraisal of each student in terms of task resolving leadership characteristics at a 20-score scale.

    At this initial stage of the research, without identifying people, we can say that based on behavior styles (D,I,S,C) some students assess their leadership skills to be as high as 30-35 scores. There are quite few low self-ratings, in principle this proves that the majority have positive characteristics of the naval officer. Main tendency – estimates growth from R to S

    At the next stage of the research it is planned to personalize the results and show the dynamics of the Face test and Test 2.



20. At the moment all the materials of the Project are being summarized, and a reference booklet will be edited on differences between cultures and traditions for educational institutions and shipping companies that participated in the project.

The Project will continue in the next season, and we invite all those willing to take part in it.

East Meets West: Cultural Factors of the Exchange Program between Massachusetts Maritime Academy and Shanghai Maritime University

Qi Chen

Professor, Massachusetts Maritime Academy, qchen@maritime.edu

Abstract For two years, Massachusetts Maritime Academy of US (MMA) and Shanghai Maritime University of China (SMU) have been engaging in a student exchange program. The program, conducted in two countries which differ greatly in culture, history, economic systems, social values and government structures, imposes huge challenges on the participants, who must successfully adapt to new environments. While the program has been greatly applauded by both institutions, the only known instances of conflicts fall primarily into the category of cultural misunderstandings between the East and the West. This paper presents an empirical analysis of how the cultural factors affect the exchange program. Applying a case study methodology and drawing on the data collected from the participating exchange students over the course of two years, this paper examines the relationships between the performances of the exchange students at the host institutions and their cultural preparation. The findings indicate that the more culturally prepared such students are, the more successfully they will perform at the host institutions and the more easily they will adapt to the new environment. The results are preliminary due to the limitations of data. With the on-going development of the MMA-SMU exchange program and consequent availability of additional data, more rigorous statistical models could be applied to the research, generating more significant conclusions. To do so would unquestionably help further enhance the MMA-SMU exchange program.

Keyword: *international cooperation, cross-culture, maritime education, the East, the West.*

1. Introduction

Over the course of last twenty years, the world has become increasingly more interrelated. To prepare maritime students to be more competitive in this rapidly globalizing world, more and more maritime universities are engaged in various exchange programs in hope to broaden international views of their cadets, enhance their capability of conducting cross-cultural business and be successful in the more interdependent world. For two years, Massachusetts Maritime Academy of US (MMA) and Shanghai Maritime University of China (SMU) have been conducting a student exchange program. Each year, about 10 students are selected from each institution and sent to the other campus to study for one semester. In the strict sense, it is an exchange of Maritime Education and Training (MET) between two similar institutions in which participating students pay tuition, room and board to their home school though they study at the host institution. The program, involved two countries which differ greatly in culture, history, economic systems, social values and government structures, imposes huge challenges on the participants, who must successfully adapt to new environments.

While the program has been greatly applauded by students, faculties and administrators of both institutions, the only known instances of conflicts fall primarily into the category of cultural misunderstandings between the East and the West. It becomes essential for the MMA-SMU program to recognize cultural differences of the two countries, set up the framework of the program which minimizes the cultural shock that participating exchange students might encounter and acclimatizes the students to their new environment.

In this paper, I present an empirical analysis of how the cultural factors affect the MMA-SMU exchange program, focusing on the Chinese students selected from SMU to study at MMA only due to data restrictions. I would like to show, with data presentation and case studies, how the different value systems of the East and the West could lead to different perceptions, ideology and behavior of the participating exchange students. I also argue that cultural education from both host and home institutions would be highly recommended.

The paper is structured as follows: Section II briefly describes the MMA exchange program and its special design aiming at minimizing the potential culture shock that Chinese exchange students may encounter. In section III, an event study is presented to illustrate how the cultural conflicts might affect the performance of the Chinese students. Section IV summarizes conclusions.

2. An Exchange Program Designed to Mitigate Culture Shock

Born and raised in China, the participating exchange students from SMU are deep-rooted in Chinese culture, which dominates their mental perceptions, psychological normality, social values and personal behavior. The gist of traditional Chinese culture is Confucianism, with the key philosophical concepts: human-heartedness (ren), propriety (li), filiality (xiao) and rightness (yi). The doctrine of Golden Mean, derived from Confucianism, requires people to live by the felicitous middle between the extremes of excess (too much) and deficiency (too little). What lies the proper distance between these extremes is believed leading to a personal embodiment of virtue and resulting in a well-ordered society. Hugely influenced by the Chinese *value system* which is defined to be what is expected and hoped for in a society, the participating Chinese exchange students demonstrate characteristics of collective-oriented, hierarchical and high-uncertainty- avoidant society, such as pursuing the success and well-being of the larger group (family, term or company) rather than individual benefit, interdependence rather than independence, valuing long-term social relationship rather than short-term accomplishments, modesty rather than insolence, diligence rather than indolence, respect for authority, elderly and superior, discouragement of conflicts, greater fear of failure and risk taking.

On the other hand, the western culture is centered upon the principles of freedom, liberty and equality. It emphasizes the worth and dignity of individual activities and personal success, encourage risk-taking behavior and change, value autonomy and independence, fewer social obligations, confrontation being acceptable, delegation of authority and minimum deference for superiors. Therefore, it is well expected that the Chinese exchange students, coming from such a different cultural background and being blended into the new environment in a swift period of time, would unavoidably experience a “culture shock” when collectivism, familism and hierarchy of the East meet with individualism, rationality and secularism of the West.

The term culture shock was first introduced by anthropologist and economist Kalervo Oberg (1960) as a "disease" suffered by individuals living in a new cultural environment. According to Oberg, culture shock resulted from the loss of well-known cultural signs and symbols, causing individuals to experience anxiety, frustration, and helplessness. To have realized the stress and difficulties cultural differences might impose on the participating Chinese students, the MMA-SMU program is designed in such a way as to make the cultural shock to the minimum.

First of all, MMA-SMU program is a bilateral exchange program, different from other student exchange programs currently in practice among maritime universities. Each spring term, 10 students will be selected from one institution and sent to the other. Therefore, both MMA and SMU are the host as well as the home institutions. To some extent, there is a kind of “hostage effect” to both schools, as each side is fully aware of the fact that how the exchange students are treated will be pretty much how their own students will be treated on the other side.

In addition, MMA adopts a series of measures helping SMU exchange students effectively cope with the new environment.

Assignments of roommates: SMU exchange students are teamed up with American cadets for the dormitory assignment, that is, one American cadet is assigned to be the roommate of one Chinese visiting cadet. To be a roommate of Chinese student, MMA cadets have to go over a selection process and meet the following criteria:

- min. 3.0 GPA at MMA;
- to be currently enrolled in Chinese classes with an intention of either going over to SMU as an exchange student the following Spring term, or simply being interested in China.
- to participate willingly the activities associated with the MMA-SMU program, like taking the trip to New York and offering necessary help to the Chinese students.

It turns out that the American roommates become the primary cultural mentors during the entire stay of the SMU students in US. They give Chinese students constant advices on the lists of "please do" and "please do not", bring them home for weekends and birthday parties, show them nearby attractions to let them experience the American way of life. On top of being such wonderful cultural guidance, American roommates are great sources of assistance for the course work of the Chinese students, since MMA pairs purposely the roommates with the same majors of studies, and possibly similar hobbies and personalities. They also help Chinese exchange students see quickly the unique features of MMA instructional method and class organization. At MMA, it is strongly encouraged to have interactions between teachers and students and free expression of student opinions in the classrooms. This is quite contrary to what Chinese students used to have back home: Chinese classroom is more likely to be the teachers' solo show and students, to a huge extent, take in the teachers' lectures passively.

Freedom of course selection: the MMA-SMU program is conducted in two majors at this point: Marine Transportation and International Maritime Business. The participating Chinese students come to MMA the second semester of their junior year. They are encouraged to pick the courses designed for the term, but by no means restricted to those courses. Normally, SMU students select two kinds of classes: the courses complementary to what they have taken before, like Advanced Seamanship, Stability & Trim and Vessel Chartering & Brokerage, and the courses which enhance their understandings of the society, like American Government, American History and Western Civilization. After SMU students overcome the initial difficulties, for instance, English terminology and course organization, they excel in the class performances. Academic achievement and hardworking spirit of the SMU students win the respect of MMA faculty and classmates. Consequently, they feel more at ease and accepted. Just like one student put it: "once I am doing fine in the classroom, I am so much more confident and happy here."

When establishing the selection criteria for participating Chinese students by SMU, in addition to high academic achievements, factors that may help minimize the potential culture shock are given some special consideration as well. These factors include: being fluent in oral and written English, having some previous exposure to other cultures and bright and vivacious personality.

The Chinese exchange students all passed the Level 6 English Tests, which is considered the highest level of all the college English tests in China. The English proficiency greatly enables the Chinese students to be blended in positively and smoothly with MMA cadets and to perform to their potential in the classroom.

Most of the Chinese exchange students have previous experience of interaction with other cultures through variety of channels, such as international travel, international school, and participating foreign student activities in China.

Students who passed the academic requirement were interviewed and assessed, among other things, for their personality merits, by a special selection panel consisted of school administrators, faculties and student counselors.

Another measure designed to soften the culture shock is that, SMU students are required to come as a group and participate activities as a group. A group leader was appointed by SMU administration prior to students' departure to MMA. This measure provides the students with much cushion to minimize the cultural discomfort if they do experience any.

Characteristics	Year 1	Year2
Gender	30% female 70% male	20% female 80% male
Major	50% marine transportation	50% marine transportation
	50% int'l maritime business	50% int'l maritime business
GPA (at SMU)	IB: 3.29	IB: 3.41
	MT: n/a	MT: n/a
GPA (a term at MMA)	IB: 3.87	IB: 3.79
	MT: 2.92	MT: 3.62
English Proficiency	Level 6 100%	Level 6 100%
Previous int'l travel	10%	10%
Attending int'l school	10%	10%
Exposure to other cultures	70%	80%
Areas to grow up	metropolitan: 0 %	metropolitan: 30%
	City: 50%	city: 50%
	Town: 50%	town: 20%

Table 1. Profile of students and cultural preparations

3. Case study: the conflicts between MMA and SMU students

In this section, we will examine three recorded instances which show the cultural misunderstanding between Chinese and American students and consequently the conflicts which lead to either less desirable academic performance, frustration and anxiety of the Chinese students, and even concerns and worries of American faculty.

3.1 different attitude towards cost-sharing of gasoline.

As the Chinese students only stay at MMA for one semester, they depend on their MMA roommates or friends to drive them around locally. It so happened that one SMU student asked his American roommate to drive him to a mall about one hour away from MMA campus. The American roommate proposed that the Chinese cadet should share the gas price. The Chinese student believed it was an unfriendly and selfish gesture and called off the trip, which led to a "cold war" between the two for days (they simply did not talk to each other). When being asked the question why not share the gas price, the Chinese student presented two reasons: all the other American cadets did not ask their Chinese roommates to share gas price and the roommate was not friendly with him, and also selfish, by doing so.

Based on the event, a brief survey was conducted by the author in 4 classes which were composed of only American students. For the question "Would you ask your roommate/friends to share gas prices when you take them out in your car?" , great majority of the MMA students said that it would depend on the distance. If 5-10 minutes' drive, they would not ask for cost sharing, but they surely would, if it is a long distance. They believed that the cost-sharing was fair, as it was well over an hour's drive. Some other responses from MMA cadets were that they might not ask for a price share if they were truly getting along with their friends and if they were not demanded to provide the service very oftener. Though the American cadets had various ideas about the cost-sharing, they all agreed that to share gas price was a common practice in US and definitely not an act of unfriendliness or insulting.

The same question was presented to some Chinese exchange students and they said that, if asked directly, they would share the gas price, but would prefer to pay back the favor in a more indirect way, such as, to do him a favor later, or to give him some gifts from China. They thought that the act was not friendly and not preferable either.

This is a typical example of cultural conflicts when the east value system meets that of the west. The word "roommate" in English simply states a fact that the two people live in the same room, while in Chinese is called *shiyou*, which means Room Friends. So in most Chinese students' mind, their American roommates are also their first friends at MMA and the friendship between them would possibly last life time. In east culture, once they are friends, loyalty and long-term commitment should be the most valued properties to be hoped for, like an old Chinese proverb goes: " for friends, what I would not give up?" But it does not mean that Chinese would not pay the favors friends do for them, just in a different format, as an old Chinese proverb exhorts that friends should never talk about money. A more common practice of the similar situation in China would be taking turns or paying indirectly. That is, the Chinese student would pay the favor next time with things like taking the roommate to dinner, or even showing the American roommate around at his expenses when his roommate goes to China next year.

Furthermore, in Chinese culture, it is so much afraid of the direct confrontation between the two sides, because both do not like to be rejected and "lose face". That is the reason that Chinese barely give a No as an answer to questions, even if they know firmly in their heart they have to reject. Instead, they would use the word like "I will think about it", "I will get back to you later". So it is not surprising that when the Chinese student was directly asked to pay for the gas price right on his face, he would feel uneasy and unfriendly.

On the other hand, in an individual-oriented society like America, people act more directly and out of their own best interest. The American students would not hesitate to speak out their mind and prefer to deal with issues with a straightforward fashion. And they also believe that confrontation is acceptable.

This kind of cultural misunderstandings would certainly be lessened and eliminated when there is more cross-cultural communication and facilitation between the students of both maritime institutions and people of the two countries in general.

3.2 how to handle the situation when American roommate snores.

A Chinese student happened to have an American roommate who snored heavily. Then he slept in the couch at the student lounge for 3 weeks before he wrote an e-mail complaining to the company officer, and was assigned to a single room. The student also claimed that because of the instance, he could not concentrate on his class-work and failed to perform in the examinations. While the other 4 SMU students in the same class made A, A-, A- and B+, he got a C+ in an important class of the major.

Again a brief survey was conducted with both American and Chinese exchange students separately, with the question: what you would do if your roommate is snoring heavily? This time, American students couldn't offer a clear-cut answer right away and all agreed that was a tough situation. On the one hand, it was not the roommate's fault to snore. On the other hand, it could be a real distraction for the roommate. One student said that " I would walk straightly to him and wake him up. Before he snores again, I would fall into sleep". Many other MMA students said that they would ask for a new roommate immediately if the quality of their sleep has been seriously impacted.

Chinese students' response to the question would be that "I'll try to be tolerant first. If things would not be improving and the snoring really bothers me, I will buy a heavy duty ear plug. I will prefer not to take the matter to the company officer".

The case certainly illustrates the nature of Chinese culture. In the collective-oriented Chinese society, harmony is highly expected and the doctrine of Golden Means is still followed. Individuals would put the interest of larger group above their own, maintain strong obligations to the group members and value long term social relationship. So the Chinese student would not take such an extreme measure as to wake up his American roommate in the middle of night. That might be due to two considerations: the American roommate was a member of the exchange program. The Chinese cadet did not want to tip his roommate's private thing, like snoring, by reporting it to the company officer. Since direct confrontation is not quite acceptable in Eastern cultures, the only option for the Chinese student is to be tolerant. But when the whole thing reached the point that he could not bear any more, he then chose to sleep in the sofa with the anticipation to avoid the direct conflict.

3.3 perception of extra-curriculum activities.

During the stay of the SMU exchange students, MMA will organize some extra-curriculum activities like trips to New York City, Washington DC and other scenery places, and faculties taking students home for cookouts at their backyard on weekends and holidays. One SMU cadet saw the activities contradictory to his missions as an exchange student, because they would take away the time he could otherwise studying the course work. Both American faculty and students could hardly understand the mentality of the Chinese student and even worry that he was too reserved or even unhappy at the host school.

When asked privately, the Chinese student admitted that for him the most important of all was to get best possible grade for every course at MMA and be awarded the title of Student of Three Virtues after getting back to SMU. Chinese culture puts much emphasis on the empowerment of people with books, as a Confucius quotation goes: "The person who excels in study can follow an official career". For thousands of years in Chinese society, books have been the ladder which allows the people to climb up their social status. Though there is also the slogan like *traveling thousands of miles is equal to reading thousands of books,* most people still adheres to the doctrine: *the worth of other pursuits is small, the study of books excels them all.*

The reality of the Chinese society imposes challenge on the Chinese students as well. The harsh competition in the college graduate labor market and at the entrance examinations of graduate schools made the Chinese cadet realized that a high GPA from an American school and the fact that he was selected as an exchange student were quite essential for his future career.

American professors and students see the extra-curriculum activities as part of their learning process for Chinese students to understand American history, culture, economic structures and family values. They assume that the Chinese students are interested in American culture and society, people and the extra-curriculum activities are an excellent way for the Chinese to learn America.

From the abovementioned cases, we can see that all the events are the results of cultural misunderstanding of the East and the West. And the common feature of the Chinese cadets who did experience conflicts with their roommates or some other people is that they all come from relatively small cities where there are less exposures to the outside world, and they tend to have more reserved personalities like being quiet in spite of the fact that they are all very good at both oral and written English.

Though we use only 3 cases of the SMU students studying at MMA, the event study does yield some interesting findings, which indicate that the more culturally prepared students are, the more successfully they will perform at the host institutions, the more easily they will adapt to the new environment and the more satisfied they will be from their overseas experiences.

The paper further proposes that in its selection process, the home institutions weigh cultural preparations and adaptability on the same level as academic achievement, foreign language proficiency and related personal virtues. It also suggests that host institutions should be sensitive to the cultural differences exchange students might encounter and insist upon a school-wide cultural awareness so that the possibility of cultural conflicts may be minimized for those who choose to participate in the MMA-SMU exchange program.

5. Conclusion

Applying a case study methodology and drawing on the data collected from the participating exchange students over the course of two years, academic ranking, English proficiency, class performance measured by grades, recorded cultural conflicts, previous exposures to other cultures, and questionnaires designed to obtain program related information, this paper examines the relationships between the performances of the exchange students at the host institutions and their cultural preparation. The findings shows that the more culturally prepared the Chinese students are, the more successfully they would be blended into the new environment and they would perform academically at the host institution.

The results are preliminary due to the limitations of data. With the on-going development of the MMA-SMU exchange program and consequent availability of additional data, more rigorous statistical models could be applied to the research, generating more significant and, hopefully, more inspiring conclusions. To do so would unquestionably help further enhance the MMA-SMU exchange program and generate a model for other MET exchange programs in general.

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Simulation Across the Engineering Curriculum Getting the Most from Your Simulation Systems

Stephen J. Kreta
Professor and Dean
Thomas Mader
Professor and Chair
Robert Jackson
Maritime Vocational Instructor
California Maritime Academy

Abstract There is no question that Engineering simulation systems have had a tremendous impact on the Maritime Education and Training in Maritime Training Institutions across the world. The ability to use these systems to economically, efficiently and safely duplicate normal and casualty situations in steam and diesel propulsion simulated ships has been well documented in conferences such like those of the IAMU as well as other international forums more specifically dedicated to the use of such systems.
However, the reality still exists that these systems are not inexpensive, and once the decision has been made by a maritime training institution to purchase or build one, there are still operational and maintenance costs that must be incurred by the institution. This paper will not deal specifically with the design, purchase, installation, or maintenance of the simulator, nor will it try to make a cost justification for this major piece of equipment. It is assumed that these decisions have been made and most institutions are already operating such systems.
This paper and presentation will look for opportunities to use the simulators across the engineering curriculum once the decision has been made to purchase one. The authors will show several benefits from using the simulators in a wide array of engineering and technology courses. Benefits will range from more realistic approaches to otherwise difficult concepts in Thermodynamics and Fluid Mechanics, to de-mystifying the engineering and mathematical processes in the design of such systems, and the closer relationships between the theories involved in energy systems and the operations of those very same systems.
Keyword :

1. Introduction

Merchant and Naval vessels are much more complex than at any time in the history of shipping, and marine engineers must not only be well trained to operate these vessels safely and efficiently, but also educated to understand the complexity of such engineering systems. The Maritime Education and Training (MET) Institutions today are challenged to provide an extensive background in the concepts of Engineering theory and principles, while ensuring these concepts can easily be understood and applied directly to shipboard operational systems.

Maritime Engineering graduates are well known for their prowess in operational and hands-on understanding both shipboard and shore-side. But many of our graduates are either leaving the shipboard environment earlier than ever before or not entering it at all. These graduates go into fields of electrical, mechanical, instrumentation and controls, and industrial engineering and design, and often enter graduate and post-graduate work in these fields as well as pursuing professional engineering licensure. Our stakeholders and employers of these graduates are expecting an engineering graduate that excels not only in the practical aspects of engineering systems and operations, but also graduates who have the theoretical background of engineering principles and practice found in many of the world's best "engineering" programs. This may cause some confusion in our students (and our faculty) as they struggle to grasp both the theoretical and the practical aspects of our profession – along with all other components needed for an educated citizenry – and meet the Standards of Training Certification and Watch keeping (STCW) along with its associated sea-time requirements and certifications - all within a 4-year program.

One well established and effective way to ensure engineering students are prepared for the operation of shipboard and power plant operations is the use of Maritime Engineering Simulation. Systems like this run the gamut of costs and pedagogies ranging from PC Computer based training programs to full scale full mission simulators where students must enter simulated control rooms and associated engine rooms with actual valves and controls that are electronically tied into the simulation system. These systems have proven to be safe and effective systems for a wide range of training for the students from normal operations to start up and shut down of systems to a full load of possible casualties in which the students must address any fault with which the instructor chooses to test the student.

However, there is a significant cost in the design, purchase, installation, operation, maintenance and eventual upgrade and replacement of such systems. Additionally, once the decision has been made to acquire such a system, there are also associated costs with learning the capabilities of the system, and experimenting with this new pedagogy in an attempt to fit it into the curriculum. Often this process is further complicated by adjusting other specific training courses in order to more fully utilize the opportunities that the simulators offer the faculty.

Unfortunately, due to the operational costs and the specific objectives prepared for the use of simulation, the full capabilities of the simulation systems are rarely utilized. It is just not feasible to have all students run the simulators though all of its options and still have time to complete the entire curriculum. Once the system is up and running and the faculty have achieved a comfort level in the operation and use of the systems, there remain many opportunities for incorporating the simulator into a wide range of courses in the Engineering Curriculum. The examples on the following pages are in Heat Transfer, Thermodynamics, Refrigeration, and Instrumentation and Controls, and are intended to simply begin the conversation about these opportunities, and are not intended to exhaust the options.

2. Bring Theory to Practice

The authors believe that using the engineering simulators in this way can provide these benefits to MET Institutions and Maritime Universities:

- Better understanding and usage of the simulation systems themselves
- Allow engineering faculty not normally involved in shipboard engineering operations access to the simulators and perhaps a better understanding of the complexities of the operations as compared to principles and theories
- Allow students in engineering theory courses to perform experiments in a system that is “real” to them
- Allow faculty and students almost unlimited change points for lab experiments not possible with typical lab experimental equipment
- Allow faculty and students to calculate “textbook” problems then run similar problems in real or modeled time and compare outcomes from full system with calculated values
- Allow for increased utilization of simulations systems further increasing the benefits relative to the investment costs
- Allow students to perform experiments and see that there are real complications throughout the entire system if individual systems are adjusted or allowed to run out of control

- Allow the students to understand the theory and engineering design that must be incorporated into any engineering system and how such systems must be balanced for optimization and efficiency
- Use the simulators as labs for courses in which lab equipment is difficult to justify for either cost, space or safety reasons

3. Heat Transfer

A typical experiment in Heat Transfer is the use of a Heat Exchanger. This experiment looks at the use of the air heater in the turbo charger system of a diesel engine. Fig 1 shows the heat exchanger in its relationship to the entire turbocharger system.

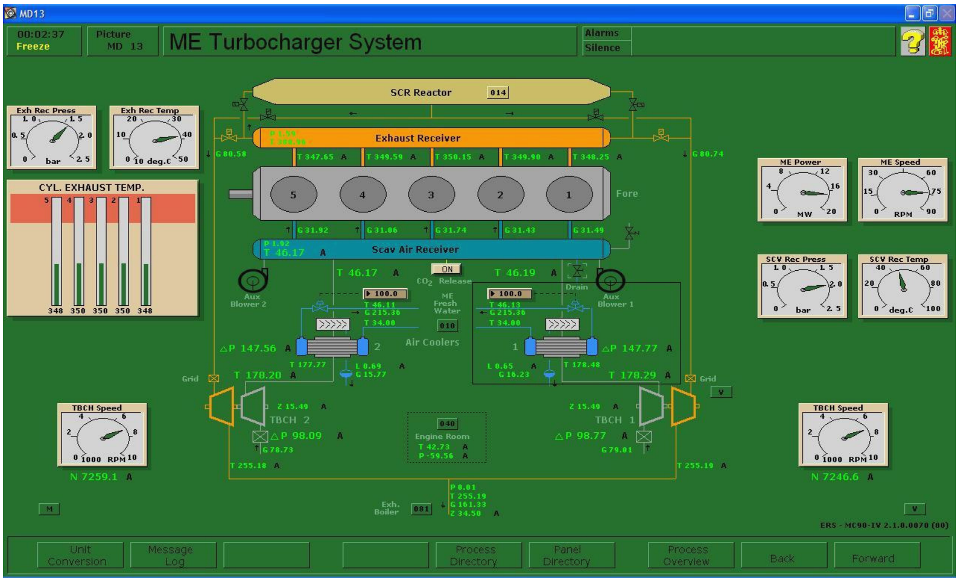

Fig. 1 – Air Cooler Heat Exchanger in Turbocharger system (1)

With this system the faculty can adjust the following parameters of the system:

- *Air flow rate*
- *Pressure drop across the system*
- *Air inlet temperatures*
- *Air outlet temperatures*
- *Cooling water flow rate*
- *Cooling water inlet temperature*
- *Cooling water outlet temperature*
- *Coefficient of heat transfer*

Using the various parameters and using the following formulas, Heat Transfer faculty can teach to the following objectives:

Formulas:

Q = m Cp (To-Ti)

Q = (HTC) A (LMTD) F
Q = Heat transfer rate
M = Mass flow rate
Cp = Specific heat of the fluid
To-Ti – Temperature change across the heat exchanger
HTC = Overall heat transfer coefficient
A = Area of heat exchanger
LMTD = Log mean temperature difference
F = Correction factor for heat exchanger type and condition

By varying the parameters above the following objectives or values can be obtained:

- Calculate the heat transfer rates across the heat exchanger (water and air)
- Calculate the efficiency of the heat exchanger
- Change heat exchanger efficiency and re-calculate heat transfer and flow rates
- Predict flow rate changes needed as load (air flow) increases on engine

4. Thermodynamics

Faculty teaching Thermodynamics can use a Steam Engineering Simulation System to teach the overall efficiency of a steam power plant.

The full-mission Steam Plant Simulator at Cal Maritime provides a robust capability for the operational training of marine engineers. Simulator displays provide all of the necessary property data and flow rates to undertake a variety of performance analyses. The following theory-to-practice exercises illustrate how the Simulator can be used to reinforce class room lessons in the thermodynamic principles of propulsion plant design.

- Boiler Efficiency can be evaluated using by comparing the net rate of energy transfer to the working substance during steam generation ($\dot{Q}_{\text{out}}$) to the rate at which thermal energy is released in combustion ($\dot{Q}_{\text{in}}$).

$$\eta_{\text{Boiler}} = \dot{Q}_{\text{out}} / \dot{Q}_{\text{in}}$$

$$\dot{Q}_{\text{out}} = \left(\sum \dot{m}_{\text{steam}} \times h_{\text{steam}}\right) - \left(\dot{m}_{\text{feed}} \times h_{\text{feed}}\right)$$

where the mass flow rates and enthalpies of feed, desuperheated steam and superheated steam are all displayed on the ***Port*** and ***Starboard Boiler*** schematics

$$\dot{Q}_{\text{in}} = \dot{m}_{\text{fuel}} \times LHV$$

where the mass flow rate of fuel to each burner is displayed on the ***Fuel to Burners*** schematic and the Lower Heating Value (LHV) of the selected fuel is displayed in the plant ***Parameters*** table

This analysis may be performed at different power levels to illustrate changes in Boiler Efficiency over the power range.

- Main Engine Efficiency can be evaluated by comparing high and low pressure turbine power outputs ($\dot{W}_{\text{out}}$) to the net rate of energy conversion in the 2-stage turbines ($\dot{Q}_{\text{in}}$).

$$\eta_{\text{Turbine}} = \dot{W}_{\text{out}} / \dot{Q}_{\text{in}}$$

$$\dot{W}_{\text{out}} = \dot{W}_{\text{first-stage}} + \dot{W}_{\text{second-stage}}$$

where the first and second stage turbine power outputs are displayed on the ***Main Turbines*** schematic

$$\dot{Q}_{\text{in}} = \dot{m}_{\text{in}}\left(h_{\text{in}} - h_{\text{ext}}\right) + \left(\dot{m}_{\text{in}} - \dot{m}_{\text{ext}}\right) \times \left(h_{\text{ext}} - h_{\text{out}}\right)$$

where the mass flow rates and enthalpies of steam at the turbine inlet, extraction point and outlet are all displayed on the ***Main Turbines*** schematic

- Steam Plant Efficiency can be evaluated by comparing SSTG and Main Engine power outputs ($\dot{W}_{\text{out}}$) to the rate at which thermal energy is released in combustion ($\dot{Q}_{\text{in}}$). This analysis assumes hotel electrical loads are negligible when compared to steam plant auxiliary demands.

$$\eta_{\text{Steam Plant}} = \dot{W}_{\text{out}} / \dot{Q}_{\text{in}}$$

$$\dot{W}_{\text{out}} = \dot{W}_{\text{propulsion}} + \dot{W}_{\text{generators}}$$

where propulsion power is displayed on the ***Main Bearings*** schematic and generator power is displayed on the ***Main Switchboard*** schematic

$$\dot{Q}_{\text{in}} = \dot{m}_{\text{fuel}} \times LHV$$

where the mass flow rate of fuel to each burner is displayed on the ***Fuel to Burners*** schematic and the Lower Heating Value (LHV) of the selected fuel is displayed in the plant ***Parameters*** table.

This analysis may be performed at different power levels to illustrate changes in Steam Plant Efficiency over the power range.

- Regenerative Heating Effects can be demonstrated by observing the position of auxiliary steam regulators at full sea speed with and without extraction. First attain steady-state operation at full sea speed without extraction and record the regulator positions. Then initiate extraction, allow the plant to stabilize, and record the regulator positions again. Following the demonstration, discuss how the reduction in steam flow through the regulators represents fuel savings in the boiler.

- Boiler Shrink and Swell in response with maneuvering pressure transients can be demonstrated. Following the demonstration, discuss the cause of these variations in water mass specific volume, and the rationale for two-element (level and steam flow) feed controllers.

5. Refrigeration and Air Conditioning

One of the most important parameters when looking at the overall efficiencies of any refrigeration or air conditioning system is the relationships between the high side and low side temperatures and pressures as compared to the work performed by the compressor. The theoretical efficiency – or Coefficient of Performance (COP) - of a refrigeration system is shown by the following equation:

COP = Heat Transfer in Evaporator/Work of Compressor

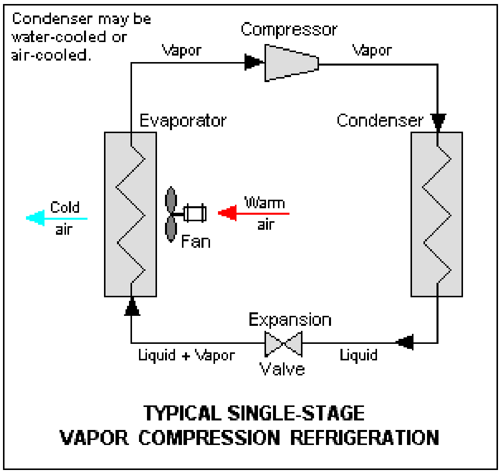

Fig. 2- Typical Refrigeration systems as found in most textbooks (2)

As many marine based refrigeration systems are cooled by the seawater, and the seawater temperature is a variable as ships travel across oceans and seas, this example can help not only in understanding the principles of refrigeration and heat transfer, but can be an important lesson for operating engineers as well.

The system shown in figure 3 is from a diesel simulation system and is a seawater cooled condenser for a ship's service refrigeration system. Compare this figure to that as found in most engineering textbooks when analyzing refrigeration systems (fig 2). The simulator provides a much more detailed picture of what is happening and becomes a laboratory experiment for many individual components of the system or of the system as a whole.

The following parameters of the system can be controlled and monitored:

- *Sea water inlet temperatures and pressures*

- *Sea water outlet temperatures and pressures*
- *Refrigerant inlet/outlet temperatures*
- *Refrigerant mass flow and volumetric rates*
- *Coefficient of heat transfer across the heat exchanger*
- *Condenser (Refrigerant) Pressure*

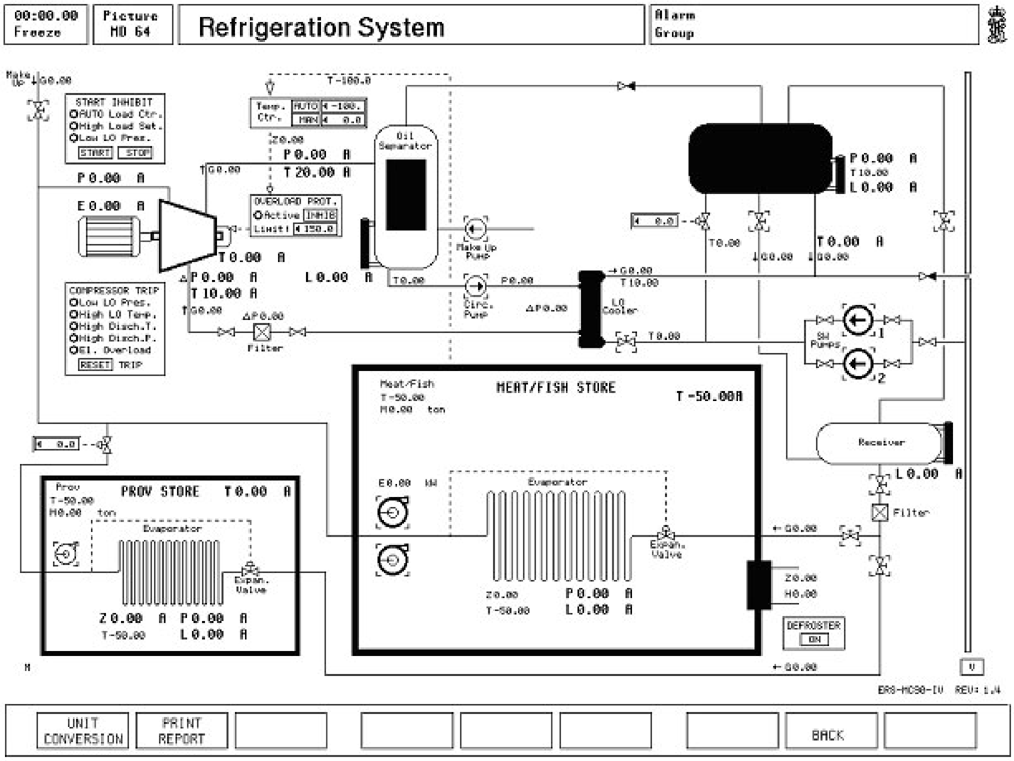

Fig. 3 Marine Refrigeration System (1)

By monitoring pressures and temperatures at various points along the system and determining appropriate enthalpy (h) and entropy (s) values, this lab experiment will allow the student to calculate flow rates, heat transfer rates and temperature changes for various seawater and tube fouling conditions of the system. Efficiencies of the system can be obtained from the information gathered as the parameters are changed.

Additional but similar experiments can be made using the ship's evaporator systems and once high and low side pressures are obtained, overall co-efficient of performances can be calculated. With flow rates, pressures and temperatures, additional experiments can be made on the compressor operations and efficiencies in later experiments.

6. Instrumentation and Controls

In this example of bringing theory to practice, the authors will use a Fuel Oil viscosimeter system to show how a Cascade Control System can work. A cascade-control system consists of one controller (primary, or master) controlling the variable that is to be kept at a constant value, and a second controller (the secondary, or slave) controlling another variable that can cause fluctuations in the first variable. The primary controller positions the set point of the secondary, and it, in turn, manipulates the control valve. (3) In this case, the master controller senses the viscosity, signaling the slave controller which is measuring fuel temperature, finally sending a signal to the control valve which is measuring steam pressure, ultimately controlling the steam flow rate to the fuel oil heater.

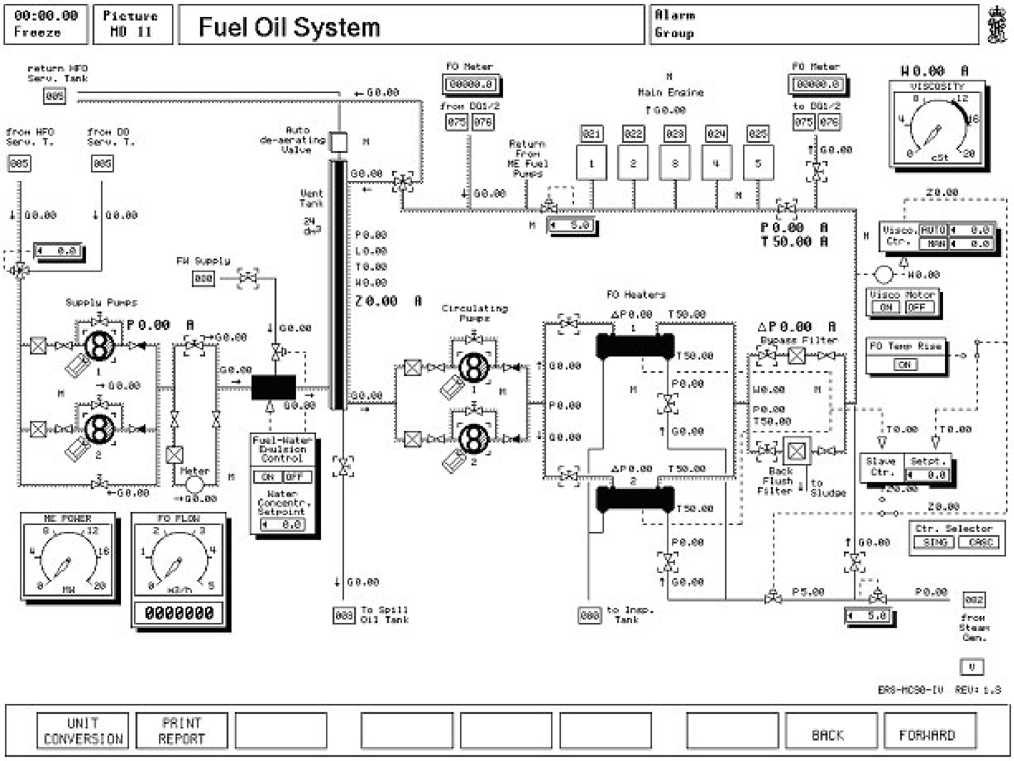

Fig. 4- Fuel Oil System with Heater and Viscosimeter (1)

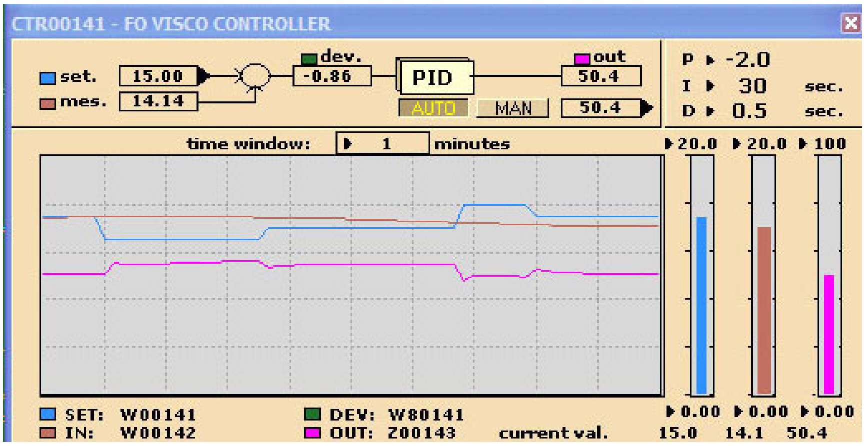

Fig. 5 PID Controller Graph for a Fuel Oil Viscosimeter (1)

Figure 5 shows a PID controller used for this purpose, where:

P = Proportional
I = Integral
D = Derivative

Variables on the system are Pressure, Temperature and Flow rates for both the fuel and the steam. In the Cascade control system, the viscosity of the fuel is the primary objective. Viscosity – a measure of the fluid's ability to flow – is critical to proper operation of the system through the fuel injector pumps and injector tips. Improper viscosity can cause decreased overall efficiency by poor fuel combustion and incorrect fuel flow rates, and can cause increased maintenance and repair.

Controlling the fuel's viscosity is a matter of controlling the temperature of the fuel at a given location. This feedback mechanism causes a steam line valve to adjust to regulate the steam flow to the fuel heaters. The change in steam flow (or in fuel flow) will cause a change in the fuel outlet temperature and therefore in its viscosity.

The operator can adjust the controllers by adjusting the parameters shown below and the student can learn to tune the controllers for a given set of operating conditions. As the operating conditions vary, the students can see how effective the control system remains. As the results of the systems can be given in real time, the student begins to understand how quickly the system can and will react to changes in the system. The student can learn an appreciation how the controller works by inserting his or her own adjustments to the steam control valve to compare human controllers to automatic control systems.

Adjustable parameters of Control systems:

- *Fuel viscosity*
- *Steam Pressure*
- *Fuel Oil Temperature*
- *Gain (magnitude ratio) – the ratio of change in output divided by the change in input that caused it. (3)*

- *Integral control action – Action in which the controller's output is proportional to the time integral of the error in put. (3)*
- *Derivative action – Control action in which the rate of change of the error signal determines the amplitude of the corrective action applied. (3)*

6. Conclusion

This paper gives several examples of how existing maritime engineering simulators can be used to help teach a myriad of engineering principles across the engineering curriculum. While using a system that students already understand, these principles and theories can be brought to practice to better understand the principles themselves as well as the effects of these principles upon a much larger system and the consequences when experiments are run outside the norms of proper operational procedures and practices. The authors encourage engineering faculty of all disciplines to work closely with faculty teaching simulation to help integrate the simulators across the curriculum as a platform for teaching difficult engineering concepts.

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EDUCATION AND TRAINING OF ELECTRO-TECHNICAL OFFICERS AND STCW CONVENTION AND CODE NEW STANDARDS IMPLEMENTATION

Prof. Dr. Mykhaylo V. Miyusov
ONMA Rector
Prof. Dr. Vadym M. Zakharchenko
ONMA Deputy Rector
Odesa National Maritime Academy (ONMA)8, Didrikhson str., 65029, Odessa, Ukraine
rector@onma.edu.ua, zvn@onma.edu.ua

Abstract There are any requirements for electrician or electrical engineer officer in STCW Convention, 78 as amended. During review of the STCW Convention there were some points of view for this question.
"…As more of the traditional skills of the past were incorporated into the training of engineers the position of electricians was phased out and in theory the new technology was sufficiently advanced not to require continuous attention of a specialist. However, there has in the last decade, particularly on specialized ships, been major technological advances in the field of electronics and computers and due to minimum of manning, vessels are increasingly reliant on efficient operation of this technology. The skills required for this role are not only very new and highly sophisticated but are also constantly evolving…"
"…In consideration of this emphasis and the shortage of trained qualified personnel in the industry, the co-sponsors wish to stress that it is necessary to ensure that nothing in the STCW Convention or Code will prevent a suitably qualified and competent electrician from being employed on board any vessel and prevent that electrician from performing a related role on board without having gained the competences specified for certification as ETO..."
Ukraine defended necessity of three levels of Competence for Electro - technical personnel as new standards of the STCW. MET system for Electrical Engineer Officer in Ukraine has long history. ETO MET in ONMA.

Keyword: *STCW Convention and Code, new standards, Electro-technical Officers (ETO), ETO MET in Ukraine.*

At the end of June, 2010 a remarkable event took place – on the Diplomatic conference in Manila (the Philippines) amendments to the Annex to the International Convention on Standard of Training, Certification and Watchkeeping for Seafarers (STCW Convention) and to the Seafarers' Training, Certification and Watchkeeping Code (STCW Code) [1], [2] were approved.
IMO continuous work on comprehensive review of the STCW Convention and Code has preceded this event. Adopted amendments cover practically all chapters of the STCW Convention and all sections of the STCW Code. Taking into account the comprehensive nature of the amendments, we can speak about practically new edition of the STCW Convention and Code.

Essential standards of seafarers' training became a result of a detailed reconsideration. However, standards regarding engine department were reformed most of all. Meanwhile, the most important amendments, in our opinion, are inclusion of standards regarding electro-technical officers into a new edition of the STCW Convention and Code.

From the very beginning of the STCW Convention and Code reconsideration IMO stated that technological advances tendencies address and required levels of training and certification and watchkeeping arrangements ensuring due to innovation in technology should be one of the leading principles. [3].

Maritime engineering is known to have had considerable progress in electric and electronic technologies for the last decade, to implement computer systems, especially on special purpose vessels. Many shipping companies have already provided availability of electrical specialists in their crew for ensuring efficient operation of modern equipment. Meanwhile, there are different positions' names for such specialists in different companies (Electrician, Electrical Engineer, Electrical Officer, Electronic Officer, etc.) and different functions. At the same time, unified requirements for competence and levels of responsibility for such specialists have not been specified before as the corresponding standards were absent in the STCW Convention and Code. These factors were taken into account and appeared to be the key ones while making a decision about training and certification standards development for electro-technical specialists.

Development of electro-technical specialists training and certification standards turned out to be the most debatable question during STCW Convention and Code reconsideration. These questions were discussed at 38th, 39th, 40th and 41st sessions and at two Intersessional meetings of Subcommittee on standards of training and watchkeeping of the IMO. Different points of view were suggested and considered in the process of work. Two main stages of the discussion about standards relating to electro-technical specialists can be specified.

At the beginning of the discussion delegations of some countries doubted as to reasonability of the STCW Convention and Code's containing such standards at all. Existence of such standards caused concerns that they could lead to creation of a new department in the crew. However, most of them have agreed with the necessity of such standards existence, taking into consideration such factors as technological progress and actual electrical specialist's availability on different types of vessels. Meanwhile, a necessity of having deep special knowledge and understanding for performing operation, maintenance and repair duties of modern electro-technical and electronic equipment was mentioned.

Discussion of the electrical specialists' levels of responsibility issues became the next important stage. During the discussion, training and certification standards for all of the three levels were suggested [4]:

Electro-technical rating (Support level);
Electro-technical officer (Operational level);
Senior Electro-technical officer (Management level).

Discussion as for Senior Electro-technical officer's standards' inclusion into the STCW Convention and Code was one of the most heated. Supporter and opposition of this issue went approximately fifty-fifty. However, as a result a decision about Electro-technical officer's standards' inclusion into the STCW Convention and Code only on two levels was approved: Electro-technical rating (Support level) and Electro-technical officer (Operational level).

The authors of the article offer their colleagues to pay special attention to training and certification standards for Electro-technical officers (ETO). To our mind, maritime educational establishments must organize specialists' training in compliance with these standards in the nearest future. The skills required for ETO are not only very new and highly sophisticated but are also constantly evolving.

Mandatory minimum requirements for certification and specification of minimum standards of competence for ETO are determined in new Regulation III/6 of the STCW Convention and Sections A-III/6 and B-III/6 of the STCW Code. These regulations provide ETO training in the following functions and corresponding competences:

Function: Electrical, electronic and control engineering at the operational level

Competences:
-Monitor the operation of electrical, electronic and control systems;
- Monitor the operation of automatic control systems of propulsion and auxiliary machinery;
- Operate generators and distribution systems;
- Operate and maintain power systems in excess of 1,000 volts;
- Operate computers and computer networks on ships;
- Use English in written and oral form;

- Use internal communication systems.

Function: Maintenance and repair at the operational level

Competences:
- Maintenance and repair of electrical and electronic equipment;
- Maintenance and repair of automation and control systems of main propulsion and auxiliary machinery;
- Maintenance and repair of bridge navigation equipment and ship communication systems;
- Maintenance and repair of electrical, electronic and control systems of deck machinery and cargo-handling equipment;
- Maintenance and repair of control and safety systems of hotel equipment.

Function: Controlling the operation of the ship and care for persons on board at operational level

Competences:
- Ensure compliance with pollution prevention requirements;
- Prevent, control and fight fire on board;
- Operate life-saving appliances;
- Apply medical first aid on board ship;
- Application of leadership and team-working skills;
- Contribute to the safety of personnel and ship.

As we can see, ETO functions and competences system assumes operation, maintenance and repair of a wide range of equipment. It should be noted that it concerns not only operation or replacement of broken equipment. In many cases, scanning of faults, maintenance of complex equipment falls within the responsibility of Electro-technical officers. It assumes deep process level, interior arrangement and operation mode knowledge.

In order to perform mentioned above functions and competencies, Electro-technical officer must have deep knowledge in different engineering and technological areas – starting from Mechanical engineering system and Electro-technology to Communication systems and Data processing.

Additionally, we'll draw your attention that new Section B-III/6 of the STCW Code recommends to take into account IMO resolution A.702(17) concerning radio maintenance guidelines for the global maritime distress and safety system when designing Electro-technical officers training programs in addition to the requirements stated in table A-III/6.

Thus, ETO knowledge, understanding and proficiency system assumes new programs' development and implementation at maritime educational establishments. Such programs can be classified as educational and training programmes in Combined Technology, as they should contain components concerning different traditional subject areas: Electrical and Electronic Engineering, Mechanical Engineering, Computer Science, Information and Communication Technology, etc.

As for “Controlling the operation of the ship and care for persons on board at operational level” functions, competence system, corresponding to it, is generally analogous to the competence system provided by the new edition of the Table A-III/1 of the STCW Code for officers in charge of an engineering watch. Competences dealing with seaworthiness of the ship and compliance with legislative requirements are an exception.

We should pay attention to “Application of leadership and team-working skills” competence that is provided in the new edition of the STCW Code in Tables A-II/1, A-III/1 and A-III/6 for deck and engine departments. This competence includes a vast range of knowledge, understanding and proficiency and is included into competence standards for ensuring effective resource management, cooperation between crew members and minimization of “human element” influence on accident occurrence.

Besides the above mentioned theoretical components, in compliance with Regulation III/6 of the STCW Convention ETO training programmes should contain not less than 12 months of combined workshop skills training and approved seagoing service of which not less than 6 months will be seagoing service which is documented in an approved training record book. As you can see, requirements for ETO practical training are similar to the ones for officers in charge of an engineering watch.

Maritime educational establishments of a number of countries are known to be experienced in electro-technical specialists training. It should be noted that training and certification of such specialists have not been covered by international standards yet and are carried out in compliance with national requirements and regulations. But still, in the authors' opinion, maritime educational establishments of such kind can easily adjust their educational and training programmes to international standards established by the new edition of the STCW Convention and Code.

At the same time, some countries might have an ambiguous situation with ETO certification standards implementation. In a number of countries, where electro-technical specialists' training and certification are carried out, there exist a few ranks that are given to electro-technical officers (electrical engineers).

For example, Electro-technical ship's specialists' training and certification system has had a many years history in Ukraine. Thus, the Odesa National Maritime Academy (ONMA) has been training marine electrical engineers for more than 60 years. ONMA has considerable experience in developing and carrying out Electrical engineers' with the Bachelor of Sciences (first cycle of higher education), Specialist and Master of Sciences qualifications (second cycle of higher education) education and training programmes. ONMA is also very experienced in carrying out refreshing and updating courses for electrical engineers. Besides, Ukrainian maritime colleges carry out education and training programmes for electrical officers with qualification of Junior Specialist (short cycle in the first cycle of higher education framework).

Ukrainian national regulations provide 3-rank system of ship's electrical engineers certification. According to the level of education and practical experience a ship's electrical engineer can be given the third, the second and the first class.

To achieve a third class (the lowest one) electrical engineer's rank it is enough for a candidate to have Junior Specialist qualification and a workshop experience including not less than 6 months of seagoing service. In their turn, a candidate for the first class (the highest one) electrical engineer's position/rank must complete the second cycle of higher education (Specialist or Master Diploma) and have not less than 24 months of seagoing service as Second class electrical engineer.

Such multilevel training and certification system has proven to be good and enables to upgrade the qualification and progress step by step for electro-technical officers. Besides, such system allows a shipowner to select a crew with the qualification necessary for a certain vessel and to assure the most effective electro-technical and electronic equipment operation, maintenance and repair.

National certification regulations for electro-technical officers providing a quantity of ranks that is more than one exist in a number of other states. Such countries have a reasonable question – how to adjust an existing 2^{nd}- and 3^{rd}-rank national training and certification system for electro-technical officers to a 1-rank one, established for ETO by the new edition of the STCW Convention and Code?

From the authors' point of view, the problem of national regulations adjustment to the new STCW Convention requirements would be easily solved in case of adoption of Senior Electro-technical officer standards on the Management level. However, taking into consideration the fact that such standard has not been adopted; administrations and maritime educational establishments will have to make important decisions as for national training and certification regulations adjustments to the new edition of the STCW Convention. It might be reasonable to apply a combined approach – to certify all the electro-technical officers corresponding to Regulation III/6 as for ETO in compliance with the STCW Convention and to certify higher ranks electro-technical officers in compliance with national requirements.

Besides, the authors would like to draw attention to the discussion about electro-technical specialists' training and certification reasonability on the Management level. To our mind, this discussion has just begun. Delegations from a number of states have been successively supporting at IMO the idea of Senior Electro-technical officer standards implementation into the STCW Convention and Code. Such countries as Bulgaria, China, France, Poland, Ukraine, United Kingdom, etc. are among them.

Arguments in support of Senior Electro-technical officer's standards are the following: wide usage of modern electro- and electronic technologies and computer systems in marine engineering, existence of special purpose vessels with powerful and complex electric power plans maintained by electro-technical specialists' groups that might include a few electro-technical officers. In such situations there appears a necessity of management level tasks realization.

Besides, during the discussion at IMO delegates from many countries stated that electro-technical functions were often performed on the ship by University graduates. For the purpose of getting such qualified specialists involved in the crew work professional development should be provided, i.e. a possibility of obtaining a management position. Such an idea conforms to the IMO policy as for attracting new entrants to, and retaining qualified seafarers in the maritime profession and to the up-to-day IMO motto “Go to sea!”.

The authors encourage their colleagues to start a discussion about electro-technical officers’ training and certification on the Management level within IAMU’s framework and to form a mutual position in this matter for its further discussion at IMO.

Shipowners should also get ready for new standards implementation when defining their manning policy [5]. Actually, electro-technical officers' standards inclusion into the STCW Convention and Code doesn't assume mandatory availability of such specialists in the crew of the vessels of all types. Resolution 6 of the Manila Conference states that the STCW Convention and Code are instruments concerned with standards of training and certification and do not determine ships’ manning levels [6]. Meanwhile, it was emphasized that administrations and shipowners should take into consideration the principles of safe manning adopted by the IMO.

Guidelines for the application of principles of safe manning adopted by IMO Resolution A.890(21) recommends to consider size and type of ship; number, size and type of main propulsion units and auxiliaries; construction and equipment of the ship; method of maintenance used when determining the minimum safe manning level of a ship. [7]. Depending on these factors, shipowners will have a choice when arranging “Electrical, electronic and control engineering” functions provision. Responsibility for this function can be placed upon electro-technical staff or engineers. It should be marked, that engineers' competences have been considerably expanded within the framework of “Electrical, electronic and control engineering” functions in the new STCW Code edition. Particularly, “Maintenance and repair of electrical and electronic equipment” competence appears in Table A-III/1 of the STCW Code defining minimum competence standards for officers in charge of an engineering watch.

However, the set of competences, provided for ETO, covers a wider range of equipment, is more detailed and assumes deeper knowledge, understanding and proficiency in the area of electrical and electronic technologies. It is obvious that shipping companies will need more and more ETO because of electro- and electronic technologies use extension computer systems and networks use increase, and e-navigation role expansion in maintaining safe navigation.

Thus, the STCW Convention and Code new standards implementation supposes a range of new problems to be solved by administration, shipowners and maritime educational establishments. Authors emphasize that it is necessary to exert every effort for provision of the qualitative education and training for ETO, favorable conditions for being employed on board any vessel, and ensure that only persons having gained the competences specified for certification as ETO would/will be allowed to perform (have the right of performing) a related role on board.

New standards implementation on time in training programmes for electro-technical officers supposes priority task solving on corresponding model course and training record book elaboration in the nearest future. These documents are to become an important formation and realization tool for education and training programmes for ETO in maritime educational establishments.

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Professional Development of Shipboard Engineers and the Role of Collaborative Learning

Rajendra Prasad
Assistant Professor, World Maritime University, rp@wmu.se
Takeshi Nakazawa
Professor, World Maritime University, tn@wmu.se
Michael Baldauf
Assistant Professor, World Maritime University, mbf@wmu.se

Abstract Rapid changes in the ship management pattern characterized by outsourcing of ship operations have had severe implications on shipboard human resources in terms of their declining numbers and competence which in number of cases has been implicated as the contributing cause of accidents. A review of investigation reports of accidents that occurred in ship machinery spaces has indicated that nearly one fifth of all accidents/incidents are attributable, at least in part, to the deficiency in knowledge and skills of shipboard engineering staff. Maritime education and training (MET) is based on the philosophy that the generic engineering and seamanship knowledge supported with basic practical skills imparted to / acquired by the prospective marine engineers during their education and training will be effectively transferred to their specific on job situation. This preliminary study identifies factors that have implications on shipboard engineers' initial and continual learning and to address issues that need further research for developing a suitable mechanism to channelize the natural process of on-the-job learning. Applicability of collaborative learning is discussed with a view to identify issues needing further research to assess its suitability for higher maritime education and training and application on board for professional development of shipboard engineer officers.

Keyword*: Human factors, competence, learning, collaborative learning*

1. Introduction

With steady improvements in design, availability of better materials, advanced construction techniques and production under sound quality control leading to higher reliability and consequent diminished frequency of technological failures, the role of human element in accident causation has become more apparent [1,2,3]. It is a common place to come across statements that human error is responsible for 80% of accidents in most industries, "the fact remains that the most important safety breakthroughs in the 21st century will depend less on technological progress than on recognition of the primacy of human factors [4]. Comprehensive knowledge and understanding, rather than surface knowledge acquired by rote learning, is the platform on which competence is built. Setting adequate standards of knowledge, understanding and proficiency for development of competence is paramount but equally important are the methods to facilitate understanding. Prospective marine engineers are required to transfer their learning to the work situation and this transfer of learning is much easier if the learnt knowledge is more comprehensive [5]. The techniques of knowledge transfer for major part of the curriculum delivery in most maritime education and training institutions conform to behaviourist approach potentiating surface learning through memorising rote. The prevailing assessment methods where incentive is to pass examinations at the end of various courses, with a few exceptions of practical training courses, also support this form of surface learning. Prospective marine engineers with such learning are deprived of long lasting retention of facts and development of skills of learning. Learning of professional acumen continues during their shipboard professional careers and it is imperative

that the methodologies for knowledge transfer implemented during their MET inculcate in them the skills of learning to transform them into lifelong learners.
Techniques of 'collaborative learning' are student-centred learning approaches that actively involve them in thinking, propounding their ideas, clarifying, explaining, reflecting and enquiring thus developing deep understanding of concepts. Application of collaborative learning techniques in MET institutions while enhancing comprehensive understanding of the subject matter and social skills will also help the students in developing attributes of lifelong learners which are essential for them to learn from dynamic work situations on job and professional development along with peers.

2. Demands for multiple skills

Operators, like marine engineers in ship's machinery spaces are at the centre stage of operations interacting with machines, technology and the work environment. They intervene to prevent undesirable operational deviations and in the event when such deviations do occur, apply appropriate counter measures to maintain safety and efficiency of operations. Through their timely preventive actions and quick recovery processes they mitigate the consequences of incidents or accidents. The cognitive processes which enable operators to make decisions, judgments and plans of actions to achieve desired objectives are however the very processes which can fail and lead to error [3]. According to Kuo the factors responsible for errors on part of the operators encompass personal attributes of knowledge, skills and experience as well as physical, physiological, psychological and psycho-sociological characteristics of individuals [6].

A socio-technical system comprises people at all hierarchical levels and irrespective to their position in such a system they are prone to committing errors. Consequences of operational failures at the sharp end resulting in what has been termed as 'active failures', and of the failures in planning and control termed as the 'latent failures', are jointly responsible for undesirable incidents or accidents [7], (Figure 1).

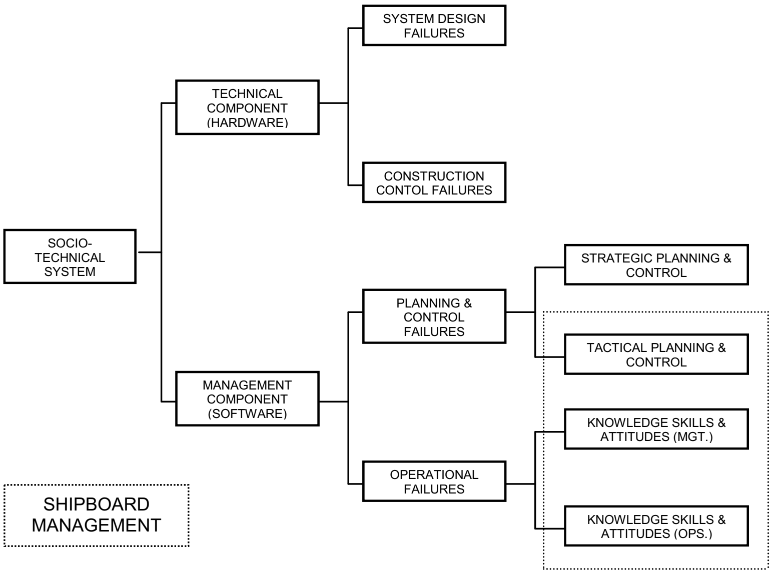

Fig. 1 Socio-technical system, management components and sources of failure

The management component or the (software) of a socio-technical system, like a ship, comprises planning and control at two levels. Upper or the shore management of a shipping company or a ship management company is responsible for strategic planning. The lower level comprises the shipboard management which is responsible for the tactical day to day planning, controls and shipboard operations that involve interactions at the human-machine interfaces. Consequently the shipboard engineers are responsible for planning of operations as well as for executing them and are therefore required to possess a combination of management and operational competence commensurate with each individual's hierarchical position on board. Emphasis of either type of competence changes as they gradually move up the management hierarchical ladder from support level to the operational level and finally to the management level as each one moves through his/her respective career path.

3. Human element in accident causation

3.1 Competence of shipboard engineers

Aetiological literature on accidents vehemently refers to the influence of various environmental, organizational and personal factors on operators at the human-machine interface in committing errors, mistakes and resorting to violations. Such analyses are of course based on the assumption that the operators possess the requisite knowledge and skills, they are selected commensurate with the essential competence demanded by their respective functional tasks and that they are adequately familiarised with the ship specific systems and procedures. Erroneous or unsafe acts committed by the operators at the human-machine interface leading to failures have been summarised by Cacciabue as the failures of planned actions in achieving their desired ends and termed as 'lapses', 'slips', 'mistakes' and 'violations' [8]. Mistakes are errors in selection of a suitable plan or a procedure and occur due to lack of knowledge, skills and experience of operators.

3.2 Competence mismatch

Competence of engineers in the context of shipboard duties refers to the application of knowledge, understanding and skills in a manner that their duties can be performed in a safe, efficient and timely manner [9]. Shipboard engineers' professional knowledge, technical skills, abilities, aptitude, social skills and attitudes must match the required level of competence for a particular ship's systems and the work environment. The requisite expertise of engineers changes in character as the ship technology changes. It also changes when there is need to replace the experienced engineers who have to leave the ship [10]. Employment of shipboard staff in commercial shipping is marked with high turnover and short term employments. Whenever a ship's flag or its managing owner changes there is a change in the organizational structure, policies and procedures demanding changes in crews' behavioural responses to meet the new requirements. According to the International Safety Management Code (ISM Code) a ship's safety management system must be implemented afresh upon change of company. The transportation safety board (TSB) of Canada, based on their random sampling of Sea-web database of vessels between 8000 and 50,000 deadweight tonnes and constructed in 1997, have reported that 55% of such vessels, on an average, had almost three managers per vessel over the intervening 10-year period [11]. Multiparty and fragmented ship management structures, technological developments in shipboard engineered systems, globalization of seafarers, short tenure of seafarers on board, shortage of trained seafarers, diversity in standards of MET and fast track education and training in some countries with emphasis on quantity rather than quality contribute to undesirable lack of competence of seafarers and a mismatch between the available and the desired levels of competence.

3.3 Accident causal factors

Several accident causation models and human error taxonomies have been developed by researchers for systematic reporting of accidents, their aetiological analysis and for predicting failure modes and mechanisms. Some researchers have used the terms organizational factors, job factors and individual factors for categorising error causation factors leading to unsafe acts [12]. In this context the individual factors subsume mental & physical abilities and capabilities comprising *inter alia* professional knowledge, skills, training and experience. Some of the taxonomies are fairly explicit in specifying inadequacy of knowledge, skills or training of operators while others use terms such as mental limitations, lack of awareness, ignorance etc.

Most of the international safety conventions and regulations have been developed on the basis of lessons learnt from past accidents yet there exists no centralised and harmonised global data of investigation reports on maritime accidents. Most national maritime administrations do maintain their individual databases of accident investigations reports and are available in the public domain on their websites. Accident investigations reports from the following sources have been reviewed for this research:

Australian Transportation Safety Bureau (ATSB)
Transportation Safety Board Canada (TSB)
Danish Maritime Authority (DMA)
Marine Accident Investigation Branch UK (MAIB)
National Transportation Safety Board USA (NTSB)

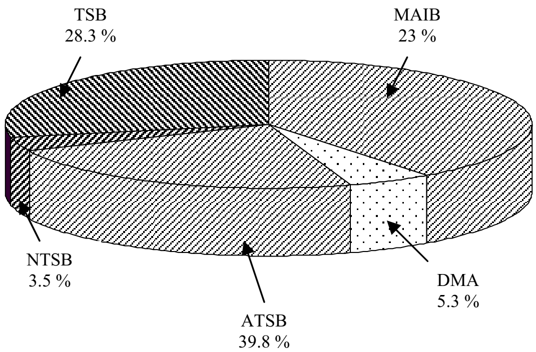

Fig. 2 Distribution of 113 machinery space accidents reports among five investigating authorities

Numbers of reports from each of the above organizations differ depending on the initiating years of posting of reports on their respective websites and their availability in electronic format. Reports of accidents involving fishing vessels, pleasure crafts and vessels less than 500 gt or those with propulsion machinery of less than 750 kW were not included in the review. From the remaining 782 accident investigations reports those pertaining to accidents in machinery spaces or resulting into personal injuries to the engineering staff were shortlisted. Thus a total of 113 investigation reports of machinery failures and occupational accidents in machinery spaces were further reviewed for this analysis. Each accident investigation report in its final conclusions or findings has indicated the most probable causal factors identified by the investigators. In these 113 reports a total of 288 probable causal factors have been identified, which for the purpose of this analysis have been placed under three groups, namely: Shore management factors; Shipboard management factors and the Individual factors. Only those individual factors that are applicable to the shipboard engineering staff have been considered for this analysis. It is noted that:

Deficiency of knowledge of engineers has been identified as one of the probable causation factors in 31.8 % accident reports. Proportion of causes on account of deficiency of knowledge, experience and training is 19.1% of total causation factors.

In a noteworthy study conducted by Makoto Uchida [13] reviewing court judgement reports of accident enquiries from Japan Marine Accident Inquiry Agency spanning from year 1995 to 2003, a similar distribution is noted. In his study 173 judgement reports of accidents related to the marine engine management on merchant ships were statistically analysed on the bases of methodology vide IMO Resolution 884 (21). The study revealed that the accident attributed to human error related causes were due to knowledge-based mistakes and amounted to 20.7% of total causes.

4. Professional knowledge and competence

4.1 Diversity in MET standards

In spite of the remarkable achievement in the international regulatory regime implemented through the International Convention on Standards of Training Certification and Watchkeeping for Seafarers (STCW) the standards of maritime education and training still elude preciseness that they are intended to attain on global basis. Save for the limited guidance in the form of specified competencies, the contents and the standards of MET syllabus are still shrouded with vagueness. Rapidly changing technology has always created a gap between the static model of competence standards set by MET institutions and the dynamic nature of competence model demanded by the changing technology. There is a perpetual time lag in bridging this gap and as a rapid and short term measure there are increasingly high demands for proactive training measures e.g. training in the electronic chart display and information system (ECDIS) for navigators, electronic controls on intelligent engines for engineers. This inevitable gap varies amongst MET institutions nationally as well as internationally.

4.2 Social competence

Present crewing pattern characterised by multinational crew has introduced variances in professional standards on board. Seafarers with diverse ethnic and cultural backgrounds are required to work together in teams which call for pertinent social skills on part of the seafarers [14]. Developing amicable human relations, team work and leadership skills are legitimate and valuable classroom goals not just extracurricular ones [15]. The STCW Convention requires marine engineers to be proficient in sixteen specified competencies before they are considered competent for shipboard engineering operations. None specifies or implies development of social skills.

4.3 Transfer of learning to work environments

The main focus of education and training in the MET institutions, as also mandated by the STCW Convention, is on development of professional skills on a firm foundation of theoretical knowledge. The philosophy of MET is based on the belief that once the prospective engineers have acquired the minimum requisite knowledge and practical skills they will be able to apply the learnt knowledge with necessary modifications to meet the varying demands of operations on board. Transfer of learning and its application to work situation is context sensitive and is easier if the learning takes place in similar environments as the actual work environment. The learning that occurs during onboard training, practical exercises in simulated conditions and leaning on job is more easily transferred than those learnt in the class room [5]. The extent of knowledge and skills transfer to work situations also depends upon the ease with which learning can be retrieved, which in turn, is a function of how well the material was learnt. Stronger the understanding and comprehensive the learnt knowledge more readily such transfer can occur. Conceptual learning that involves deep understanding is more likely to be transferred than the material that is merely committed to rote memorisation, because thinking at deeper level of abstraction facilitates transfer by fostering meta-cognition [16].

4.4 Knowledge transfer in MET environment

Swedish researchers Marton and Saljo on basis of their study, three and a half decades ago, suggested a shift of focus from teachers to learners for better learning achievements. Delivery of course curricula in educational institutions, MET providers being no exception, continues to be the traditional teacher-centred [17]. The traditional method relies on classroom delivery of lessons in a linear fashion and has been referred to as a 'push' method, where the teacher is pushing the learning material to students in logical steps by step fashion [18]. In such teacher-centred learning activity the learners play a passive role expecting to be provided with new knowledge that they can add to their pre-existing repertoire. In this form of teaching the learners do learn provided they are thinking and making connections with other ideas and experiences and are thus active. If the learner is not able to make necessary cognitive connection with new information due to his/her limited existing knowledge and experience, if the information is too complicated, if it is delivered too quickly for him/her to assimilate or if there are environmental distractions the learner may not be able to keep himself/herself engaged in the process of active involvement. This type of passive learning is therefore inflicted with a strong likelihood of learners' cognitive dissociation with the discourse and their mentally wandering off in spite of physical presence in the class. Such students then need to put in extra efforts for learning through self reading, tutorials or peer help, failing which they may resort to rote learning for clearing the examinations.

Research over half a century espouses that 'teachers cannot simply transfer readymade knowledge to students' [19] and that the students have to create their own knowledge through understanding of the new information and its assimilation with reference to their existing knowledge repertoire, either to modify or to form new concepts. This calls for active involvement of a learner in the process of learning. When confronted with new information a learner's curiosity causes an intrinsic state of mental tension that makes him/her strive for more information. This kind of intrinsic motivation to learn is stronger than the extrinsic motivation engendered from threats of examinations or enticement of rewards. To potentiate comprehension and deep learning the learners are required to be kept engaged in the process of interpretation and interrelation of information; overt questioning the teacher/author or covert self interrogation, reflection and critical thinking. Acquiring skills for learning is a prominent feature of an educational process and has a lifelong implication on the professional lives of people. MET institutions in addition to ensuring that their students learn how to perform their tasks also need to inculcate, through application of suitable teaching techniques, the skills of learning that they could apply during their professional careers as well.

5. Active learning process

5.1 Collaborative learning

Some of the educational techniques that keep students engaged in the process of learning are characterised as group based learning methods under the name of 'collaborative learning'. In such student-centred learning processes the students are essentially required to actively involve themselves as members of small groups to seek and assimilate relevant information on a particular subject matter, a query or a problem through interactions among themselves or at times also involving the teacher. They are required to engage themselves intellectually to discuss, reflect, argue, convince and disagree/agree to comprehend the concepts or look for solutions depending on the preset targets of learning. The students are responsible for their own learning and the built in interdependence feature of the group work makes them responsible for other group members' learning. There is an intrinsic motivation for the group members for their active participation for own success which in turn is linked to the success of their group. Such an approach which is based on the theory of constructivism, in addition to engendering deep learning, also helps the students in developing skills of learning. As the group members have to interact with each other the development of social skills for communications as well as respecting other's ideas, putting forth one's ideas convincingly without offending others and teamwork is another desirable offshoot feature [20]. Collaborative learning is an umbrella term that encompasses a variety of educational approaches in which students collaborate to apply their intellectual efforts jointly to search for solutions, constructing meanings or creating something new with information and ideas [15]. The process provides them an exposure to diverse view points. They are challenged socially and emotionally requiring them to propound and defend their ideas which help them in creating their unique conceptual framework of subjects/topics/events discussed. The group atmosphere of learning affects both the success and satisfaction in learning [21].

Number of research studies in the US has been conducted at the primary, secondary and tertiary level including engineering colleges, by comparing achievement of students who participated in collaborative learning with those in reference groups having attended same courses through the traditional class room instructions. Majority of such studies have shown the collaborative learning to have enhanced learning achievements. Positive achievement effects were noted in 63 % cases with 32.6 % indicating no improvement and in 4.4 % cases negative trend was noted in a review based on 29 studies done at elementary and secondary grades [22]. A similar review in 2008 of fourteen studies conducted in five Asian countries at three levels covering diverse subjects of basic sciences, engineering and social sciences indicated positive achievement effect in 53.3 %, no effect in 20 % and negative effect in 26.7 % cases [23]. This review also noted that that positive achievement effects were comparatively higher, in 75% cases, at the college level. Johnson and Johnson on basis of their study of eight different cooperative learning methodologies through 158 studies have concluded that though there are variations in level of positive achievement but all show a positive achievement effect [24]. Application of collaborative learning techniques in the MET institutions will help students in deeper understanding of subjects matter as well as in developing attributes of lifelong learners. Such skills learnt prior to embarking on their marine engineering profession will provide requisite motivation for them to apply the collaborative learning principles for learning from work situations and for professional development amongst peers.

5.2 Impediments to implementation

Although initiated nearly eighty five years ago the collaborative learning techniques have not gained much popularity outside the USA for multifarious reasons. The flexibility of structures, extent of teacher involvement, time duration of application and assessment of learning have generated a wide variety of applications. Consequent loss of its specificity with many unable to differentiate between group learning and teaching students by seating in small group has been responsible for its slow acceptance [25]. Societal resistance from the feeling that educational achievements were being sacrificed to irresponsible permissiveness has adversely affected its growth even in the US [26]. In spite of favourable results on enhanced achievement of students as shown by a number of research studies in secondary and post secondary educational institutions the scepticism about its success in view of a new and untried methodology, longer time required for delivery of curriculum, extra work for preparation for implementation, though only initially, and the unwillingness of teachers to give away control of teaching process have been impediments in application of collaborative learning systems in educational institutions.

6. Professional development of shipboard engineers

6.1 On-the-job learning

Successful completion of mandatory pre-sea courses at their MET institutions is only the initial phase of professional education and learning for marine engineers. The second phase of learning, rather the actual professional learning, through application of learnt knowledge and skills in actual work environments starts when the prospective marine engineers take on the role of operators aboard ships. This phase of professional development through on job learning and experience has its genesis in participation in a social practice but in a disparate social environment than that of educational institutions. Akin to apprenticeship, at least in the initial stages, professional learning is formalised by a progression through tasks of increasing accountability [27]. Through their successively widening responsibilities for operating equipment of greater complexity or performing task where wrong actions can have significant consequences, they are gradually exposed to the unique characteristics of various shipboard engineered systems, normal working parameters and deviations thereof. Maintaining currency of safe operations requires them to routinely assess the operating conditions and the influence of work environments, select the course of action in cognizance with specific rules, procedures and traditional practices peculiar to the ship. This allied with demands for continuous confirmation or modifications of previously learnt concepts progressively add to their repertoire of knowledge, skills and experience, an essential element in professional development.

6.2 Development through collaboration

Performance goals, activities and the social setup are unique to each ship's machinery spaces. Under the organizational and environmental influences they also keep changing with time and get accentuated due to turnover of the engineering staff. This makes the socio-technical setup on each ship a unique and dynamic amalgam of varied levels of professional knowledge, skills and experience. Each technical problem even when occurring on an identical system, sub-system or a piece of equipment is unique because of its deterministic variants and situational characteristics caused by technical, organizational and environmental influences in that particular case. When practitioners hold a mental model of a system that is inaccurate or incomplete their operational responses to the system are inappropriate as well. Having knowledge of one kind, e.g. operational action in a particular situation and on an equipment on previous ship, is not necessarily applicable to the equipment of the same make on another ship due to its individual characteristics and asymmetric situational context. The mental model needs to be created anew or modified in the new situation.

Incumbents are continually faced with the task of assimilating nuances of their new setup through familiarisation, instructions, guidance, formal & informal talks, over hearing, observing other's actions, self exploration and through interaction with peers. By exchanging information, knowledge and thoughts they create a structure, a blueprint or a mental model for understanding of similarities or discrepancies in the events enhancing familiarity amongst various situations. Need for such exchange can hardly be disputed as it is almost unlikely that each one in the team has faced a particular situation in his/her past shipboard experience. It may be, and by good fortune, that one in the team has the experience of such a particular situation who can share his/her experience. Such an exchange increases the individual capacity of team members to act more appropriately in proximate situations.

6.3 Peer collaboration on board ships

In absence of guidance, mentorship or peer help through amicable social interactions in work place the learning of professional acumen by the incumbents is by hit-and-trial method i.e. learning through mistakes. An engineer faced with a novel situation or condition of an equipment or a part thereof makes his/her conclusions relying on personal repertoire of knowledge experience and available documented information and would like to seek affirmation to his/her conclusions. Without any feed back or reinforcements on the validity of his/her perception he/she is in a dilemma whether his/her conceptual assessment is right or wrong and the degree of its correctness or otherwise. That people are social creatures who like to talk with each other about topics of common interest [30] is squarely applicable to the engineers on board especially under such conditions of ambivalence.

Need of knowledge exchange on engineered system, organizational set up and working environments specific to the ship through mutual coordination cannot be over emphasized.

Formalized systematic collaboration among team members facilitates transfer of pertinent information from those who have to those who need it, with all the benefits of collaborative involvement as mentioned in paragraph 5.1 above. Such peer collaboration for learning, aside from sharing knowledge of systems characteristics, is also extended to solving technical problems, risk assessment and risk management utilizing the strength of varied knowledge and experience of all team members. In absence of deliberate, systematic and formal transfer of knowledge through interactions the learning still occurs but in a fragmented manner, at uncertain pace and at times at the cost of efficiency, damages, personal safety and even ship safety.

If collaborative learning is to be applied on board it has to be conceptually different than that in a class room scenario. The team of shipboard engineers would need to assume the responsibility of leading as well as controlling the coordination activities within the group to achieve learning objectives, which are also to be set by the team. A suitable framework is needed to guide the team members for its effective and beneficial conduct. Success of the collaborative learning process requires active and amicable participation of each member and calls for their social skills of good communication, respect for each one's ideas and defending one's ideas without offence to others and common goal. MET institutions do not apply collaborative techniques the engineers are not expected to have the desirable social skills necessary for application of collaborative learning process. Desirability of applying collaborative learning techniques in shore MET level is emphatically perceptible.

7. Conclusions

Research has identified that inadequacy of professional knowledge is one of the factors responsible for shipboard accidents. Diversity in MET standards, methods of curricula delivery, assessment procedures and employment pattern of marine engineers constrain the process of comprehensive understanding of engineering concepts and on job learning. Objectives of MET generally confine to providing specified generic engineering and seamanship knowledge with some basic skills to perform tasks on board. The teaching methods adopted for achieving these objectives however fall short of the processes that could inculcate skills of learning. Application of suitable techniques in the MET institutions would promote students' comprehensive understanding of subject matter which is an essential feature for transfer of learning to work situations. It will also help them in developing skills of learning, cooperation and team work, the desirable personal attributes for shipboard duties.

Specific knowledge of the engineered systems and influence of work environment on them are unique to each ship. All possible problems, machinery conditions and work situations cannot be perceived, documented or studied for prescribing solutions. Every engineer cannot get an exposure to all perceivable situations but amongst the team of engineers on board there is a unique wealth of knowledge and experience that must be shared for mutual learning and sound professional development. This needs to be achieved through formal application of a suitable variant of collaborative learning on board ships.

Implementation of collaborative learning for marine engineers' learning and development on board will require a suitable strategy, a framework for its effective application, guidance and training. This calls for further research that would explore feasibility of its application, to develop suitable strategies and procedures for its application for the benefit of marine engineers and safety of ships, persons and the environment.

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Maritime training between old and new techniques

Radu Hanzu-Pazara
Lecturer, Constanta Maritime University, hanzu@imc.ro
Paulica Arsenie
Associate Professor, Constanta Maritime University, arseniep@imc.ro
Liviu Constantin Stan
Lecturer, Constanta Maritime University, liviustan14@yahoo.com

Abstract Maritime education is a field that combines theoretical and practical knowledge's in almost 80% of the mandatory learning curricula. In many cases, the practical applications are more advanced than the theoretical support. In order to cover this inconvenience is necessary to keep theoretical knowledge's updated to the level of actual practical techniques used in applications and meet onboard the ships by the students, future officers. The use of computerized applications, use of simulated exercises and on-line learning are some procedures that mark the progress of maritime education and training in this stage. This new approach of teaching includes methods of communication between teacher and students, including specifically oral, electronic and multimedia forms of communication. Some of these procedures are successfully applied in our university. By introducing in the teaching process of different forms of computerized applications, simulators and multi-media courses is targeted the best understanding of different concepts, theoretical or practical, by our students. Last years analyze show an increased interest for electronic forms of training by students, they considering more suitable for their generation to access the information through internet facility and in an interactive form.

Keyword: *Maritime, Training, Techniques, Skills, Competencies*

1. Introduction

From the beginning of his history, the humanity has been attracted by the seas. Starting from here, navigation can be considered as an activity with a long history. From the first stages navigation has requested knowledge about how it can be done. In this way, during time, has been developed specialized trainings and techniques adequate for implementation of these trainings. In time have been developed cycles of studies dedicated to maritime training, based on clearly international requirements, with main objective to cover the necessity to have more competent persons on board ships.

Today, many of study disciplines included in maritime training curricula are based on theoretical knowledge and practical applications. The theoretical knowledge's not suffered many and major changes during last years, but, the practical applications have changed accordingly with the technological evolution. So, in this context, the use of computerized programs, multimedia systems and simulators in the training process have become common techniques.

The impact of classically training methods on graduate competency is known, the impact of new methods is under study. We say under study because the use of latest technologies in the maritime training process has a relative short history and due to continue improvements of these technologies, the results have not been completely counted.

An appreciation of the impact produced by the insertion of modern teaching techniques in the training process can be seen through the activity of younger officers onboard ships, where simulated applications are meet in a real form. According with statistics communicated by the shipping companies, the younger officer are more familiarized with the technology presents onboard and have a higher capacity in use of these for a more safer activity.

Even if the modern training techniques have a major role in achievement of future maritime officers competencies and professional skills, never must not be forget the importance and position inside of training of so called classical training methods, like chart working, communication, written transfer of information and teacher implication in the act of training.
Many of the basically knowledge can't be transferred through other methods then classically ones. In this category we include knowledge about principles of navigation, ship handling theory, loading of cargoes principles and engine working principles.
On the other way, is very difficult, almost impossible, to create sophisticate applications using simulators or other computerize programs, without a strong theoretical basement.
Taking in consideration all aspects regarding maritime training, is necessary to know to combine in a harmonious way the theoretical knowledge with practical application and also traditional training methods with the modern ones, in order to achieve the major goals of this training, more competent peoples onboard ships.

2. Role of teaching methods in maritime training

As we stated before, in the present, the maritime training curricula is based on theoretical knowledge and application of these for different situations. Each of them, theory and practice, have an important role in the maritime training process, even there are voices which considers one or other more important. We accept that practical skills are important in a practical activity like maritime navigation or ship engineering, but also we consider, and know, that no one has born with knowledge about navigation and ship engines. So, is important, as maritime teacher or trainer, to know the role of each part, theory and practice, in the entire training process, and most important to choose the right methods for implementation and development of knowledge which wants to transfer to the student.
During times was experienced many methods for knowledge transfer inside of a training process in different fields and from each of them has hold better aspects and through the next method has tried to improve the previous.
The beginning of training methods was based on written and oral techniques for knowledge transfer. Inside of these techniques an important position was occupied by the teacher and his skills in communication.
Inside of teaching and training process, the communication is a vital part of it. In an informative environment, as academic, the freedom of information must be certified. For this reason is necessary to develop systems to facilitate information transfer. Lecturers and students, as main elements of this system, must to be able to assure a correct information transmission and receive.
Long period have considered that only teachers are responsible for information issues. Now, students have their contributively part at this process. Taking account the present stage of research activities and the fast moving of information in all media systems, students can have their own opinion about it, opinion which can contribute positively to the development of the studied subject.
So, the communication today must be considered a two-way process. This mean that information sent must to have a reply, as a feedback. Based on the received feedback, sender can have an image of his own capacity in generation of information.
A positive feedback is an encouragement for future new ideas and information, for a higher development of the present stage. On the other way, a negative feedback can produce two effects: first to lead to conclusion of a necessary improvement of the present stage, second, to cut any interest in the subject and leave it.
From these considerations we can deduce the role of verbal and written communication as part of maritime training. Communication have an important role also when is use an advanced training technology. Here communication is the first stage of an application when is transfer all the details and requirements of the future activities. If communication is realized in a wrong manner or information transmitted is not correctly understood, the scope of application can be completely compromise.
Transfer of knowledge through written form is use especially for courses and laboratory application content development and can be seen as easier training method.
Both of these training techniques are consider the classically ones and here the teacher has a very important role in selection of information and right method of transmission.

If these are considers as traditional methods, today become more important the new ways, like computerized and virtual environment communication tools.
Computer based training is not a new tool for training and connection between lecturers and students. These computerized programs for training are use today in many teaching domains, being designed to help students to acquire knowledge and to do this without a lecturer near by. In the maritime academics this training tools have an important role due to necessity of mixing theory and practice. During practice, especially on sea, students can be connected with the theoretical aspects of their duties and with a dedicated lecturer through these programs.
Beside of the advantages presented by these programs, there are some disadvantages, especially regarding the production costs of these materials and the time spent for concept and creation.
In many situations, the computer based training have replaced by the e-learning or by the on-line training. These new methods of communication and training permits real time transfer of information and a direct connection between students and lecturer.
Many universities have developed system for communication between lecturers and students, especially on-line systems which offer possibility to test courses content and teaching materials, to find students opinion about these and to help lecturers to make changes and necessary improvements to their own course materials. Many of these communication systems are created inside of the institution web portal or like an independent teaching platform.

3. The connection between the use of new training techniques and improvement of the training process

In the present days, the computers and computerized programs are part of the life of many people. The computerized technologies are becoming indispensable for many activity fields, computers being part of the educational processes, or even the essence of these.
Various technologies as simulators, computerized programs and many types of virtual learning as web platforms and virtual campuses are used today for training purpose in the maritime academic field.
All these have their own history and evolution, some faster, others in time, but all, as single or combined, help to reach the final goal, better trained seafarers for more and secure oceans.
From all these training procedures, the first were the specialized training programs, based on computerized technology and used mostly for designing and studying of different processes. Being the pioneers, these programs did not have a very expressive way of revealing the results and in fact, the procedures for obtaining these results were difficult. Having a poor data base, it was necessary for applications to know the entrance data and all usable variables as user. During time, these programs have been improved and in short time they became indispensable for training courses regarding ship design, engine design and engine internal processes, and liquid cargo transfer or in situations that request a deep study of thermal and tensional processes inside of different parts of ships body.
The next step in the technological development of the training process has been marked by the advanced computerized programs, more complex, with a more realistic presentation of processes and operations - the simulators. Basically, the simulators consist of computerized programs, but the graphical expression is more evaluate, the images offered are closer to reality and in this way, they allow to the user to interpret easier the information.
The use of simulation in providing solutions to the problems of risk and crisis management and the optimal use of crew resources has a long established pedigree in maritime training [1].
Simulator-based training courses were introduced primarily to train the skills of passage planning and the importance of the Master/Pilot relationship [2].
The 1980s saw the introduction of Engine Room simulators and towards the end of that decade, cargo operations simulators also became available. These types of simulator have primarily been used to train officers in the handling of operations, including fault finding and problem diagnosis, and increasingly to train teams in the skills of systems, resource and risk management.
Many types of simulator: bridge, engine and cargo control room, have tended to emphasis a physically realistic environment in which these exercises occur, although of the PC-based simulators for training some tasks is increasingly widespread [5].

The only mandatory requirements in the maritime domain for the development of the non-technical skills of crisis management are those of the International Maritime Organization's (IMO) Seafarer's Training, Certification and Watchkeeping Code. Table A-V/2 of this code specifies the minimum standard of competence in crisis management and human behavior skills for those senior officers who have responsibility in emergency situations.
The simulators used in the maritime officers training are a compulsory request of the STCW Convention and Code in order to assure an increased safety of maritime activities.
The competence assessment criteria detailed within the Code are not based on specific overt behaviors, but rather on generalized statements of performance outputs, and as such are highly subjective and open to interpretation.
At the end, but not the last, the technology used in the present training process uses the virtual techniques through its components as on-line teaching and web based applications.
The incorporation of the elements of information and communication has been highly accepted and renowned as valuable aspects in the formation process of engineers and technologists.
The advent of on-line technologies coupled with an emerging recognition of the importance of effective teaching are acting together as catalysts to change the face and nature of teaching and learning across all sectors of education. Significant changes appear to be emerging in higher education and in many components of school education. Through on-line technologies, we finally appear to have the means to create the forms learning environments that we know work best. The classroom of tomorrow is starting to emerge and it is quite different to the classroom to which many are accustomed. Perhaps the most noticeable difference is in the roles of the participants. Everyone seems to have to do things a bit differently [4].
On-line learning can be an active and engaging experience. There's not much room for spectating in a well-designed on-line learning environment. Students are encouraged to collaborate and work together. The environment is usually one of a shared learning space with learners attentive and receptive to others in the class.
Move to on-line is coinciding with moves to more authentic learning settings. The on-line technologies encourage and support such strategies as problem-based learning, case-based learning and even work-place learning. The concept of a classroom as a place of learning is expanded as the classroom loses it boundaries [4].
Learning on-line encourages and supports the development of a range of students' key and generic skills. There are many useful skills that can be developed through networked learning including information literacy, task management and working with others. Learners become self-sufficient and cognizant of their own role in influencing what is learned. It's all about whom takes responsibility for what is learned.
Learners often need to be encouraged and induced into the changed roles and need to consulted and negotiated with to gain their cooperation and consent [3].

4. The impact of new training techniques on student's competencies and skills

The use of the latest technology during the training process in maritime field has a good impact on increasing safety and security over seas. This impact, as results of training, is seen in time and evaluated from feed backs received from companies where graduates work after finishing studies. Other modality to evaluate the impact, as general evaluation, is represented by the reports of international organizations regarding safety on sea and from them to extract the percentage represented by our graduates.
These evaluations are used for maritime transport sector, where graduates work as ship officers, for rest of graduates who work in connective activity domains, as port operation, ship operations and others, and the evaluation feed back is provided mainly by the companies.
Beside of these evaluations provided by the independents and also beneficiaries of the training results, our university, as maritime trainer provider, have designed its own evaluations, made during studying years and after graduation.

The maritime statistics show a large number of ship accidents as capsizing or sinking caused by the deficient loading of ships, completely ignoring tensions in the hull or not enough studying them according with the sea state during voyage. More tragically is that these types of accidents have human casualties and for protecting human life on sea in these situations, one must know what can happen in case of over solicitation of ship structure.

In the same direction, now are used loading simulators, especially for specialized ships, as oil and chemical tankers and gas carrier ships. Based on information about ship structure behaviour for different loading conditions and using simulators after, can be completed the training related to ships operation.

During simulated exercises students have the possibility to operate different types of cargo, with different characteristics and, most important, different grades of risk. This training offers possibility to become familiar with the future real operations onboard of these ships.

For officers who intend to work on board all types of tanker ships is compulsory to provide special training.

Making an analyse of the results after training with and without technology in line of ship operation, mainly loading operations, we observe an increasing level of knowledge and skills at students that complete this training using simulators and computerized programs. Also, their professional evolution onboard ships can evolve successfully, considering them able to get a more rapid accommodation to ship equipments designated for cargo operation.

In the navigation field, the main technology used for training is represented by the ship handling simulator and crisis management simulator. Both of them have important roles in the safety area, basically helping the trainee to realize a safety ship navigation, second to protect the environment in case of maritime disasters, as ship collisions followed by the oil pollution.

The classical training for avoiding collision supposed the use of plotting paper for calculation of optimum avoidance manoeuvring. Today, the simulation techniques allow not only to calculate and deduct the right avoidance manoeuvring, but also to live this manoeuvring. This possibility offers a way to understand exactly what presumes such a manoeuvre and to correlate the avoidance information with the ship handling procedures.

The practical results of this innovative method are represented by the decreasing of collisions in simulated environment with over 60 percents compared with the classical procedure.

In the real environment the results are almost comparable with the simulated ones, statistics being obtained from shipping companies that take our students as cadets or officers and also from our students from their own experience as cadets. Over 80 percents of returned students from their cadet practice revealed that the hours spent in ship handling simulators were very usefully onboard and allowed them to be familiarized with ships bridge equipments, to react faster in different closer situations and to prove to their trainer officers their own level of competency.

Training on ship handling simulators gave better results for graduates, which after a number of years spent on sea, decided to work in the harbour pilot activities. For these, it is imperatively important to know how to handle a ship in small spaces as harbour basins and how to use correctly ships handling capacities.

Also, this training is requested in order to raise graduate’s interest to work in the vessel traffic control services, where is necessary for ship handling characteristics and capacities and to anticipate the dangerous manoeuvres.

Crisis management simulator has proved its utility through the reduction of cases of large oil quantity pollution or limitation of such pollutions. From their recruitment in the training process until today, the number of wrong actions in case of accidents with oil pollution has decreased with 40 percents due to a better knowledge of the indicated procedures and protocols applied in these situations.

Besides the training of future or actual maritime deck and engine officers, these simulators are usefully for training of personnel engaged in solving dangerous situations, as emergency situation inspectorate personnel, which has possibility to perform different emergency situations involving commercial ships or other type of boats, for lives saving operations and help of a boat in distress.

In connection with online training, our university developed in time its own web based training system, where our students and former students can find necessary information’s as courses and applications.

This facility is very usefully in the distant learning concept, and taking into account the maritime work environment, this concept is very agreed by the present seamen who want to improve their skills and competencies in order to accede to a superior rank, to pass to ship officer position.
Almost 80 percents of the students included in the part time study cycle are accessing this form of courses provider, doing this activity during their onboard stages, in order to be ready for exam at returning home.
The communication between trainers and trainees can be done through different ways, using the electronic correspondence or an open forum for general impressions and opinions. These communicative procedures can help the improvement of the present data and to generate the development of additional subjects with role of covering of missing data or usefully information's for the principal courses.

5. Conclusions

We are living in a time of changes. Many of well known activities are change today or just transform. This process doesn't avoid the training field, either the maritime training system. But, the present change doesn't means to give up completely to the previous training methods and techniques.
In the actual context is important to realize a good harmonization between older and new techniques, to combine in a right way theoretical knowledge with practical skills, to put together traditional teaching methods with latest technologies use for training, in order to achieve the main goal of any maritime training, better trained personnel onboard ships.
In the present paper we tried to present different types of training technology, some classically, other of the last moment, and to show the advantages of each of them and how can contribute, through a correct usage, to increasing of maritime training level and graduate's competencies.
As a conclusion of ours analyze, we consider than new techniques have a clearly way for development and part of them, like virtual learning, will become in the future the most common way of training, maybe, with some reserves in the maritime field, due to specificity of training and necessity of a lot of practical applications, difficult to be realized completely in a virtual environment.

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A Contrastive Analysis of the Organotin Compound in Main Ports of Bohai Sea of China

WU Wanqing
Professor, Dalian maritime university,wuwanqingdmu@sina.com,
FENG Xing*
PHD, Dalian maritime university,windstar19850310@gmail.com
Wu wenfeng
PHD, Dalian maritime university,wuwenfeng0611@126.com
ZHANG Bin

Abstract: Using headspace solid phase micro-extraction combined with gas chromatography and flame photometric methods, organotin compounds in surface water and bottom soil are investigated at nine sampling stations in seven harbors of the Bohai Sea of China in 2005 and 2008. The investigation result shows that the organotin pollution still exists and is serious in part of the ports. In recent years, the organotin content declines, this indicates that the product mix of the anti-fouling paints for ships has changed which shows a good trend in China and in other areas of the world as the international AFS convention is coming into force and with the retroactive application of the convention.

Keyword: *organotin, surface water, bottom water, Bohai Sea of China, TBT, AFS convention*

1. Introduction

In Year1960, the anti-fouling property of organotin (especially the TBT) was found. The use of organotin greatly extends the service life of marine construction and ships, reducing the fuel consumption and the dock repair cost and making a great economic benefit. But so far TBT is recognized as one of the most poisonous human induced chemicals in the marine environment according to recent research [1]. Organotin has a huge affect on fish, crustaceans, mollusks and marine algae. Once introduced into the environment, it interferes with the normal function of the biologic endocrine system [2].

In October 2001 in London, The international community adopted the “International Convention on the Control of Harmful Anti-fouling Systems on Ships, 2001” (AFS Convention) on the diplomatic conference held in the headquarters of IMO to deal with this important issue of marine environmental protection. The purpose of this convention is to protect the marine environment and human health from adverse effects, phase out the use of organotin compounds in anti-fouling paint and create a new mechanism to prevent the use of other hazardous substances in future anti-fouling paint. The AFS convention met the conditions of entry into force on September 17, 2007 and came into effect on September 17, 2008.

The Bohai Sea is inland sea in China and makes an important role in China’s economic development. Its ecological environment is very important. Navigable waters of the Bohai Sea is rich in resources and has a heavy shipping track. The marine self-purification ability of the Bohai Sea is very weak because it is semi-closed and there are Miaodao islands arranged in the gulf mouth, which prevents the gulf and the sea from convection. In recent years, large quantities of pollutants were discharged into the Bohai Sea, making the environmental quality of the Bohai Sea worse. The contrastive analysis of organotin compound in the surface water and bottom water of the main ports of Bohai Sea of China in recent years was carried out. The environmental factors affecting the distribution of the organotin in the Bohai Sea is analyzed in the paper, in order to get a more detailed understanding of the source of organotin, its biochemical processes after being discharged into the Bohai Sea, the pattern of organotin pollution in recent years and to provide a reliable scientific basis for future pollution control.

2. Sample collection

The samples of surface water and bottom water of seven main ports of the Bohai Sea were collected in July 2005 and May 2008 respectively. The details of sample collection are shown in Table 1.

Serial number	Latitude	Longitude
No.1 water and sediment sample	40° 18′ 12″ N	122° 03′ 38″ E
No.2 water and sediment sample	38° 54′ 38″ N	117° 54′ 04″ E
No.3 water and sediment sample	37° 33′ 75″ N	121° 23′ 43″ E
No.4 water and sediment sample	39° 54′ 24″ N	119° 36′ 26″ E
No.5 water and sediment sample	38° 35′ 58″ N	120° 09′ 47″ E
No.6 water and sediment sample	38° 56′ 27″ N	121° 39′ 02″ E
No.7 water and sediment sample	38° 56′ 10″ N	121° 39′ 11″ E

Table 1. Encoding Table of the Port Water and Sediment Samples

2.1 Sampling points

The above-mentioned sampling stations are displayed by Figure 1.

Fig. 1 Sampling Sites in Bohai Sea

2.2 Samples collection methods

2.2.1 Collection of surface water

The sample collection of surface water was carried out according to the requirement of the national standard of People's Republic of China "Oceanographic survey norms-observation of chemical elements of sea water (GB 12763.4-91)". The sea water samples were sealed in bottles and then carried back to the laboratory wrapped with a black plastic bag. Then the samples were preserved in darkness under 4℃ and filtered before the analysis.

2.2.2 Sediment (surface sediments) sample collection

The sample collection of surface sediments was carried out according to the requirement of the third chapter of the national standard of People's Republic of China "Oceanographic survey norms-Marine geological and geophysical survey (GB/T 13909-92)". In every site, the surface sediments were collected using the grabbing sediment container. The sediments were sealed up in bottles and then carried back to the laboratory wrapped with a black plastic bag. The surface area of the sediments was 10 cm2 and the thickness was 2-3cm. Then the samples were preserved in darkness and under -4℃ and filtered before the analysis.

3．Detection and analysis

The main organotin analysis methods are liquid-liquid extraction (LLE), microporous membrane liquid-liquid extraction (MMLLE), liquid extraction rods (SLMP), solid-phase extraction column (SPE), solid-phase micro-extraction Extraction (SPME), supercritical fluid extraction (SPE) and microwave extraction [3]. As the solid-phase micro-extraction (SPME) can be derived [4], extracted and enriched at the same time, so this study takes the headspace SPME method[5].
In the detection process, the organotin compounds were detected according to the analysis conjunction technology and gas chromatography and flame photometric methods, in accordance with the various steps of top SPME. Seven water samples and sediment samples were analyzed during the detection process, and the analytical instrument was SHIMADZU9A. The specific detection method is described in the following section.

3.1 Analysis of water samples

A 50ml water sample was taken and mixed with glacial acetic acid. The solution was mixed with magneton and the PH of the solution was adjusted to 3.3. The solid-phase micro-extraction fiber was exposed to the top air of the reaction bottle. 1 ml 3% sodium borohydride solution was added to the reaction bottle quickly with a syringe. Under acidic conditions, the butyltin compounds reacted violent with $NaBH_4$ and the volatile hydride was generated. The SPME extraction fibers were directly transferred to the GC injector 15 minutes after the reaction. The butyltin hydride compounds were separated in the HP-1 capillary column under the programmed temperature control 10 minutes after being thermo-analyzed. This separation was detected by QSIL-FPD sensitively.

3.2 Sediment samples analysis methods

We took 3-5g (wet weight) sediment sample and mixed it with 1 ml 100 ng/ml tetrabutyltin methyl alcohol solution smoothly. 1-2g copper powder was added to the sediment sample for desulfurization. 10 ml HCL-THF (1:20) was added to the sample and the organotin was changed into corresponding chloride, then the mixture was ultrasonic extracted with 25 ml 0.01% tropolone-hexane for 15 minutes and 10 ml hexane for 10 minutes orderly. The combined extraction mixture was concentrated to 2-3 ml by rotary evaporation at the temperature of 25°C, and then the Green reagent was added for derivation, the mixture was ultrasonic reacted for 15 minutes under room temperature, then 5 ml 0.5 M H_2SO_4 solution was added to the mixture to remove the excessive green reagents, the organic phase was washed with about 40 ml deionized water and then the organic phase was transferred to the short column filled with silica gel-Florisil-anhydrous $NaSO_4$ which was washed with 10 ml hexane for desiccation and purification, and then the column was washed with 10ml hexane. The washing liquid was concentrated to 1 ml in the flow of nitrogen, and then 1 L sample was GC-QSIL-FPD analyzed.

4．Contrastive analysis of the test results [6]

4.1 Contrastive analysis of the test results of water samples

The contrastive testing results of the organotin content in the samples analyzed in2005 and 2008 are shown in Table 2. No organotin was detected in the sites. The cause of the results were considered as the hydrodynamic action and degradation of the organotin in the surface water according to the analysis, and this can not truly reflect the organotin pollution of local waters [7]. The hydrodynamic conditions of the surface water in every port were better due to the ocean tide and the surface wind, so the exchange capacity of the sea water and the diffusion velocity of the organotin in sea water were better as a result[8]. Though the samples were collected from the surface water of the sea area in the ports, the actual water samples did not have the true representation because of the exchanging action [9]. Secondly, the organotin of the surface water was easily degradable mainly because of the ultraviolet light degradation、biodegradation and chemical degradation [10].

SITE	MBT: (ng/L) 2005/2008	DBT: 2005/2008 (ng/L)	TBT: 2005/2008 (ng/L)
1	nd/nd	nd/nd	nd/nd
2	nd/nd	nd/nd	nd/nd
3	nd/nd	nd/nd	nd/nd
4	nd/nd	nd/nd	nd/nd
5	nd/nd	nd/nd	nd/nd
6	nd/nd	nd/nd	nd/nd
7	nd/nd	nd/nd	nd/nd

Table 2. Comparative Analysis of Organotin Content of Surface Water From the Main Ports in Bohai Sea in 2005 and 2008

4.2 Contrastive analysis of the test results of sediments

The organotin pollution of sediment can reflect the organotin pollution of the sea area well according to the above research, so the emphases of the contrastive analysis of this research is focused on the changes of the organotin content of the sediment from 2005 to 2008. We got the contrastive results as shown in Table 3.

SITE	MBT: (ng/g) 2005/2008	DBT: (ng/g) 2005/2008	TBT: (ng/g) 2005/2008
1	339.13/nd	nd/nd	nd/nd
2	456.17/17.03	nd/43.89	6.30/125.36
3	644.87/nd	nd/nd	6.51/4.92
4	707.31/nd	nd/6.54	nd/6.43
5	1434.57/nd	nd/nd	36.30/8.39
6	203.2/nd	nd/5.01	26．0/3.24
7	89.6/nd	nd/4.94	11.0/3.69

Table 3. Comparative Analysis of Organotin Content of the Sediment From the Main Ports in Bohai Sea in 2005 and 2008

A. Analysis of every site

SITE 1 (Bayuquan Port): No TBT and DBT was detected twice, but the MBT content varied greatly, from 339.13 ng/g to nd. The organotin content of Bayuquan port has a downward trend as shown in this research. The Bayuquan port is developing fast in recent years and became a through port of hundred million tons in 2007, but the organotin content of this port has a downward trend and this indicates that the retroactive effect of AFS convention has already played a significantly restrictive role in organotin pollution control. It is not allowed to use organotin compounds in the anti-fouling systems of ships from January 1, 2003 according to the bulletin issued by the Ministry of Communications of China in 2003 named “Organotin compounds served as the pesticide should not been used in the anti-fouling systems of ships”.

SITE 2 (Tianjin Port): The TBT content ascends from 6.30 ng/g to 125.36 ng/g and the DBT content ascends from nd to 43.89 ng/g, but the MBT content drops from 456.17 ng/g to 17.03 ng/g. We can see that the organotin content of Tianjin port presents an upward trend, which has the biggest increase among all the sites, and the increase of the TBT content is large as the result shows. Although Tianjin port has been developing fast in recent years, the terrestrial pollution sources were the main reasons for the increase of organotin content in the surrounding sea water of Tianjin port according to our analysis and in combination with the changes of the organotin pollution caused by ships in other ports in recent years.

SITE 3 (Yantai Port): The TBT content dropped from 6.51 ng/g to 4.92 ng/g and no DBT was detected, the MBT content dropped from 644.87 ng/g to nd. The developing velocity of Yantai port is also very fast in recent years and it is close to be a hundred million ton harbor in 2007, but the overall TBT content of this port has a downward trend, the cause was the same as that of Bayuquan port.

SITE 4 (Qinhuangdao Port): The TBT content increased from nd to 6.43 ng/g and the DBT content increased from nd to 6.54 ng/g, but the MBT content dropped from 707.31 ng/g to nd. According to the analysis, the organotin pollution of the port may be associated with the use of the anti-fouling paint in the ships, because the Qinhuangdao port is the largest coal exporting port. The organotin content of Qinhuangdao port increased accompanied with the increase of the throughput in recent years.

SITE 5 (Shanhaiguan Shipyard): The TBT content drops from36.30 ng/g to 8.39 ng/g and no DBT was detected twice, the MBT content dropped from 1434.57 ng/g to nd. Shipyards are always seriously

organotin polluted, but the organotin content of the Shanhaiguan Shipyard has a downward trend according to the contrastive analysis of organotin content between 2005 and 2008, which further indicates that the product structure of the anti-fouling paint used on ships has been rectified greatly and the proportion of organotin compounds in anti-foul paint decreased evidently at present in China.
SITE 6, 7 (Dalian Port): The TBT content dropped from 18.5 ng/g to 3.47 ng/g , the DBT content increased from nd to 4.98 ng/g , the MBT content dropped from 146.4 ng/g to nd. This pattern of Dalian Port is similar to that of Bayuquan Port and Yantai Port, which indicates that the organotin pollution caused by the use of anti-fouling paint on ships decreases evidently.
B. Overall analysis
Through the above-mentioned analysis of the sediment of every site, the organotin content of the main ports in Bohai Sea shows the following patterns:
(1) The overall organotin content of the ports is decreasing. This downward trend indicates that the ingredient of anti-fouling paint used on ships in China and in the world has been changed due to the constraints of the convention and the related regulations issued by the Ministry of Communications of China in 2003. This created a favorable condition for the implementation of the AFS convention.
(2) The organotin content of the ports depends not only on the sea-borne pollution, but to a great extent also on the terrestrial source pollution. Therefore, in order to protect the water environment from organotin pollution, not only the sea-borne pollution but also the related terrestrial and water environment source pollution should be limited.
(3) The organotin content of every port indicates that the emphasis on the current AFS convention of every shipping corporation is different.

5. Conclusion

According to the contrastive analysis, the organotin pollution of the Bohai Sea water environment in China can be concluded as following:
(1) The organotin content of the surface water from the main ports in Bohai Sea is lower than the detection limit. The hydrodynamic effect and degradation of the surface water have a great influence on the organotin content.
(2) The detection rate of the organotin pollutant in the sediment of the main ports in Bohai Sea reaches to 86% and the organotin content is generally higher than the detection limit and the organotin residue standards established by the developed countries, which indicates that the organotin pollution of the Bohai Sea water environment still exists and is very serious in some ports.
(3) In recent years, the overall organotin content of the ports has been decreasing. This downward trend indicates that the ingredient of anti-fouling paint used on ships in China and in the world has been changed and has created favorable condition for the retroactive application of the convention and the domestic related regulation.
(4) The organotin content of the ports depends not only on the sea-borne pollution, but to a great extent also on the terrestrial source.

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Hydrogen Based Shipping Industry

Yaqub M. Amani
PhD, Professor of Electrical Engineering
State University of New York, Maritime College
yamani@sunymaritime.edu

Abstract With environmentally clean ocean going vessels becoming a requirement for future generations of cargo and other types of ships, the maritime industry is interested in hydrogen as potential fuel for future technologies. An advanced system used to create a viable shipping economy based on hydrogen is the subject of this paper. The combined use of tidal, wind, wave and solar energy for generating electricity will provide sufficient power to generate hydrogen to use as fuel for ships.

Keyword: *hydrogen, ships, maritime industry, cargo, renewable, sustainability*

1. Introduction

Historically, the shipping industry relied on wind power for commerce. Large sail boats carried goods from Asia to Europe and other destinations. The Industrial Revolution and subsequent trade expansion by end of twentieth century resulted in the creation and use of powerful cargo ships and tankers to carry goods between continents. Although this transition from sails to combustion drive was a necessary part of human history and the development of the shipping industry, it is not a sustainable option and contributes to environmental problems that carry consequences for humans and wildlife.

Confidential data from maritime industry insiders indicates that, based on engine size and the quality of fuel, fifteen of the world largest ships may now emit as much pollution as all 760 million cars currently on the road worldwide. Pollution from the world's 90,000 cargo ships has been shown to contribute to 60,000 deaths a year in United States of America alone and costs $330 billion per year in health costs [1]. The average family in US has 110 tons of carbon foot-print, and the average family of four in the rest of the world has a 22-ton carbon footprint. Compare this to a 150' (45.7m) yacht to running for 1000 hours at 12 knots and producing 50 times more of a carbon footprint than the average world family of four! [2] The transportation sector accounts for a large fraction of air pollutant emissions. Health and environmental effects of air pollutants (NOx, CO, VOCs particulates) are leading to stricter restrictions on tailpipe emissions worldwide [5].

These statistics, supported by the fact that transportation and heating contributes about two thirds of all greenhouse gas emissions, make it apparent that that low- or zero- current carbon fuels will be needed to meet future carbon emission reduction goals.

The following statements place emphasis on how important it is to jump start a new era of hydrogen shipping in maritime industry:

"A transition to hydrogen as a major fuel in the next 50 years could fundamentally transform the U.S. energy system, creating opportunities to increase energy security through the use of a variety of domestic energy resources for hydrogen production while reducing environmental impacts, including atmospheric CO_2 emissions and criteria pollutants."

-The National Academies The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D

Needs February 2004
"Imagining the hydrogen energy economy is easy enough for visionaries and dreamers, but ultimately it doesn't happen unless scientists and engineers overcome technical obstacles, entrepreneurs take risks, corporate boards commit capital, and consumers choose. What is remarkable about our efforts is that the visionaries and the pragmatists are working together, in close partnership, to make the hydrogen energy economy a reality."
-David K. Garman, Under Secretary, U.S. DOE May 23, 2005
New pivotal projects such as the Low Power Recreational Fishing Boat presented at International Conference on Ecologic Vehicle and Renewable Energies in 2007[3] and the Small Hydrogen and Solar Boat that uses sails as primary propulsion (July 2008) [3,4 have established a new, economically feasible green options and support the above sentiments. Hydrogen refueling infrastructure demonstrations are now commonly conducted as part of hydrogen vehicle demonstrations. Thousand Palms, California is building a hydrogen refueling station to convert methane to hydrogen using a partial oxidation reformer as part of the California Fuel Cell Partnership. A list of worldwide hydrogen fuel stations is published in reference [6]. The Clean Urban Transport in Europe (CUTE) program is planning demonstrations of 27 hydrogen fuel cell buses in nine European cities, including hydrogen infrastructure demonstrations. The Global Environment Facility is planning demonstrations of 30 fuel cell buses in developing countries. [7] These developments highlight the movement to use new, eco-friendly technologies and apply them to the transportation industry. Many can be translated to the maritime shipping industry. While having undergone reasonable improvements through new technology leading to better fuel economy, maritime shipping still producing an unacceptable amount of waste thereby negatively impacting the environment and contributing to downstream health and sustainability issues. Laying down the foundation for hydrogen based commercial shipping will serve to improve an industry that is in need of drastic change.

I propose the use of small scale underwater tidal generators, wind turbines, wave energy conversion mechanisms and photo-voltaic devices placed along coastal areas to produce electricity and supply energy to hydrogen reformers. The hydrogen produced by many low kilowatts generators can be pumped into large underground storage containers. Hydrogen fuel cell powered boats can stop to be refueled by such hydrogen service stations. These boats are also able to supplement hydrogen fuel by using electricity produced by solar and wind energy on their on board, low scale hydrogen generating plants. This wave of hydrogen 'farming' will not only supply emission free fuel to the shipping industry, it will create a new market that provides jobs to hydrogen 'farmers' along coastal areas. It also provides a new vision for the next generation of small to medium horse power ships produced. It may sound far fetched for application in the near future, but the technology exists for such an endeavor.

Globally, the number of cargo ships and subsequent energy needs are projected to grow rapidly in the next few decades. We have witnessed a rapid rise in the price of oil just a year ago, and continued reliance on carbon fuels for shipping drive technologies will have significant impact on air and water pollution and greenhouse gas emissions,. Fossil fuel supplies are being depleted at an exponential rate and our reliance on foreign fuel supplies is not realistic for the future; therefore, the prospect of shipping fueled by a secure, sustainable energy source is one of great interest to the maritime industry.

2. Hydrogen Based Shipping Technology

A variety of renewable energy sources such as tidal, wind, wave energy and solar power can be used to produce sufficient energy for hydrogen production from water or other reforming technologies. The hydrogen acts as fuel for Proton Membrane Fuel Cell and the output is usable electricity. This energy, combined with electronics, will be used to drive a variable frequency three-phase electric motor as seen in

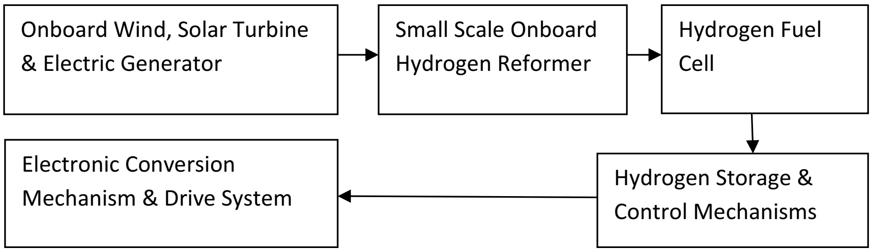


Fig.1 Onboard fuel generation and conversion mechanism and drive system

One notable issue to address is scale weight loss in conversion. For example, an internal combustion car engine (ICEV) of the same size and capacity requires 74% more parts than Hydrogen Fuel Cell engine and is fifty percent more efficient than ICEV. Existing research and software simulations studies suggest new ways to improve on this efficiency.

Classifying vessels by their specific power needs will also aid in determining what is needed to develop a hydrogen based shipping infrastructure. In particular, the locations of fueling ports and development of the ships' drive systems need to be established.

Using technology developed for automobile hydrogen refueling stations and applying it to Marine Energy and Refueling Port (MERP) is feasible, however, more studies need to be conducted to relate the two systems. Here are a few proposed models:

1. The first model is suitable to coastal areas where a hydrogen pipeline is part of an existing infrastructure to bring energy to urban and coastal areas. The MERP's can be integrated into this system and could simply contain small storage and fueling stations.
2. The second model is based on a distributed, small scale local supply for hydrogen shipping. This model encourages complete reliance on renewable energy resources such as tidal, wind, solar and, where available, wave energy.

Marine Energy & Refueling Ports can be non-intrusive, small islands attached to coastal or off-coastal area where maximum energy yields can be harvested from wind, wave and tidal currents. The MERP will house a compatible hydrogen reformer, low pressure hydrogen storage and a fueling station. In addition, these structures should house a vertical axis wind turbine, a vertical axis tidal turbine, photo voltaic panels and the appropriate electronics necessary for control and conversion. The technology needed to create this infrastructure already exists and funding for future development of technologies is readily available.

3. Shore-Side Infrastructure

The Department of Energy (DOE) has made it clear that it intends to make hydrogen the dominant fuel for maritime transportation. The following are statements have been issued by the DOE:

- *Develop large-scale, cost-effective hydrogen production methods that make the cost of hydrogen competitive with gasoline. A significant component of this production must ultimately come from sources that are not dependent on fossil fuels or do not produce carbon emission.*

- *Develop storage methods for hydrogen to provide an adequate capacity for the next generation vehicles.*
- *Develop technologies that use hydrogen efficiently for the wide range of industrial and for hydrogen Transportation."*

In order to demonstrate the feasibility and commercial viability of hydrogen as fuel for commercial maritime shipping industry, we should build a few small floating ports which supports, tidal generators, vertical axis wind turbines and a number of solar panels, a hydrogen reformer, a low pressure hydrogen storage and fueling station. The electric energy generated by solar, tidal and wind will generate electricity to be used for hydrogen production as seen in the diagram below.

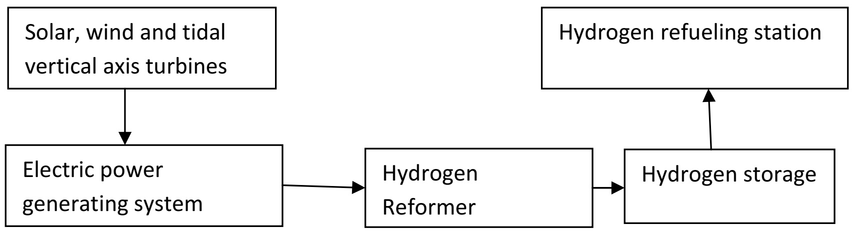


Fig. 2 Marine Energy & Refueling Port

4. Hydrogen Reforming Techniques

Hydrogen is abundant in nature. The best source is water, although the hydrogen density in gasoline, methane and other hydrocarbons are higher. But in the maritime shipping industry water will suffice. To understand the basics for measuring energy related question, let us compare hydrogen to gasoline.

There are different technologies for hydrogen production. Detailed discussion and capacities of hydrogen reformers is addressed in recently published findings [8, 9, 10]. Here is a brief look at most promising technologies that could be utilized in commercial shipping:

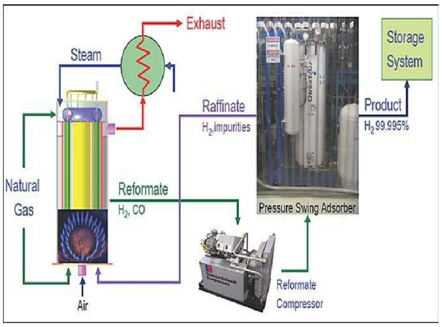
I. Electrolysis is an efficient and emission free method for generating hydrogen. In this process, electricity is used to separate water into its constituent elements (hydrogen and oxygen) by passing an electric current between positively and negatively charged electrodes. The hydrogen and oxygen are isolated from each other after electrolytic reaction using a highly efficient inorganic membrane and then channeled to separate hydrogen and oxygen vessels. This technology produces very pure hydrogen at pressures of 363 psi [9]. Power consumption is 4.8 kilowatts-hour per 10,000liters/hr, which are approximately 167 standard liters/minutes. This amount of hydrogen production is enough to supply fuel to an 8KW (10.7 hp) hydrogen fuel cell. There are reformer units that produce up to 60,000 liters/hr. These units are the size of a typical container (20-ft in length).

II. Methanol cracking technology for hydrogen generation is another on-site, on-demand method. This technology was reported in 2002 [10]. For the production of 1000 Nm^3/h H2 = 16,700liters/minutes from methanol the following utilities are required:
650 kg/h methanol, 360 kg/h de-mineralized water, 13 m^3/h cooling water and 50kW/h of electricity.

This plant will supply hydrogen to twenty one 65 Kilowatts hydrogen fuel cell units

(HyPM-HD65 model). The total power delivered to the vessel will be 1380.8 KW which is equivalent to 1853 horse power per container, sufficient to power ships

III. Steam Reforming Technology operates at higher temperatures 800-900 C. It produces hydrogen at 10-25 bar and requires 0.46Nm^3 methane to produce 1Nm^3 of hydrogen. There are small scale reformers, which works at lower temperatures as well. This process is used for large scale hydrogen production.



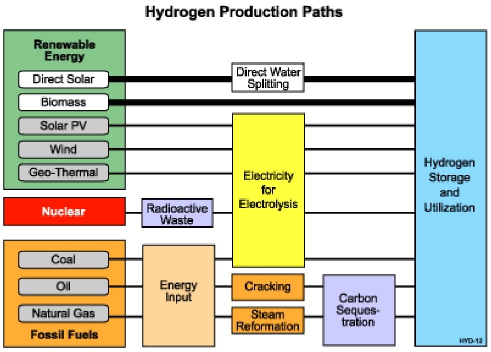


Fig. 3 left- H2 Natural Gas, steam reformer, right- H2 production path ways. Source DOE

This reforming technique could be used to produce hydrogen from other liquid fuels

Methane: $CH4 + H2O + HEAT \rightarrow CO + 3H2$

Propane: $CH8 + 3H2O + HEAT \rightarrow 3CO + 7H2$

Ethanol: $C2H5OH + H2O \rightarrow 2CO + 4H2$

Gasoline $C8H18 + 8H2O + HEAT \rightarrow 8CO + 17H2$

Carbon-monoxide is removed by water-gas shift reaction

$$CO + H2O \rightarrow CO2 + H2$$

The goal set by DOE for \$2-\$3 per gallon of gasoline equivalent (gge) for hydrogen will be achieved [11]. There is no doubt that if small scale reforming facilities mainly using electrolysis are in placed along coastal areas, the combination of wind, wave, solar and tidal energies could produce hydrogen at lower prices.

Hydrogen Storage

Hydrogen storage is critical for use in transportation. The storage of hydrogen is one the most contentious topics in debate about the safety of hydrogen based shipping industry. The sooner we could come to a conclusion on this subject, the better it is for all sides in this debate. There are compact safe storage tanks built for cars and buses currently in use. The hydrogen storage tank designed and manufactured by Quantum Storage, a California based company, is used in the GM Sequel, the NASA Helios Plane and many other automobiles. These light weight storage tanks give GM cars a range of 300 miles per filling. There are other trends in hydrogen storage research and developments which could revolutionize transportation sectors. These technologies include: hydrogen storage in magnesium clusters [12], micro-porous metal-organic structures [13], and carbon nano tubes [14].The status of storage technology and final goals put forth by DOE are well documented in [15]. There are many other studies on hydrogen storage techniques and technologies. Here are a few described by the DOE:

Compressed tanks [5000 psi (~35 MPa) and 10,000 psi (~70 MPa)] have been certified worldwide according to ISO 11439 (Europe), NGV-2 (U.S.), and Reijikijun Betten (Iceland) standards and approved by TUV (Germany) and The High-Pressure Gas Safety Institute of Japan (KHK). Tanks have been demonstrated in several prototype fuel cell vehicles and are commercially available. Composite, 10,000-psi tanks have demonstrated a 2.35 safety factor (23,500 psi burst pressure) as required by the European Integrated Hydrogen Project specifications. The energy density of hydrogen can be improved by storing hydrogen in a liquid state. However, the issues with LH_2 tanks are hydrogen boil-off, the energy required for hydrogen liquefaction, volume, weight, and tank cost. The energy requirement for hydrogen liquefaction is high; typically, 30% of the heating value of hydrogen is required for liquefaction. New approaches that can lower these energy requirements and thus the cost of liquefaction are needed. Hydrogen boil-off must be minimized or eliminated for cost, efficiency, and vehicle-range considerations, as well as for safety considerations when vehicles are parked in confined spaces. Insulation is required for LH_2 tanks, and this reduces system gravimetric and volumetric capacity. Liquid hydrogen (LH_2) tanks can store more hydrogen in a given volume than compressed gas tanks. The volumetric capacity of liquid hydrogen is 0.070 kg/L, compared to 0.030 kg/L for 10,000-psi gas tanks. Liquid tanks are being demonstrated in hydrogen-powered vehicles, and a hybrid tank concept combining both high-pressure gaseous and cryogenic storage is being studied. These hybrid (cryo-compressed tanks) insulated pressure vessels are lighter than hydrides and more compact than ambient-temperature, high-pressure vessels. Because the temperatures required are not as low as for liquid hydrogen, there is less of an energy penalty for liquefaction and less evaporative losses than for liquid hydrogen tanks.

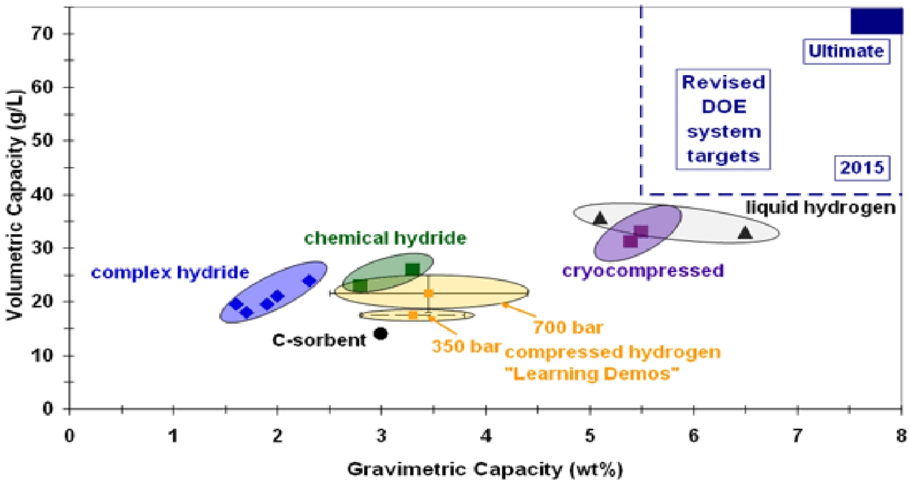


Fig. 4 Hydrogen Storage status

5. Proton Exchange Membrane Fuel Cells (PEM)

The hydrogen fuel cell is the heart of this technology. It converts hydrogen to electricity. There are many types of fuel cells [16]. This technology was invented by General Electric in the 1950s and was used by NASA to provide power for the Gemini space project. It is now the fuel cell type auto companies consider to be the most promising replacement for the internal combustion engine. PEM fuel cells are also known as Polymer Electrolyte Membrane, solid polymer electrolyte and polymer electrolyte fuel cells. In the PEM fuel cell, the electrolyte is a thin polymer which is permeable to protons, but does not conduct electrons. The electrodes are typically made from carbon. Hydrogen flows into the fuel cell on to the anode and is split into hydrogen ions (protons) and electrons. The hydrogen ions permeate across the electrolyte to the cathode, while the electrons flow through an external circuit and provide power. Oxygen, in the form of air, is supplied to the cathode and this combines with the electrons and the hydrogen ions to produce water. PEM cells operate at a temperature of around 80°C. At this low temperature the electrochemical reactions would normally occur very slowly so they are catalyzed by a thin layer of platinum on each electrode. This electrode/electrolyte unit is called a Membrane Electrode Assembly (MEA) and it is sandwiched between two field flow plates to create a fuel cell. These plates contain grooves to channel the fuel to the electrodes and also conduct electrons out of the assembly. Each cell produces around 0.7 volt to run a light emitting diode, in contrast to around 300 volts needed to run a car. In order to generate a higher voltage, a number of individual cells are combined in series to form a structure known as a fuel cell stack. PEM fuel cells have a number of attributes that make them ideal candidates for use in automotive applications and small domestic applications, such as replacements for rechargeable batteries. They operate at relatively low temperatures which allow them to start up rapidly from cold and have a high power density which makes them relatively compact. In addition, PEM cells work at high efficiencies, producing around 40-60 per cent of the maximum theoretical voltage, and can vary their output quickly to meet shifts in power demand. There are many companies offering fuel cells ranging from low kilowatts to 250 kW fuel cell units. Department of energy lists the following reforming techniques, as leading technology to be implemented: [17, 18]

Alkaline (AFC)	10-100 KW
Phosphoric acid	250 KW modules
PEM	250 KW modules
Molten carbonate	250 KW modules up to 1 MW
Solid oxide	up to 3MW

Studies show that the price of fuel cells will dramatically fall and will be comparable to \$30/kW, the price for ICE. The studies also point to the fact that in many cases hydrogen fuel cell technology surpasses goals set by DOE.

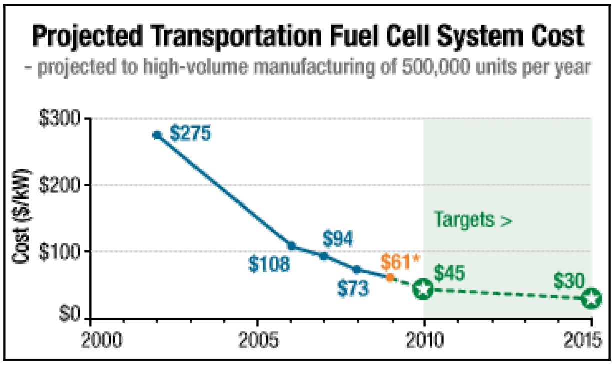


Fig. 5

6. The Drive System

The diagram below depicts all necessary control and drive mechanism. The output of the fuel cells is fed into inverters and transformers to produce high voltage variable frequency power for a synchronous three-phase motor. A typical drive system will be compromised of the components depicted in fig. (6)

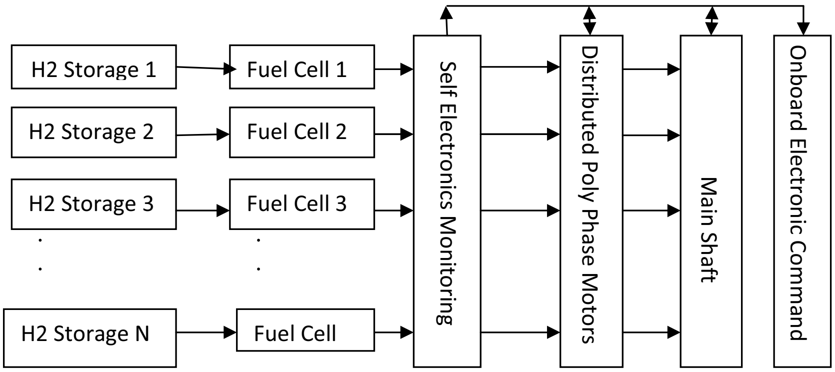


Fig. 6 Drive System

The idea here is to design a distributed storage, fuel cell and motor drive system. Sections of the main shaft will serve as the rotors of multiple stators of the three phase motors, which deliver power to the ship. Each section will have a separate fuel cell and hydrogen supply. The use of three phase or multi-phase motors will allow the bridge operator to supply torque on demand and therefore increase the system efficiency. The human operator will be complemented by an electronic auto pilot. Each motor has an independent fuel cell, electronic conversion mechanism and hydrogen generating unit . The individual drive station will have Self Electronic Monitoring Unit (SEMU) and reports the operating characteristics to an Onboard Electronic Command Unit (OBECU).

The challenge is up to naval architects to design a hydro and aerodynamic cargo ships, with double hulls. This will serve two purposes. First it will house the cover while the cargo ship is loading and unloading. Second, it will further provide protection in case of accidents and promotes safe shipping. The aerodynamic cover serves as holding surface for high efficiency solar panel and will be retrieved to the spacing between hulls while in port. Once the cargo ship leaves the port the photo-voltaic surfaces will generate some power to support on board hydrogen production.

Cost analysis

At this point the only reference for commercial shipping we have is the energy balance. One gallon of gasoline is equivalent to approximately 120,000 BTU and hydrogen produces 116, 000/kg. It could be estimated that the price of one million BTU is about \$8-\$9 in US, assuming one US dollar per gallon of gasoline. Hydrogen production by means of electrolyses is the cleanest and the cost will be \$20/million BTU and \$28/million BTU including liquefying process and storage costs. Most of the cost is the cost of electricity which we estimated at \$0.045/kWh. If wind, wave and tidal energies are used to produce electricity, the price will drop to \$13/million BTU, and the environment will not be polluted by the 2.9 kg /1Nm3 of CO_2 produced if fossil fuel is used for generating electricity. If we look at the larger picture of hydrogen shipping economy versus fossil fuel, it becomes clear that after adding carbon tax and health care costs, the move towards a hydrogen economy make sense.

There is no cost analysis for the shipping using hydrogen as fuel, but there are extensive studies related to land transportation [14, 15]. They show fuel options for cars and discusses different options and detailed analysis of:

a. Extra vehicle cost
b. Fuel cost
c. Infra-structure investment cost
d. Air pollution on local level
e. Greenhouse emissions
f. Oil imports/ national security
g. Long term sustainability

The paper considers three options for hydrogen fuel used in cars.

1. Direct hydrogen fuel cell vehicle
2. Gasoline partial oxidation Fuel cell vehicle
3. Methanol FCV

7. Conclusion and Recommendations

(1) It is clear that there is a need for new ships to use alternative energy resources. This need is based not only on environmental considerations, but on security considerations and inadequate fossil fuel supply.

(2) Hydrogen is the future fuel, based on the latest advances in fuel cell design and hydrogen reforming techniques. There are many options for hydrogen reforming. Research shows that on-site, on-demand hydrogen production is not just a vision for future, but it is a reality. More research is needed to miniaturize the hydrogen production facilities. The trend in cost of hydrogen will go down as the capacity of hydrogen generating stations increases. There are many hydrogen fueling stations in operation and researchers are working to improve the efficiency of hydrogen production using solar energy for methanol based fueling stations. Many such stations are functioning in Europe, and some has been installed in California.

(3)Collaboration among marine engineers, electrical engineers, naval architects and hydrogen related specialists is the key to initiate a vigorous debate and construct a cargo ship with onboard hydrogen generating station, fuel cells, photovoltaic panels and electric motors. There are safe storage devices for hydrogen, so the ship could be designed to have its own hydrogen storage instead of carbon based fuels.
(4)Organizations and groups should be formed to establish worldwide standards and criteria for shipping, parallel to Department of Energy DOE and International Energy Agency (IEA) components destined to be used on hydrogen commercial marine ships and Marine Energy & Refueling Ports.

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The sustainable development strategy impact on maritime transport in the EU

Adam Przybylowski
Ph. D., Gdynia Maritime University, adam@am.gdynia.pl

Abstract The effects of globalisation, geography and history make maritime transport the most important transport mode in developing EU trade for the foreseeable future. The Commission, the Member States and the European maritime industry should be working together towards the long-term objective of "zero-waste, zero-emissions". The common transport policy favours the development of the maritime transport as one of the environmental friendly modes of transport in compliance with the idea of sustainable development (Lisbon and Goeteborg Strategies). The EU, through a set of political actions, legal and financial instruments, promotes intermodal transport and creation of motorways of the seas. The paper presents the impact of the sustainable development concept on the EU transport policy that is to enhance the development of an overall maritime policy which combines an integrated, cross-sector approach with effective policy co-ordination and common action. One of the most important issues is the so-called Greener Maritime Transport, i.e. promotion of green solutions in maritime transport.

Keyword: *Sustainable development strategy, EU, maritime transport*

1. Introduction

The EU is one of the most active promoters of the idea of sustainable development all over the world. The goals of the EU transport policy stem from the guidelines for development strategies set out at the level of the European Community. The most significant EU strategic documents include the Lisbon Strategy and the Goeteborg Strategy. The former emphasises the necessity to increase the competitiveness of the European area, whereas the latter draws attention to ensuring sustainable development of this area [1]. The implementation of the sectoral transport policy (as well as of other Community policies) is supported by the EU horizontal cohesion policy, especially through structural funds and the Cohesion Fund. In its transport policy the EU aims at changing the demand pattern through shifting potential demand from the road transport sector towards the rail, inland waterway and sea transport – short-distance shipping as well as promoting combined transport and public transport. Such solutions are more environmentally friendly, thus helping pursue sustainable development.

2. The vision of Sustainable Development

The most frequently quoted definition of sustainable development is from *Our Common Future*, also known as the Brundtland Report: [2]
"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- *the concept of **needs**, in particular the essential needs of the world's poor, to which overriding priority should be given; and*
- *the idea of **limitations** imposed by the state of technology and social organization on the environment's ability to meet present and future needs."*

Following Dourojeanni (1993) it is possible to graphically represent (Fig. 1) the achievement of sustainable development by the simultaneous attainment of three objectives: environmental and natural resource sustainability, economic growth and social equity.

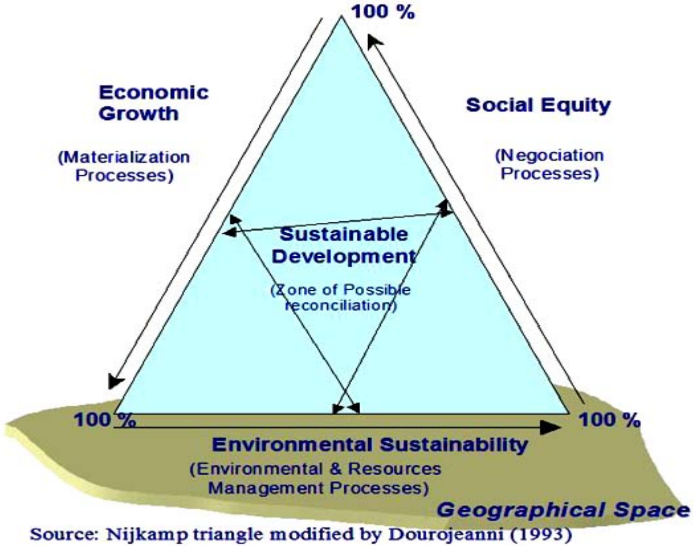

Fig. 1 Sustainable Development triangle [3,4].

The attainment of environmental sustainability refers to the balance between the human rate of use of the environment and its resources, with natural resources rates of growth and environmental resilience [2]. In similar terms, the attainment of economic growth is related, among other things, to the generation of employment, food, income and wealth (net economic benefits). Social equity refers to the need to give due consideration to the need to generate equal opportunities among people (generational, gender, cultures) to have access to the natural resources base for its use and to the wealth generated. Therefore, the attainment of sustainable development implies the balance between these three objectives or, in other words, to their simultaneous achievement.

According to the Division for Sustainable Development from the United Nations' Department of Economic and Social Affairs, transportation is expected to be the major driving force behind a growing world demand for energy [5]. It is the largest end-use of energy in developed countries and the fastest growing one in most developing countries. Furthermore, adequate, efficient, and effective transport systems are important for access to markets, employment, education and basic services critical to poverty alleviation. Current patterns of transportation development are not sustainable and may compound both environmental and health problems.

Therefore, there is a need for urgent action, ranging, inter alia, from the promotion of integrated transport policies and plans, the accelerated phase-out of leaded gasoline, the promotion of voluntary guidelines and the development of partnerships at the national level for strengthening transport infrastructure, promoting and supporting the use of non-motorised transport and developing innovative mass transit schemes. The international co-operation is required in order to ensure transport systems support sustainable development. The efficient and affordable transport systems are necessary for poverty alleviation and the need to mitigate adverse externalities to health and the environment. Countries all over the world should support greater use of public and non-motorized transport and promote an integrated approach to policy making including policies and planning for land use, infrastructure, public transport systems and goods delivery networks, with a view to providing safe, affordable and efficient transportation, increasing energy efficiency, reducing pollution, reducing congestion, reducing adverse health effects and limiting urban sprawl [5].

Climate change is the most pressing global environmental challenge, and one that calls for major efforts and active steps on the part of industrialised countries, in line with their common and differentiated responsibilities, as well as working in conjunction with transition and developing

countries. Any such action must be taken within the framework of the UN Framework Convention on Climate Change (UNFCCC). There is a need of the full integration of the commitments made by the EU Member States with regard to the Kyoto Protocol and, beyond that, the definition of quantified objectives for reducing greenhouse gas emissions in accordance with the decisions taken by the European Council and the Environment Council in March 2005 - namely to reduce such emissions by between 15 and 30% by 2020 and by between 60 and 80% by 2050, compared with the levels measured in 1990.
From an environmental and social point of view, the failure to unhitch growth in transport from growth in GDP is an extremely worrying tendency, which the Sustainable Development Strategy neglected to redress. The development of road traffic, prompted by new strategic choices by companies geared towards flexibility, just-in-time production and ease of operation by employing a cheap, flexible workforce, poses serious threats in several respects (including congestion, emissions of CO_2 and micro-particles, and safety). The new guidelines on trans-European networks adopted by the Council in December 2003 go some way towards meeting the crucial objective of switching traffic from road to rail and maritime transport networks. However, according to The European Trade Union Confederation (ETUC), the marked improvements are needed with respect to studies investigating the impact of such projects on jobs and on the environment [6].

3. EU transport policy

3.1. Goals of the EU transport policy

The updated transport policy goals are based on two assumptions:
- mobility is the key to Europe's prosperity and the free movement of its citizens;
- the negative effects of this mobility, i.e. energy consumption and the impact on health and the environment, must be reduced.

The functioning of common transport policy instruments brought about many positive EU-wide changes, for instance: [7]

- improvement of the quality of services provided and a wider offer of the form and mode of transport,
- reduced costs of transport and a decrease in prices of goods at the Community level, which limited inflation and stimulated exports and investment as well as stabilising the economies of EU Member States,
- improvement of the economic and spatial cohesion of certain parts of the Community,
- improvement of social mobility, resulting in greater labour market flexibility,
- ongoing standardisation of transport equipment and techniques, the development of modern methods and technologies as well as of intelligent traffic management (e.g. interoperability, telematics, the Galileo satellite navigation system).

Solely efficient transport sector provided with modern infrastructure and effective market mechanisms can guarantee necessary level of mobility of goods and people. Nowadays, in the age of globalisation and existing highly competitive world economic environment, the mobility is getting essential to the EU's economies and communities. It is key to higher quality of life and welfare as well as fundamental for enhancing EU's competitiveness and vital to achieving the goals of the EU's ambitious strategies for growth and employment. The mobility, directly connected with the economic expansion (rise of GDP), has been growing in the EU rapidly since the mid of 90s. Goods transport rose ca. 2.8% per year (1995-2006), i.e. more dynamic than GDP did and passenger transport ca. 1.7% per year in the same period.
As a result goods and passenger transport grew by 33% and 18% respectively at that time and what is more, this dynamic growth is envisaged to continue in the next decade (see fig. 2).

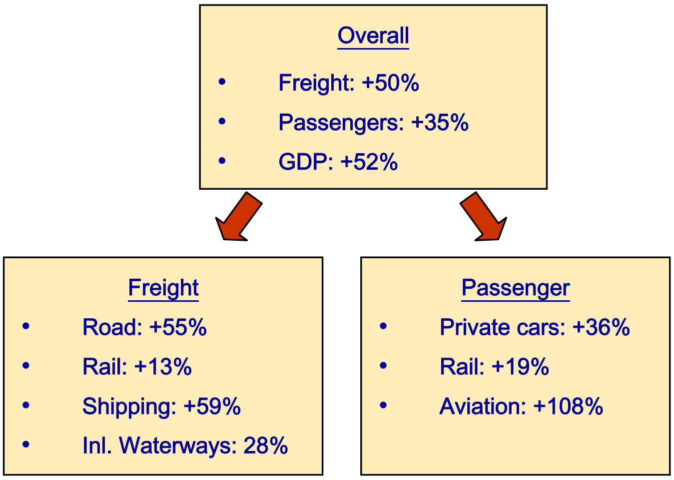

Fig. 2 Most likely 2000-2020 growth in transport demand in EU27 [9].

Characteristic trademark of the UE high mobility is, however, relatively outsize share of road transport in the existing modal split. It accounts for 45,6 % in the servicing of total transport demand, whereas rail accounts for 10.5%, inland waterways contribute 3.3% and oil pipelines add another 3.2%. Maritime transport then accounts for 37.3% and air transport for 0.1% of the total traffic (all referring to the EU27 in 2006).

As a result of currently formed modal split in the EU's transport sector, and as predicted realistically by 2020 (fig. 2), no chance for any shift in it towards the more environmentally friendly modes of transport such as rail and inland waterways, reaching the set up transport policy's objective is thoroughly impossible. When this tendency is followed-up, sustainable mobility by still rapidly growing transport activity will even dash away. For, sustainable mobility this means disconnecting mobility from its many harmful effects for the economy, society and environment [10].

3.2. External and social costs of mobility

The emissions of many hazardous gases and substances, that threaten seriously human health, lower significantly local environment quality, as well as noise emissions, heavy congestions, accidents and many other inconvenient burdens and nuisances generated by transport activities (so called negative externalities) are not directly born by transport users. They have to pay currently only costs that are directly related to the scale of the use of their mode of transport, i.e. fuel costs, insurance, wages, salaries, amortisation and other capital costs, etc.. Such costs are regarded to be private in that sense, they are born directly by the users. As opposed to them, the external costs generated by the users as well, as the costs accompanied any kind of mobility, are borne by communities and economies (states and their citizens).

The sum of the users' direct costs (private ones) and external costs of mobility give its social costs. Exclusively the total social costs caused by the transport users need to constitute the real base for the transport prises. Consequently, incorporating external costs into users' direct costs, i.e. estimating social transport cost as a keystone for charging in transport sector, especially as the basis for future right calculations of infrastructure charges, policy makers shall meet the transport policy goal, aimed at creation an effective transport pricing system that is more efficient than exiting one and can more accurately reflect the true costs involved by mobility. Alone such transport charges can give the right and optimal from the macroeconomic point of view price signals to the providers and consumers of transport services and take account of the real needs of the services used as well as consumption of scarce resources (sc. scarcity prises).

New, realistic transport prices mechanism is expected to improve the efficiency of infrastructure use, reducing the need for new investments and all at once needs to create strong incentives for users to

switch to clean vehicles, speed up technological innovation and use advanced logistics transport solutions. Getting in such a way the transport prices right, that is to say that users will bear the full costs they create and subsequently will thus have an clear incentive to change their market behaviour and the whole medium and long run decision making process in order to reduce those costs [10].
Transforming this main paradigm of sustainable mobility into practice means, that in the EU, internalisation of external costs has to be effected as soon as possible. Such necessary and unavoidable solutions was indicated in the EU's White Papers on sustainable transport policy (1992, 1998, 2001), many reports, e.g. 2006 Mid-term report, issued by the European Commission (EC), its communications, and laid down in numerous directives and regulations closely connected with Community's environmental policy. The EC, being aware of existing market failures and huge external costs borne by society, estimated at minimum 5% of EU27 GDP (€12,276 bill. in 2007), has accelerated its efforts since the mid of this decade to internalise external costs and reach the transport policy goals by making transport system "greener and more sustainable" as it is [10].
The EC, adopted its Greening Transport Package (GTP) on 8th July 2008, aimed at meeting the general EU transport policy objective set in its White Paper of September 2001. GTP's essential goal is to promote the sustainable development of the transport systems by minimising their negative impacts on economy, society, environment and spatial order. The package consists of a few documents and a great deal of initiatives proposed in connection with its main goals.
First, GTP provides a common framework for estimating the external costs of transport activities. It is based on best practices suggesting methodology and producing a handbook with reference values that can be used for th estimation of external costs. This part of the package guides us how to use these values at assessing external costs in the transport sector. Second, there comes a strategy that sets out how external costs can be internalised in all modes of transport. The strategy is both mode and impact specific. It means that the European Commission has taken into account the fact that the level of possible impact on environment and society can vary depending on the transport mode, a particular/particularly place and time (like in case of noise and congestion) or stay unlikely of these conditions (e.g. greenhouse gas emissions).
The EC is about to succeed in internalising the external costs and achieve its policy goals set in GTP by using mainly economic instruments, such as charges, taxes and emission trading schemas. These instruments are regarded to be efficient enough to make all forms of mobility more sustainable. They are strong enough to stimulate transport users to switch to cleaner vehicles and to use more advanced technology as well as less congested infrastructure, or to avoid travelling at traffic peaks too. This concept will apply to all modes of transport [10].
The European Council addressed the problem of greenhouse gas emissions produced by maritime transport already in March 2007. The Commission intends to include this transport sector in the post-2012 agreement on preventing climate change and would also like the International Maritime Organisation to develop a series of measures in 2009 to reduce greenhouse gas emissions. If the IMO fails to make sufficient progress in this area, the Commission is determined to propose taking action on the European level. One of the considered options is the inclusion of maritime transport in the EU Emissions Trading System. It is therefore crucial that the strategy for maritime sector be developed in line with the new European integrated maritime policy.

4. Challenges for maritime transport development in the EU

Shipping has contributed largely to economic growth and prosperity all along the European history. The maritime transport system is at the forefront of the globalisation process and has provided, despite the temporary economic downturn, the vehicle for an unprecedented growth of world trade and industrial and commercial interconnections in the world economy. In terms of volume, 90% of the freight exchanges of Europe with the rest of the world are seaborne. Maritime transport services, including off-shore activities, are essential for helping European companies compete globally. Among EU Member States, short sea shipping is a key element in reducing congestion, ensuring territorial cohesion and promoting the sustainable development of the European continent. With more than 400 million sea passengers a year travelling through European ports (fig. 3), passenger ships and ferry services have a direct impact on the quality of life of citizens in islands and peripheral regions [11].

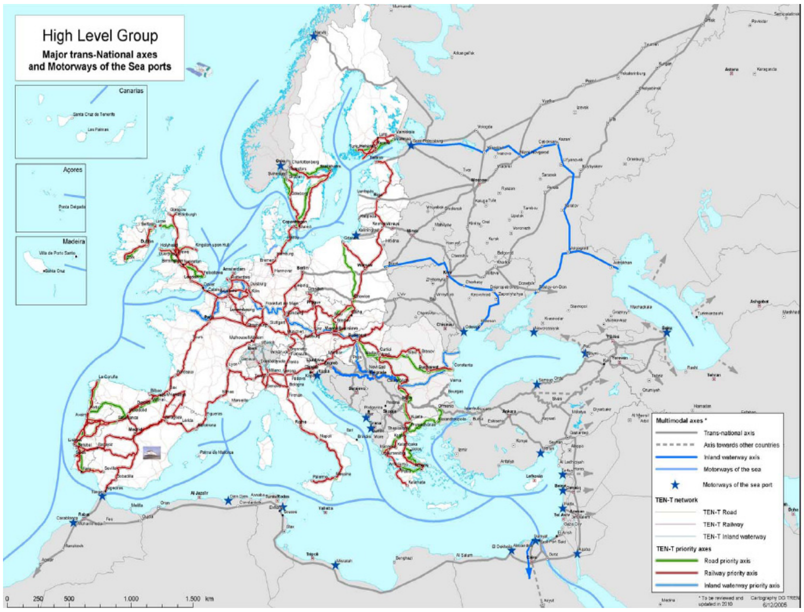

Fig. 3 Seaports and Motorways of the Sea in the EU [12].

Shipping represents one of Europe's largest export industries, providing deep sea transport services between Europe and the rest of the world, as well as in cross trades between third countries. European shipping is present in all segments of the sector in all regions of the planet. Transport of freight and passengers at sea generated € 24.7 billion in 2006 as a net contribution to the EU balance of payments. In terms of added value, traditional maritime sectors represent a share of 1.09% in the total GDP of the EU-27 and Norway. Maritime transport activities' related employment in Europe amounts to 1.5 million people. Some 70% of shipping related jobs are onshore – in shipbuilding, naval architecture, science, engineering, electronics, cargo-handling and logistics.[11]

As regards challenges and opportunities for maritime transport, the crisis of the international financial system, its impact on the real economy and the sluggish recovery prospects in different parts of the world have affected seaborne trade and thus the different branches of the shipping industry.

Moreover, recent developments in the energy markets, including the cut of pipelines for gas supplies, have underlined the strategic importance of LNG tanker-ships for ensuring a stable and long-term solution to guarantee reliable energy supplies to the EU. In a wider context, those developments remind the importance of the fleet, in all its branches of activity, for the well being of the European citizens and of the European economy as a whole.

Operators involved in the provision of maritime transport services and the European maritime transport as such will face significant challenges in the years to come. They will have to cope with the fluctuations in sea-borne trade, the negative impact of the financial crisis and other external factors, such as the risk of overcapacity in certain market segments, the rise of protectionist measures affecting world trade, environmental concerns related to climate change, volatility in energy and other commodities markets and loss of European maritime know-how because of the scarcity of skilled human resources.

Moreover, competitive advantages given by third countries to shipping businesses entail a real risk of de-localisation of head offices and maritime industries outside Europe. Often the position of European operators is undermined by unfair competition, which results from lax enforcement of safety, security, environmental and social standards in certain parts of the world. Achieving effective governance of maritime affairs and an international fair level playing field for maritime transport remains a crucial challenge to the global community.

The EU's sustainable transport policy aims at addressing the economic, social and environmental needs of our society. An efficient maritime transportation system is essential for Europe's prosperity, having significant impacts on economic growth, social development and the environment.
In autumn 2007, after having consulted the main stakeholders of the sector, the Commission started a strategic review of the EU's integrated maritime policy, examining also the challenges European and international maritime transport will face in the next ten years. This work has included the conduct of a prospective study analysing trends and signals of change in the maritime sector (the so-called 'shipping scenarios' for 2018). It has also involved consultation with experts from maritime administrations in the Member States and Norway, as well as advice from a group of senior industry leaders representing different interests within the maritime transport industries. Two major issues guided the reflection:

- By 2018, European shipping transport services should be at least as efficient, reliable and sustainable as today. There should be sufficient transport capacity available and the port and port hinterland capacities should be able to cope with increased cargo volumes.
- By 2018, the shipping industry should be at least as competitive as today, and have an equally strong or better position on the global markets.

Several important conclusions come from this strategic review exercise. First of all, the recovery of the world economy from the current financial crisis would lead to a growth in international trade and will require a maritime transport system able to deliver advanced logistic solutions. Moreover, in a recession period, short sea shipping is a perfect vehicle for stimulating intra-EU trade exchanges and thus supporting recovery of growth in the EU and its neighbouring countries. Overall, the next ten years may offer a unique opportunity to reinforce the competitiveness of European shipping, and to strengthen its contribution to the objectives of a sustainable European transport policy.
The strategic recommendations concern seven main issues [11]:

1. Competitive European shipping: The priority is to achieve and maintain an attractive framework for quality shipping and quality operators in Europe including financial measures. This will help maritime transport achieve sustainable development goals. Such a framework would also help the sector adapt to adverse financial conditions and to the slow-down in growth of the world's sea-borne trades.
2. Human Factor: There is a genuine European interest in making maritime professions more attractive to young people and thus improving employment of seafarers. Positive measures may include facilitating life-long career prospects in the maritime clusters; enhancing the image of shipping; supporting the work of international organisation (IMO and ILO) on fair treatment of seafarers; and implementing simplification measures which aim at reducing the administrative burden on masters and senior ship officers.
3. Greener Maritime Transport: The EU should encourage all actors to promote green solutions in maritime transport. The Commission, the Member States and the European maritime industry should be working together towards the long-term objective of "zero-waste, zero-emissions". The measures announced in the Greening Transport Package should be fully implemented.
4. A safe and secure system: We should give priority to the enforcement of existing Community and international rules and the speedy implementation of measures introduced with the 3rd maritime safety package. The work already started should be completed by establishing a comprehensive framework for security measures in terms of prevention, reaction capacity and resilience.
5. International Scene: The global challenges faced by the shipping and maritime industries demand convincing answers from the international community. The Commission and the Member States may be a real driving force for change towards a comprehensive international regulatory framework for shipping, adapted to the challenges of the 21st century.
6. Short Sea Shipping and Ports: Further economic integration of the EEA Member States and of the neighbouring countries will have positive impact on maritime transport connections within the EU. It should be noted that sea-trade normally grows even in periods of business contraction. In the 2018 horizon, the European economy should recover from the current stagnation. Positive measures in support of short sea shipping should also help intensify sea-exchanges in all the European maritime façades. These measures will include the creation of a

European Maritime Transport Space without Barriers the full deployment of the Motorways of the Seas but also the implementation of measures for port investment and performance. In all cases, the principles of open markets, fair competition and greening transport should be respected.

7. Innovation and technological development: The competitiveness of the European maritime industries and their capacity to meet the environmental, energy, safety and human challenges is positively influenced by increased efforts in research and innovation. There is wide scope for improving energy efficiency in ships, reducing environmental impact, minimising the risks of accidents or providing better quality of life at sea. In the years to come, innovation and technological research and development in shipping should be further promoted. A framework of reference should be introduced for the deployment of "e-Maritime" services at European and global levels.

For example, The European Maritime Transport Space without Barriers is a concept which extends the Internal Market wider to intra-EU maritime transport through the elimination or the simplification of administrative procedures in intra-EU maritime transport, in order to enhance its attractiveness and reinforce its efficiency and competitiveness, and contribute to a higher protection of environment. To implement this concept, the Commission identified a series of measures, which are described in the parallel Communication "establishing an EU Maritime Transport Space without barriers". Those measures are [12]:

- Elimination of systematic controls and documentary requests by Customs for goods carried by sea between EU ports in line with inland transport. The measure will require a modification of the implementing provision of the Community customs code.
- Concerning the legislation on veterinary and phytosanitary products, guidelines should be adopted in order to speed up the documentary checks in Directives 89/662/EEC , 90/425/EEC and 2000/29/EC .
- Rationalisation of vessel-related and goods-related reporting and forms required by Directives 2002/6/EC (formalities for vessels at the arrival/departure of ports), 2000/59/EC (waste and residue reception), 2002/59/EC (vessel monitoring) and Regulation (EC) N° 725/2004 (maritime security) through a proposal for a directive of the European Parliament and the Council attached to the Communication.

Further enabling measures would also need to be implemented, namely [12]:

- Examining the possibility to grant facilitation to ships sailing between Community ports but making a call in a port located in a third country or a free zone;
- Enhancing the electronic transmission of administrative data through the deployment of e-maritime systems;
- Setting-up an administrative single window;
- Evaluating the feasibility to recognise the equivalence of maritime rules and rules for road/rail for the carriage of dangerous goods in view to facilitate intermodal transport.

In addition, recommendations should be given that Member States implement further enabling measures, each time the local conditions permit to do it in an efficient manner, namely [12]:

- To coordinate the inspections carried out in the ports by the various administrative services;
- To extend the scope of Pilot Exemption Certificates;
- To facilitate administrative communication;
- To create areas in ports dedicated to Short Sea Shipping where that can facilitate the operations for this mode.

The administrative simplification is expected to reduce costs for undertakings and to induce a significant modal shift from land to short sea shipping which will bring environment benefits and reduce energy consumption and greenhouse gases emissions. The benefits for undertakings was estimated at 2.4 billion €, which is probably an underestimated figure as it does not take into account the effect of modal shift.

5. Conclusion

1. Transportation is expected to be the major driving force behind a growing world demand for energy. It is the largest end-use of energy in developed countries and the fastest growing one in most developing countries. The EU has mainstreamed sustainable development into a broad range of its policies. In particular, the EU has taken the lead in the fight against climate change and the promotion of a low-carbon economy.
2. Mobility imposes many harmful costs on the economy and society and also the environment. Because of the negative outcomes of the current modal split in the EU27, there is a need for bearing some of the external transport costs by the market players in order to achieve better sustainability in Europe.
3. The EU policy should combine the competitiveness and employment objectives of the Lisbon agenda with improving the marine environment protection.
4. In its Communication on the EU Maritime Transport Strategy 2018, that is addressed to the European Parliament and the Council and in the light of their opinion and conclusions, the Commission will continue to look for concrete ways to implement the recommendations. This work will involve close cooperation with all interested parties. Thus, the European Commission makes efforts for recognition of the vital importance of shipping, and for developing a comprehensive strategy to promote the future development of the industry in compliance with the sustainable development strategy.

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Development Prospects for the Maritime Transport Complex of the Kaliningrad Region and Professional Training

Leonid Meyler
Head of the "Transport organization" department, Baltic Fishing Fleet State Academy, transport@bga.gazinter. net or bgaintern@gazinter.net;
Sergey Moiseenko
Professor, Baltic Fishing Fleet State Academy, moiseenkoss@rambler.ru

Abstract Last years a steady tendency of the maritime transport complex development in the Kaliningrad region has become obvious. At the same time, many problems should be solved for intensifying development processes of the transport complex. Among such problems are the following ones: optimization of strategic plans for the transport development, ports and infrastructure, attraction of cargo flows and integration of the transport-logistic regional system in the world and European transport systems. The regional transport strategy covers construction of a new deep-water port, modernization of existing ports and terminals, setting-up of information-logistic centers and infrastructure objects because of innovative technologies application. The paper represents the requirements and principles of formation to an educational system of self-development of specialists. The paper shows the integrated model and technologies of the personality-oriented selection of the content of professional self-development and self-improvement of specialists. Basic elements and the system structure of organizational and educational management of the self-development and self-improvement process are defined in the paper.

Keyword: *Transport complex, Port of Kaliningrad, Preparation of specialists, System of professional improvement, Educational content determination*

1. Introduction

Given to the world economy globalization, transport as an economy function is the most important tool of integration processes. One of the key links of the Russian economy development is modernization of the transport system and realization of its high-capacity transit potential for providing the Euro-Asian trade-economic links. Russia has a developed transport system. Many seaports locate on the Baltic, the Azov-Black, the Caspian, the North and the Far-Eastern Sea basins. Railroads and inland water routes, a stretched highway road network, a complex of international airports, air ways crossing the air space in latitudinal and meridian directions above the territory of the country provide the effective domestic, international and transit traffic. It is an enormous transport potential that can use the national transit resources for providing the Euro-Asian links meeting the country needs for traffic of passengers and goods in all modes of connection. Transport logistics becomes one of key elements of increasing competitiveness of the national economy and unlocking the transit potential of Russia. Logistics as a methodology for organizing and optimizing processes of goods circulation allows to reduce transport costs. In many cases, the level of logistic costs and risks determines the attractiveness of Russia for international freight flows. Therefore, development of transport-logistic complexes and their integration in intercontinental transport systems is considered as the priority field of the Russian economy and, in particular, for the Kaliningrad region. Taking into account unique geopolitical features of the Kaliningrad region, issues on functioning and development of the regional transport complex have come into a sharp focus in the Federal government. The transport complex is an important part of the industrial infrastructure and service trade of the Kaliningrad region. Sustainable and effective functioning, dynamic development and a balance of the transport complex are necessary conditions for the high rate of economic increase, rising of a quality of the population life, a rational integration of the Kaliningrad region in the Russian and world economies. This way for the Kaliningrad region, the integration to the Baltic Sea macro-region is a key process in which the transport is a driving force of the integration [1]. In particular, the issue on the transport corridor that will cross the territory of the Kaliningrad region and contribute to the regional economic growth is under discussion. The intermodal transportation on the international corridors crossing the Russian territory stipulates logistic centers creation locating along corridors. The Fig. 1 shows the main "East-West" and "North-South" corridors on Russian territory and logistic centers along them. Such a logistic center, i.e. transport hub has to be created on the territory of the Kaliningrad region taking into account its profitable geographical location and important role in the transit possibilities [2].

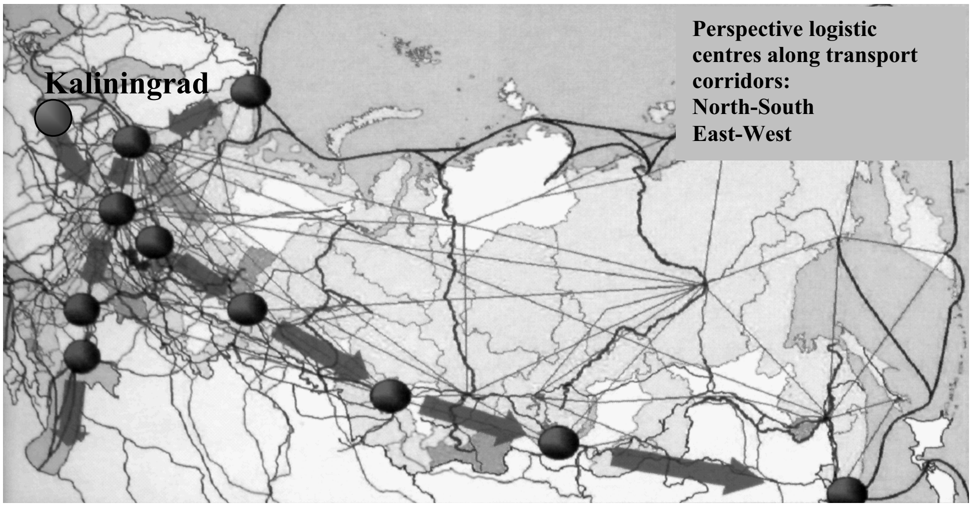

Fig. 1 Logistic centres located along transport corridors

Nowadays the "Transport Strategy of the Russian Federation until 2030" [3] determines main parameters of the transport complex for a short-term and long-term development. In particular, some categories of ports are specified for increasing competitiveness, specialization and prospects of the further development. The first category is represented by ports that provide basic volumes of handling of foreign trade and transit freight and that are able to compete with ports of neighboring countries. Construction of infrastructure objects in these ports should be held at the expenses of the state. One of the first category ports is the port of Kaliningrad. The port of Kaliningrad is favorably situated on transcontinental directions the Asian-Pacific region – Europe, South and Central Asia – Northern Europe. Presently cargo transportation between Asia and Europe performs mostly on deep-sea routes, via the Pacific, the Indian, and the Atlantic oceans. Transit time of cargo delivery from Japan and South Korea to Europe via the Suez Canal reaches 35-40 days. Via the Trans-Siberian Route (TSR), it only takes 16-18 days.
The development of the Kaliningrad transport complex makes actual the problem of staffing for the main logistic objects, such as logistic centres, port terminals, multi-purpose freight-forwarding companies, specialized ships, service companies, etc.

2. Features of the Kaliningrad Maritime Transport Complex

2.1 Main Description of the Transport Complex

The transport complex is an important part of the industrial infrastructure and service trade of the Kaliningrad region. Sustainable and effective functioning, dynamic development and balance of the transport complex are necessary conditions for the high rate of economic increase, rising of standard of living, rational integration of the Kaliningrad region in the Russian and world economies. The transport complex of the Kaliningrad region contains motor, railway, sea, river, air transport and units of the corresponding infrastructure: roads, railway stations, ports and an airport, trans-border points at

the national border [4]. Specific features of the economic-geographical situation of the Kaliningrad region as an enclave, presented in Fig. 2 are:
- geographic isolation from the mainland of Russia;
- neighbourhood with European countries members of EU and the “Schengen Agreement”;
- special economic zone regime;

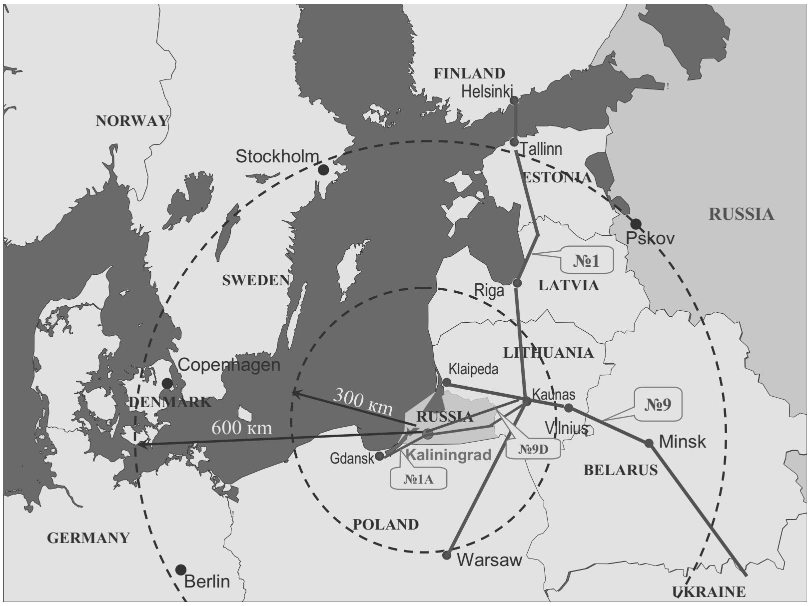

Fig. 2 Geographical location of the Kaliningrad region

Branches of two Trans European transport corridors: №1A (Riga-Kaliningrad-Gdansk) of the route № 1 “Via-Baltica” (Helsinki – Tallinn – Riga – Kaunas – Warsaw) and № 9D (Kaunas-Kaliningrad) of the route №9 (Kiev – Minsk – Vilnius – Kaunas – Klaipeda) cross the Kaliningrad region.

2.2 Characteristics and Perspectives of the Port Complex

The port of Kaliningrad is the only ice-free port of the Russian Federation on the Baltic Sea, it has unique location – the distances to the biggest ports on the Baltic Sea are 300 – 700 km [5]. The port has an avantport of Baltiysk, inner harbours at Kaliningrad and terminals along the 43 km long Kaliningrad sea canal. Canal dimensions: depth on a halfway from the entrance at Baltiysk is 10.5 m, and width is between 80 – 180 m. The rest part has depth 9.0 m; width 50 m. Such characteristics of the canal allow to carry vessels having length up to 170 m, and 30 thousands tons of tonnage. Berthing is about 20,000 m total length. 14 stevedoring companies handle all kind of cargoes in the port. Main terminals of the port of Kaliningrad are shown in the Fig. 3. The port of Kaliningrad links to port of St. Petersburg and ports of Poland, Germany, the Netherlands, Denmark, Belgium and Baltic states by container and ferry lines. The design annual throughput of the port terminals is up to 33 mln tons. The amount of cargoes handled by the port complex of the region has been increasing since 2000. Dynamics of Kaliningrad ports cargo, including container handling is shown in the Fig. 4. Serious reasons like the discrimination tariffs policy of Lithuania for cargoes transported through its territory directed to the Kaliningrad port and the global economic crisis resulted to reducing of the annual cargo and container turnover in 2008-2009. But now after recession the cargo turnover is expected to raise up to 15.1 mln tons and up to 150.000 TEUs in 2010. According to the “Transport strategy” mentioned above, directions of port development are the following: construction of new and modernization of acting port producing complexes; cruise and ferry transshipment; development of port as deep sea container hub with the approximate turnover of 128 million tons. A new cluster was developed in the port due to construction of Ro-Ro and Railway ferry terminal in Baltiysk. It will be used on the areas located along the canal for new multi-purpose cargo terminals constructing. The following cargoes form the volume: oil, oil products, metals, chemical fertilizers, container and packaged freight, construction materials, coal, ferroalloy and technics.

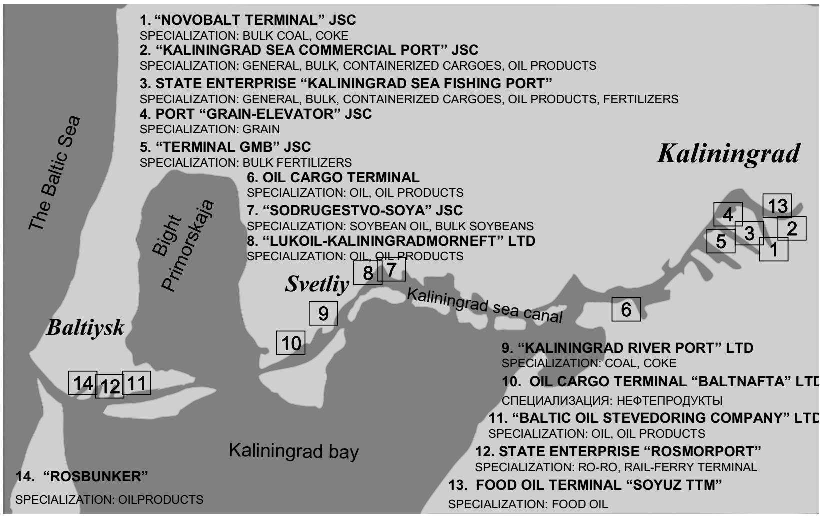

Fig. 3 Terminals of the port of Kaliningrad

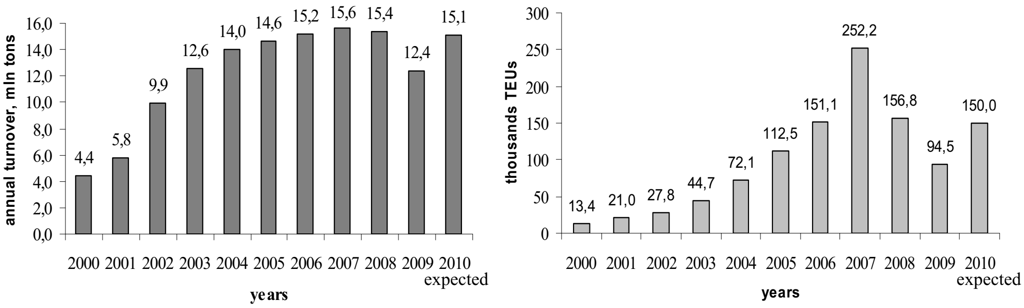

Fig. 4 Annual cargo and container turnover

Like export cargoes which intend for domestic consumption (including industrial enterprises of the region) and partial export to foreign countries (transit and re-export) and the mainland of Russia the import cargoes have to be transported from the port terminals by the railway and motor transport. It is obvious that taking into account present carrying capacities of main railway lines and roads, cargo handling of the specified volume is impossible without development of the infrastructure in the direction to the ports, increasing effectiveness of commodity circulation (using modern logistic and informational technologies, development of the transport logistics) and development of the storage facilities. Taking into account the perspectives of the Kaliningrad transport complex development in the post-crisis period, it is necessary to solve the following problems in order to intensify this process:

- optimization of strategic plans for transport modes and their infrastructure;
- attraction of cargo flows;
- optimization of transit tariffs;
- integration of the regional transport-logistical system in the European and world transport systems;
- training and increasing skills of transport specialists.

3. Professional Training Problems

3.1 Preparation of Specialists for the Transport Complex

Nowadays, training of specialists for the transport complex of the Kaliningrad region is provided by the Baltic Fishing Fleet State Academy (BFFSA) [6]. Graduates from the Academy receive the qualification “Engineer for organization and management on transport” in the field of marine and road transport. The educational process provides training of specialists who know modern information technologies, methods of system analysis, methods of optimization of transport processes, methods of modeling and simulation, etc. In addition to the study of special subjects, such as “Technology and organization of handling and transport processes”, “Transport Logistics”, “Commercial work on transport“, cadets are actively involved in scientific research. A great importance for preparation of competent specialists has industrial practices conducted in the transport enterprises of Kaliningrad. BFFSA is a partner in the projects that are partly financed by European Union. The goal of the project “East-West Transport Corridor II” [7] is to develop a “green” transport corridor between the countries of the Asia-Pacific region and Europe. Study visits of cadets to foreign ports are included in the project. Another project named “TransBaltic” [8] has a main goal to create an integrated transport system in the Baltic Sea region. One of working packages of this project is devoted to increasing of human capacity that means improving transport specialists’ professional training. A deep study of the professional and business English provides graduates the opportunity to work not only in Russian, but also in foreign transport companies. Graduation projects are carried out on topics actual to the regional transport problems. Results of projects take into account market research, recent trends of the geopolitical and economic nature, issues of management, logistics and environmental protection on transport. Monitoring of graduates shows that most of them successfully work as specialists in the fields of transport management.

3.2 A System of Professional Improvement

At the same time, there is an actual task of specialist’s professional skill improvement with the aim to develop new technologies, scientific methods of organization and management of transportation, mastering of related professions. But this task is only a part of long-life learning system. An analysis of the situation in the postgraduate education shows that at present the continuity of professional development of specialists may be achieved by implementing the cyclic scheme of continuing learning: “self-development – professional improvement/additional training - self-development - professional improvement, etc.” It is assumed that the processes of professionalism improvement and self-development should be managed. It is achieved by using a program-oriented method of management of educational processes. Objectives and means of their achievement should be linked in the programs of professionalism development. Controllability of continuing education processes has to be ensured by self- and external controlling (for example, a study center). The personal - oriented process of specialist’s professional development is carried out in specially created conditions that are associated principally with the content and technology of a educational interaction. Thus, there are two important components of an educational system: the content and tools (methods, forms) of training. The goals of education perform a systematizing function in the educational system. An analysis of existing approaches to the organization of professional improvement and professional self-development processes shows that the educational system has to be adaptive, open and accessible for specialists of all professional levels, staffed by qualified consultants, provided with technical equipment and a program check. The system should have an extensive library of electronic educational materials, virtual laboratories, modules for creating of a virtual professional-activity environment of communication. The most effective technologies among the major educational technologies of professional- and self-development are business and simulation games. Games allow updating theoretical knowledge and carrying out professional training of specialists. For example, complex business games “Ensuring of navigation safety and increasing of fishery effectiveness”, “Ensuring of maritime transportation” and simulating games for the design of transport - logistic systems in the educational process in BFFSA are used [9], [10]. The principles of variability, system, interlinking, optimality, personal orientation of subjects, modularity, discrete – continuous renewal; anticipation were introduced as the basis for the educational system of self-development. In the process of the designing the educational system we used a process approach. Development of the system was carried out by the following scheme: goals - requirements - principles - processes - functional structures - morphology (resources, material, content, etc.).

3.3 Requirements to the System of Professional Improvement

On the basis of an analysis of the goals and requirements to the system, the following processes were identified:

- the basic process - self-development and self-improvement;
- functional processes - diagnostics, problematics and self-determination, training/self-education technologies;
- selection of training content/self-education/self-development;
- information processes and technologies;
- financial and economic processes;
- administrative and legal processes;
- organization process;
- management processes.

The management processes include: forecasting, planning, monitoring, analytical processes (for example, an analysis of a social and economic situation, development of science and technology, educational technologies, a services market and human resources analysis); preparing and decision-making; implementation of decisions. Systematization of the processes was carried out on the basis of system-structural analysis. As well options characterizing these processes and system links were defined. It allowed to identify the main components of the educational system of specialist's self-development. The structure of the created educational system consists of the following main components: consultants/teachers; students; a content of education; a subsystem of personal-oriented special programs development, distance technologies of self-education, monitoring and control; methods and models of self-management, information and a material and technical base. The structural/process model of the educational system is shown in Fig. 5.

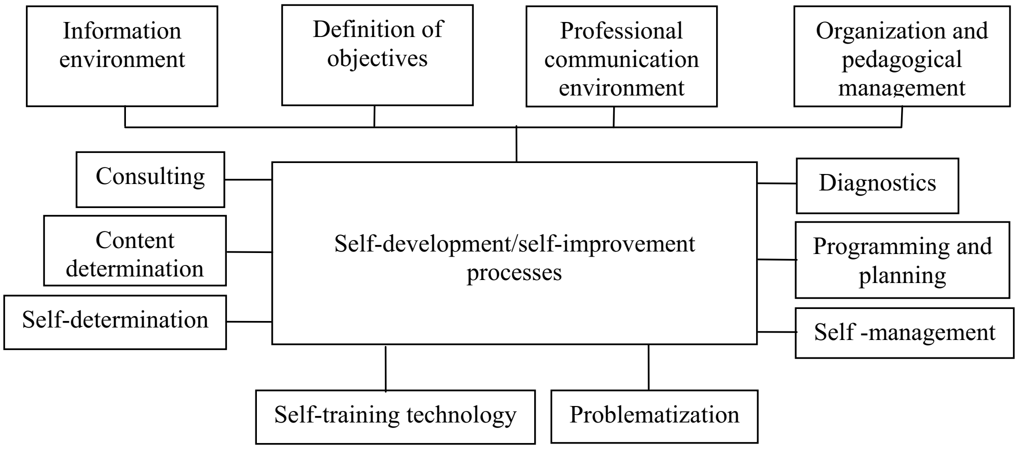

Fig. 5 Process model of the educational system of specialists' professional self-development and self-improvement

The important task of selecting the training content has to be solved both during the design of the educational system, and in the process of its operation.

3.4 A Method of the Educational Content Determination

It was suggested a method for content determination based on the principle of integration of diagnostic, simulation and expert methods. The diagnostic method allows to make an analysis of the existing specialist's level of training, opportunities, advantages and disadvantages of his self-development system. Using this method it is possible to study the development of the situation in the past, present and to identify trends, approximating them for future periods. As a result of the diagnostics of the specialist it is identified the need for compensatory education and in accordance with the objectives to move to the selection of content in the context of development plans.

Determination of the self-development/self-education content can be performed using expert and simulation methods. In accordance with the objectives of self-development and taking into account the results of the diagnostics of the specialist's professional development level and potentialities, experts can offer variable self-development programs. Such programs will be considered as a basis for the formation of personality-oriented plans for professional self-development in the future. Simulation modeling of a professional activity or some of its aspects allows to create a system that focuses on self-estimation of a professional level, determination of the personal "ignorance" field and corresponding objectives of self-education. Conducting of game experiments based on special methods allows to shift to the self-development mode. The integrated model of diagnostics and determination of the content of training and self-development of specialists is presented schematically in Fig. 6.

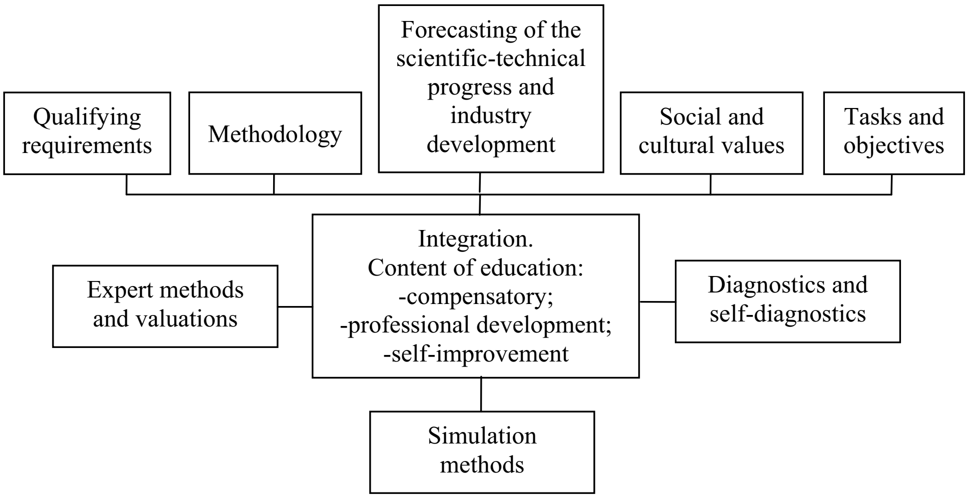

Fig. 6 Integrated scheme of a selection content process for professional self-development and self-improvement of specialists

An analysis of existing approaches to the management of educational systems oriented on post-graduate education (improvement of professional skill and retraining) shows that the processes of self-development are actually uncontrolled.

In the development of the system of organization and educational management for specialists' self-development processes results of research [11], [12], [13] were used. An analysis of an organizational work with the personnel at the enterprises of the marine and fishing fleet and the operational experience has allowed to define basic principles on which a system of organizational and educational management of the processes of professional self-development and self-improvement of specialists should be formed. These principles are: the principle of systematization; the principle adaptability; the principle of profitability; the principle of continuity; the principle of self-development system and its self-support.

The following components of the system were identified:

- managing and controlled systems;
- management functions;
- management methods;
- elements (subsystems) of the controlled system and links between them,
- main functions and controlled parameters of subsystems.

The Table below shows the suggested main stages of organization and educational management of marine specialists' professional development. It is seen that functions determining self-development and self-improvement processes are: motivation, regulation, diagnostics and control.

Stages of the training organization	Functions of management/self-management		
	motivational	coordination	control and diagnostics
1	2	3	4
1.Initial diagnostics of the level of professional readiness and assessment of an educational situation.	Identifying the degree of motivation and readiness of a specialist for self-development and self-improvement.	Identifying the level of professional readiness, as well as "lacks" of knowledge and skills. Determining specialist's readiness to individual study, skills to organize activities for self-development and self-improvement.	Evaluation of professional readiness. Determining the specialist's readiness for self-development and self-improvement.
2.Objective self-evaluation	A specialist forms self-evaluation of his professional readiness level, based on the analysis of initial diagnostics and refers it to own ambitions that are as a result a powerful motivation factor.	Identifying abilities of a specialist for a critical self-analysis and his goals, as well as readiness to cooperate in the system "teacher – learner".	Evaluation of a specialist's readiness level to the objective self-analysis and cooperation, a level of own ambitions.
3. Programming of self-development and self-improve-ment.	Determining the content of education and development of the program of action in the context of continuing professional development.	Building a system of knowledge and skills in the context of a compensatory, adaptive and developing functions of training, self-develop-ment and the self-improvement.	To set up control/self-control stages, time limits for performance of basic points of the program.
4. Designing teaching and practical activities on self-development and self-improvement.	Defining goals and means of their achieving. Selection ways of self-stimulation, factors of internal and external motivation.	Building knowledge systems, logistic schemes of their relations and the choice of knowledge actualization methods.	Developing criteria for evaluation of the knowledge and skills level, as well as the integral criterion of evaluation level of professional readiness

Table Organizational and educational management of professionalism development

Continuation of the Table

1	2	3	4
5. Planning the project implementation.	Selecting methods of stage-by-stage assessment of achievements and its stimulation.	Defining means and methods to achieve goals, limits realization of basic positions of the plan.	Selecting ways of controlling and accounting. Defining controlled parameters.

6. Implementation of the project and the plan.	Stimulation and motivation self-development and self-improvement.	Organization for a process of continuous professionalism development. Correcting the process in a case of conditions change.	Controlling and accounting. Evaluation productivity of the teaching and self-development process.
7. An outcome analysis and assessment of a specialist preparedness for the transition into the next stratum of professionalism.	Assessment of the level of professional a specialist preparedness for the transition to the next stratum of professionalism. Selection methods and means of self-development	An analysis of the goals achievement. The reflection of own actions and achievements. Determination failures and unproductive activities. Synthesis of successes and failures. Coordination further activities	Determining the level of development of certain types of readiness and training as an integral index.

4. Conclusion

The maritime transport complex of the Kaliningrad region – an enclave of the Russian Federation on the Baltic Sea has good perspectives of further development after economic recession. An actual task is the use of the transit potential of the complex and its integration in the world and European transport systems. According to solving this task active preparation and qualification improvement is stipulated.

The main stages of organization/self-organization activities in the context of professional development of a specialist were identified: diagnostics of the professional readiness level and assessment of a learning situation, self-disqualification or objective self-evaluation; programming of self-development and self-improvement; designing educational and practical activities for self-education, self-development and self-improvement; planning of project implementation; realization of projects and plans.

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Re-Engineering a Tanker Ship Management System

Capt. Suresh BHARDWAJ
Vice Chancellor, AMET University, capt.s.bhardwaj@ametindia.com

Abstract The paper explores how technology, including Information Communication Technology, can be effectively used as the interface between the shore based tanker ship management and the shipboard management for performance optimization, and how tanker operations and maintenance processes may be reengineered using suited new technology in order to make operations more effective and efficient. *A Management Systems and Process approach* is utilized to identify the processes and reengineer them to increasing effectiveness and efficiency. First, modelling of the business processes has been undertaken in order to understand and communicate about the existing processes. The modelling is also the basis for optimization by re-engineering of the processes. Focus group interviews have been conducted in the Mumbai-based ship management companies. Here, the most radical reengineering opportunity was perceived to be the sub-process of "Monitoring of Ship's Fuel and Machinery Performance", which was then taken up as the area of main subsequent focus. This sub-process was then modelled and mapped out, the technological intervention needed was studied and applied, and the reengineered process was defined with its potential for increased efficiency and effectiveness. The reengineered process was then sought validated through review, verification and critical scrutiny for any weaknesses or blind spots at the same companies that participated in the focus group interviews.

Keyword*: Systems Approach, Process Approach, Reengineering, Business Process Reengineering, Ship Management, Process Management, Optimization.*

1. Introduction

1.1 Automation in Shipping

The shipping industry in general is not very responsive to change. It tends to play safe and rely on hands-on approach to management and operation, in spite of reliable technology having made inroads into and been integrated with safe ship operations. There are very many reasons for this: The maritime shipping industry is very competitive with average rates of return below many other industries with similar risks. [17]. Matter of fact, shipping economics exist as a separate branch of economics for two reasons: The one is the cyclicality of the shipping markets that also concerns the demand for shipping services and thus also freight rate fluctuations; the other is the idiosyncratic nature of shipping investment. The two are inextricably linked: Investing in ships could be classified as an astute, a brave or an insane decision depending on the state and the prospects of the shipping markets which rarely – if ever – fulfill the promises they seem to give. [18].

So also the fact remains that, the ship owners may sell their vessels and buy new ones or move them in and out of third party management, depending on fluctuating market situations, making it difficult to plan investment in technology; owners may also come from a conservative background which views technology with suspicion from the investment return optimization perspective. In the meantime, technology keeps changing, thus encouraging a "wait and watch" approach in ship owners' decision making.

Be that as it may, in shipping, just as it is the case in any other industry, an increased induction of the latest technology and automation is seen. Sophisticated systems and equipment with embedded software for fault diagnosis as well as multiple means for communication with shore-based units are seen being installed on newer vessels, particularly on those sophisticated vessels in the fleets of owners from high national income maritime nations.

1.2 Impact of Technology

A measure of the significance of a new technology is the extent to which it changes previous ways of doing thing, or changes our ideas about how they ought to be done. Some maritime innovations can certainly be described in this way as highly significant because they have altered traditional patterns of operating ships, and in some cases, they can also be said to have contributed towards an essential change in the relationship between humankind and the sea. [8]

The June 1995 incident of the passenger vessel “Royal Majesty” running aground with 1509 passengers aboard, near Nantucket Island on a voyage from Bermuda to Boston, was investigated by the U.S. National Transport Safety Board. This investigative report [13], concluded that, automation, when designed properly and used by trained personnel, can be helpful in improving operational efficiency and safety. However, when designed poorly or misused by undertrained or untrained personnel, automated equipment can be a contributing cause to accidents.

In another analysis of the same incident, this time from the perspective of the crew, [11] it was observed that, automation is often introduced because of quantitative promises: it will reduce human error; reduce workload; increase efficiency. But as demonstrated by the Royal Majesty, as well as by numerous research results, automation has qualitative consequences for human work and safety, and does not simply replace human work with machine work. Automation changes the task it was meant to support; it creates new error pathways, shifts consequences of error further into the future and delays opportunities for error detection and recovery.

While it was originally considered that the optimum ship was simply the most profitable one and that,[3] in the long run, competitive markets would ensure that this would be that with the lowest costs. However, in maritime transport, as elsewhere, there has been an increasing concern with the protection of the environment. Following number of well publicized disasters, this economic approach has been extended to maritime safety in general, which has to be factored in beyond the lowest cost principle. This development was accelerated by a report from a Select Committee of the House of Lords [5] which concluded that: “modern science and technology are not being adequately applied in many of the fields that affect the safety of ships, the lives of those who travel in them, and the marine environment; and that there are new developments in marine technology affecting the design, construction and operation of ships which the regulators constantly struggle to keep up with and constantly fall behind as technology develops.”

In the context of accident and incidence investigation, a school of thought, however, seems to support the idea of having more automation or computerization than what exists today, [2], to compensate for the erratic and fallible humans onboard, where it is opined that improvements might best be achieved by reducing or eliminating the human factor in incident sequences.

The above differing viewpoints highlight the mixed reactions to impacts of technology and automation in shipping.

1.3 Automation for Optimization

Of all things that can change the rules of competition, technological change is among the most prominent. It has the resulting ability to achieve low cost and differentiation through its value activities. [15]

Moreover, in a highly competitive global economy, automation has been an important general approach to improve productivity, quality and customer satisfaction. [10]

In the shipping industry context, it is appropriate to refer to the proceedings of a high-end workshop that was organized by the International Federation of Ship Masters Associations in Manila in November 2009, on the sidelines of the popular Lloyds Manning and Training Conference there. At the workshop, Andreas Nordseth, the Director General of Danish Maritime Authority remarked that there is no doubt that shipping has seen tremendous advancement in technology as a result of the owners investing in meeting the challenges in this competitive world. But it seems that we have not addressed the process of operating this new technology on board the ships that is leading to fatigue and consequential accidents and near misses.

2. The Objectives of the Research-in-Progress

The purpose of this research-in-progress is to see how technology can interface into the tanker management and its operations for improvement and optimization. This will also include the examination of the cooperation between organization on land and onboard the ship which is an integral part of Tanker ship Management system. In other words, this research project is an attempt at optimization of the Co-operation between Tanker Ship Owners' or Tanker Ship Managers' Technical organization based ashore and the management on board the ships, and the communication interface between onboard and shore-based units, leveraging the technological advantage, but at the same time, not exposing the ship to greater risk.

3. The Approaches to Research

3.1 Management Systems and Process Approach

A "Management Systems and Process" approach is utilized to identify the processes and reengineer the processes towards further optimization, [12], which here means increased resource efficiency and increased effectiveness with regard to specific goals.
For organizations to function effectively, the numerous interrelated and interacting processes need to be identified first. Often the output of one process directly forms the input to the next process.
The schematic identification and management of the processes employed within the organization and particularly the interactions between such processes is referred to as Process Approach.
Processes are charted to make things better, so that they in turn can do a better job as helping people to do their jobs better. Any improvement procedure requires to first identify the project, gather facts and break it down by preparing process charts , challenging the current method, developing improvement (eliminate, combine, change sequence, simplify) and then apply the improvement.
Process charts show us the big picture while allowing us to focus on the details. They give us fresh eyes and an opportunity to view work from different perspective and vantage point. All process charts follow the basic philosophy of flow charting. Process implies movement, and movement is depicted by line drawn from left to right. Standard kind of symbols are used to denote activity and words help clarify answers on what, where, when and who. [4]
Modeling the business processes helps to identify all fundamental aspects of a company and constitutes a powerful yet simple approach to understanding and communicating what really happens in existing processes. In this way, it represents the basis for a subsequent optimization of the company sectors or even re-engineering of the whole structure that result in cost and time savings. [12]
Processes are subsets of a System.
Systems thinking concerns an understanding of a system by examining the linkages and interactions between the elements of management that compose the entirety of the management system.
A Systems approach thus, uses two basic ideas. First, one should examine objectives before considering ways of solving a problem; and, second, one should begin by describing the system in general terms before proceeding to the specific. [1].

Such a "Management System and Process Approach" encourages organizations to analyze the needs and expectations, define the processes to enable contribute to the outputs, and also keep the processes under control.
It thus provides a good framework for driving improvements and optimization and increases the probability of enhancing the satisfaction levels of the interested parties.
The evaluation of the system is also then possible. It of course can vary in scope and encompass a range of activities such as review or Self Assessment.
The "Management System and Process Approach" thus focuses on the achievement of results, in relation to the objectives that result in Optimization.

Based on the above the research theme will be restated for the purpose of clarity in the context of Management Systems and Process Approach as: the development of an effective and purposeful system of management communication process (optimization of cooperation) between the shore based management and the ship board management in order to evolve an optimal management control strategy for the purpose of optimization of a set of objective functions, subject to a set of constraints.

3.2 The Tanker ship Management System

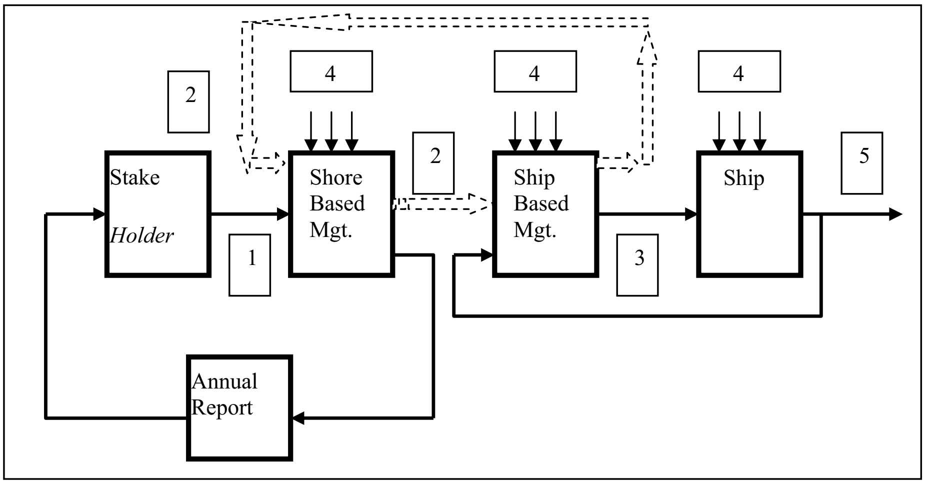

Fig. 1 Tanker ship Management System

The inputs, outputs and constraints as denoted by numbers in the figure 1 are explained below:-
(1)Expectations of the stake holders, (that defines the objective functions for process control)
Eg. Maximization of sailing time, Minimization of turn - around time, Minimization of port stay
(2) Management Communication Process (Work flow, cooperation etc. between shore based management and ship board management). The optimization to be attempted in the scope of this action research project is limited to this Process alone.
(3) Management control strategy for the ship; i.e. the strategy to achieve the desired stated objective function, derived from the stakeholder expectations.
(4) Constraints, e.g. (I) Shore based management constraints like Commercial (business commitments, etc.), Technical (Repair budget, dry docking schedules, etc.), Personnel (Availability of officers/other crew members, Flag state rules & trade union agreements), (II) Shipboard management constraints like weather, machinery/equipment limitations, regulations (SOLAS, MARPOL, ISM, etc.), piracy threats and attacks.
(5) Performance of the ship

From Figure 1 it can be seen that the "Tanker Ship Management System" is made up of several subsystems, like the stakeholder subsystem, the shore-based management subsystem, the ship-based management subsystem and the ship itself. Each of these subsystems has its inputs, outputs and set of business rules. All the subsystems are integrated to form the "Tanker Ship Management System".
This implies that, a small change made to any subsystem will affect other subsystems, as well as the Tanker Ship Management System as a whole. Therefore the management communication process comprising of the shore based management subsystem and the ship based management subsystem, which is shown in the figure with interconnections in dotted arrows(), and is the scope of this research project, cannot be viewed in isolation.
The aim to achieve increased resource efficiency and effectiveness with regard to specific output goals, which is the theme of this research project, is part of the process of working to increase efficiencies and the effectiveness of the entire Tanker Ship Management System.

4. The Methodology for the Research

4.1 Own Experience

Firstly, this research draws on the own experience of the author, who has been Chief Officer as well as Master of an 89000 ton dwt. Crude Oil Tanker, besides many other types of vessels. Subsequently, he has also been involved in the development and implementation of quality, environment, occupational health and safety management systems for 4 shipping companies listed below. This involved typically into consultancy projects over 9 months to a year, where in the complete process mapping of management systems in relation to the operation of ships was done with particular focus on the deliverables relating to quality, environment, occupational health and safety.
The companies were:

- Andromeda Shipping, Monte Carlo, Monaco; operating 5 oil tankers
- Qatar Shipping, Doha, Qatar; operating 9 oil tankers
- Pacific Basin, Hong Kong; operating a fleet of bulk carriers and tankers.
- Grand Seatrade, Hong Kong, operating 5 cape size bulk carriers.

These are international companies, and the first author's work done on the systems of these companies was evaluated and then certified by highly reputed certifying agencies like Lloyds Register and Det Norske Veritas.

4.2Focus Group Interviews

Focus group interviews are being used to create primary data about industry experts' viewpoints on the planned process which are to be reengineered for improved resource efficiency and increased effectiveness with regard to specific goals.
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Two rounds of focus group meetings have been held with the Bernhard Schulte Ship Management, Mumbai. This, company handles the complete Technical, Operations and Crew management out of Mumbai office for 70 vessels. Bernhard Schulte Ship management is a global leader in quality ship management and manages over 700 ships globally.
Additionally, two rounds of interviews were conducted with 2 Chief Engineers and 2 Masters of companies of Indian nationality but with vast global experience. These interviewees have had various ship management responsibilities both on board and ashore.
Further rounds of focus group interviews will be conducted as the research progresses.

4.3Macro level Process Mapping

As defined in the research objective, basic consideration in the systems approach to design of organizations implied dividing work into reasonable tasks (differentiation) while giving simultaneous attention to coordinating these activities and unifying their results into a meaningful whole (integration). For grouping activities the guideline followed were as follows:
Units that have similar orientations and tasks were grouped together, e.g. the shore-based individual management functions of Commercial, Technical and Operational Management, and the ship-based individual functions of Deck and Engine. (They can reinforce each other's common concern and the arrangement simplifies the coordinating task of a common manager).
Units required to integrate their activities closely were grouped together, e.g. the shore based management and the shipboard management. (The common manager can coordinate them through the formal hierarchy).
The research thus commenced as planned, with the identification of the processes and systems that constitute the Tanker Ship Management System as a whole, at a very macro level, as shown in the Figure 1 above. The process of mapping also took into account the author's own experience as well as the small amount of available relevant research reports and industry data.

4.4 Micro level Process and its Reengineering.

Based on the initial focus group interviews, the most promising reengineering opportunity emerged to be in the sub-process of "Monitoring of Ship's Fuel and Machinery Performance", which was immediately taken up as a case study. This was because the members of the focus group interview concurred that the technological advancements that have occurred in this sub-process would yield the maximum positive results in terms of efficiency and effectiveness over the present process deliveries. The advanced process controls in this sub-process are now capable of on-line real time optimization; where this has been attempted it has been successful and well accepted, and thus can be implemented more widely. The focus group interviewed also affirmed the general perception that the advances in process control technology as well as information communication technology, which previously were on independent yet complimentary paths, has now converged to a great extent to be almost seamless. Moreover, while cost is a decisive factor in determining the extent to which shipping companies are prepared to invest in information and communication technologies (ICT) infrastructure, the new satellite communication technologies are providing an economical method of transferring data between ship and shore, with ship being another node in the corporate Intranet or Wide Area Network (WAN), thus providing seamless connectivity of good quality and high credibility. This technological development can be used to improve the effective management of the ship and the seafaring workforce as a virtual team. This capability may also be nothing short of a major revolution in the shipping after the sail to motor changeover.

5. Reengineering of the Process "Monitoring of Ship's fuel and Machinery Performance"

5.1 The Current Process

In the current process, the ship's chief engineer manages the machinery spaces from the control room and reports the performance to the shore staff of the technical management company every noon via the satellite communication in a specific reporting format. This report is scrutinized ashore, fed through the program in the office and any deviations from norms requiring attention is reported back to the ship. The ship takes the corrective action and reports back to the office.

The interested parties like owners and charterers then receive performance reports in their own specified formats.

The process map is as below in Figure 2, where for the sake of simplicity, the resources and the constraints are depicted in a horizontal row matching the activity box.

5.2 The Technology Intervention

As a consequence of automation, which is nowadays usually associated with information communication technology, the centre of gravity of a shipping enterprise has shifted away from the ship. Decision making has become increasingly remote, in offices ashore. Modern shipping depends for its day-to-day operation almost as much on communication and information as on more tangible inputs like fuel. [8].

Reengineered process with radical benefits and optimization can be achieved if a vessel is fitted with a fuel and machinery performance system, with capability of accurately monitoring fuel consumptions and transferring the data to shore based organizations including Technical Management on line and real time. Reference is made to the Product description of Kongsberg K-Chief 500 Marine Automation & Fuel Performance System [9], which states that, "as a tool for fuel economizing, the fuel performance system is used for monitoring of fuel consumption and assessment of the efficiency of the propulsion machinery. Performance parameters, as accumulated fuel consumption and propeller shaft power, can be displayed and printed for reporting.

Further, measurements and calculations can be based on continuous measurements made by the Distributed Processing Units. Based on these measurements, the following performance parameters can be calculated:

SHIP	Technical / Operations Department Ashore	Resource	Constraint	
Monitor and Control Machinery Parameters		Engine Control Room	Ship's Procedures	
Prepare & Transmit Noon Report in Various Recipients' formats		A) Format B) SES Satcom*	By 1400 ships time	
	Analyze & Comment Not OK	Tech. Management Software OK		
	Provide feedback To ship	LES Satcom*		
Action on feedback and report correction				
	Confirm the Corrective action			
	Record in History and for MIS reports.	Tech. Management Software		
	Transmit reports to interested recipients	Recipients' Formats	Reporting as per agreement with parties	

*SES Satcom – Ship Earth Station Satellite Communication
*LES Satcom – Land Earth Station Satellite Communication

Fig. 2 Process map (Current)

• Momentary fuel consumption for each engine, Total momentary fuel consumption, Hull efficiency, Engine efficiency for each engine, Shaft power for each shaft, and Total shaft power.
Vital data can be accumulated and presented as below:-

Fuel consumption and power output is calculated over the entire voyage period. Accumulated data includes: (a) Duration of voyage, Distance travelled, Accumulated fuel consumption for each main engine, Total accumulated fuel consumption, Accumulated propeller shaft power in for each shaft, Total accumulated propeller shaft power.
(b) Accumulated values can be reset by the operator. When doing so, the accumulated values are printed as a post voyage report. All fuel economizing measurements and calculations are available as a display window on the Operator Station.
ShipViewer
ShipViewer is a software package that runs on a standard PC connected to the K-Chief 500 system's Local Area Network. The computer can be installed anywhere on the ship. It has similar viewing capabilities as those found in the Operator Station, but without control functions. If installing the ShipViewer on the ship's administrative network, a Gateway computer must be installed to act as a firewall between the K-Chief 500 automation system and the administrative network.
Interaction exists between the process network, the administrative network and the Gateway. Communication principles for transfer of data from the system on-board to shore is also maintained.

Real Time Monitoring including raw data normalization (i.e., accounting for the effect of waves, wind and current) is possible. For example, minute-by-minute fuel consumption of vessels can be assessed against values in charter parties. Charterers have often been frustrated by discrepancies between fuel consumption day rates included in charter party and the actual performance, given the higher fuel costs and lack of transparency.

Safety and reliability
The K-Chief 500 is designed to meet the most stringent safety and reliability requirements. It supports redundancy at all levels including communication, process controllers, serial lines and power supplies. The built-in self-diagnostic facilities monitor the entire control system and include extensive monitoring of field circuits. Both the hardware and the software have been type approved by major classification societies.
The K-Chief 500 complies with the requirements of IMO, local maritime authorities, IACS and eleven classification societies. It is designed to meet the classification societies' requirements for periodically unmanned engine room operation. The K-Chief 500 is also developed to strict military quality standards."

5.3 The Reengineered Process

SHIP	**All Departments Ashore, and Interested Parties**	**Resource**	**Constraint**	
Monitor and Control Machinery Parameters		Machinery Control Automation	ICAN	
Maintain live on-line displays and history reports	Access		ICAN	
Record in History and generate MIS reports to interested parties	Access		ICAN	

Fig. 3 Process map (Reengineered)

- I – Integrity of Data, an assurance that data is consistent, certified and can be reconciled.
- C – Confidentiality
- A – Access Control

  N – Non – repudiation by Shipboard personnel

The constraints, ICAN, in any automated and networked systems is explained below [16]:
"Information Assurance (IA) is the practice of managing information-related risks. More specifically, it seeks to protect and defend information and information systems by ensuring confidentiality, integrity, authentication, availability and non-repudiation. These goals are relevant whether the information is in storage, processing or transit, and whether threatened by malice or accident. In other words, IA is the process of ensuring that authorized users have access to authorized information at the authorized time.
Integrity – Integrity means data cannot be created, changed, or deleted without proper authorization. It also means that data stored in one part of a database system is in agreement with other related data stored in another part of the database system (or another system)
Confidentiality – Confidential information must only be accessed, used, copied, or disclosed by users who have been authorized, and only when there is a genuine need. A confidentiality breach occurs when information or information systems have been, or may have been, accessed, used copied or disclosed, or by someone who was not authorized to have access to the information.
Access Control – Authenticity is necessary to ensure that the users or objects (like documents) are genuine (they have not been forged or fabricated).
Non-repudiation – implies that one party of a transaction cannot deny having received a transaction nor can the other party deny having sent a transaction."

5.4 Optimization Potential for this Reengineered Process

This reengineering would result in
(a)Transparency. The Charterer who normally pays for the fuel costs, can directly access real time fuel consumptions from the machinery and there is no need for reporting on the same either by the Ship's staff or more conventionally by the Technical Managers ashore, giving rise to doubts on covering up for inefficient excess fuel consumptions.
(b) Elimination of lot of paperwork and duplication of paperwork
(c) More time at hand to ships staff, that otherwise would go wasteful in manual checking of fuel consumptions, analysis of performances and reporting of data to shore based managers.
(d)Fuel savings,
(e)Reduction in off-hires and charter disputes. Charter disputes frequently occur on account of causes attributed to discrepancies in fuel consumptions against as agreed in the Charter party document.
(f) Relationship building, between the charters and ship owners / ship managers, which is a key component is shipping business. It is not a one-time transaction but a continuous interaction on which stable, long term relationships are built up. 'Trust' being inherent to relationships, comprises, perceived integrity, willingness to reduce uncertainty, expertise, congeniality and timeliness. [14].

All these factors are readily addressed by this reengineered process.

5.5 Validation for the Reengineered Process

The above process as well as its optimization potential has been verified and validated theoretically through a focus group interaction with the Technical Management of a Danish shipping company that carries out its Technical, Operations and Crewing management out of their Mumbai office. This team of Technical Managers comprise some highly experienced marine engineers who keep themselves updated with latest developments in their area of operation and have even studied the reports on this enhanced technology deployed in ships. New technology deployment always carries the risk for the first time users and the industry normally waits and watches closely the developments before self deployment which also then entails the question of BATNEEC principle (Best Available Technology Not Entailing Excessive Costs).

As further work to this research, ways will be formulated to subject the reengineered process to some further tests of validation and falsification, in support of the conclusion inferred from the above.

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Who pays, and where does the money come from? Charge System for Recycling of WEEE in China

Ziyi Gao
Candidate of Dr., Department of Maritime Logistics, Graduate School of Maritime Sciences, Kobe University, Kobe 658-0021, Japan, jessicagao @hotmail.com.
Shigeru Yoshida
Professor & Dr., Department of Maritime Logistics, Graduate School of Maritime Sciences, Kobe University, Kobe 658-0021, Japan，syoshida@maritime.kobe-u.ac.jp.

1．Introduction

The production of electrical and electronic equipment (EEE) is increasing worldwide. Both technological innovation and market expansion continue to accelerate the replacement of equipment lead to a significant increase of waste electric and electronic equipment (WEEE). In view of the environmental problems involved in the management of WEEE, many counties have taken some measures to preserve, protect and improve the quality of the environment and human health as well as utilizing natural resources judiciously.

As China is a large manufacturer and consumer of electronic appliances, Chinese government has also made efforts to tackle the problem caused by the recycling and disposal of WEEE since 2001. China attempts to regulate the industry and establish a financially viable, environmentally benign and safe WEEE management system. Charge system for recycling of WEEE is an important part of the system. Charge system for WEEE needs to determine the responsibility undertaken respectively by producer, distributor, recycling business，consumer and source of funds, but they are still unclear yet in China.

Currently，the more perfect management system and pattern of charge system for WEEE have established and achieved good results in some countries and regions. But the problems facing charge system for WEEE remain to be solved in China. Much research emphasizes establish of WEEE recycling and disposal system. However, herein we pay more attention to the charge system of WEEE recycling and disposal system. Therefore, the aim of this study is to give suggestions on responsibility system and payment pattern to reference for establish of charge system for WEEE by analyzing the state of some developed countries as well as the actual conditions in China on WEEE recycling and disposal system.

The remainder of this paper is organized as follows: Section 2 shows the definition and characteristics of WEEE. Next, section 3 introduces three of the most typical system for WEEE in developed countries, then responsibility system and payment pattern in charge system for WEEE in developed countries are summarized. The status of recycling system and charge system for WEEE in China is considered in section 4 and some suggestions are put forward based on experiences of developed countries and Chinese national conditions. Finally, some concluding comments follow in the last section.

2. Definition and Characteristics of WEEE

2.1 Definition of WEEE

According to the definition given in Directive 2002/96/EC of the European Parliament (EU 2002), 'waste electrical and electronic equipment (WEEE) consists of the 9 categories that are listed in table1. It refers to the electrical and electronic products which have reached the end of their useful life and are ready for recycling or some other form of disposal.

No.	Category
1	Large household appliances
2	Small household appliances
3	IT and telecommunications equipment
4	Consumer equipment
5	Lighting equipment including light bulbs and luminaries in households
6	Electrical and electronic tools (with the exception of large-scale stationary industrial tools)
7	Toys, leisure and sports equipment
8	Medical devices (with the exception of all implanted and infected products)
9	Monitoring and control instruments

Source: Directive 2002/96/EC of the European Parliament

Table 1 WEEE categories according to the EU directive

2.2 Characteristics of WEEE

In the era of recycling stream WEEE is becoming an important waste both in terms of quantity and toxicity. It is non-homogeneous and complex in terms of materials and components. In order to develop a cost-effective and environmentally friendly recycling system, it is important to identify and quantify valuable materials and hazardous substances, and further, to understand the physical characteristics of waste.

Environmental and health effects

WEEE refers to discarded appliances, such as televisions and refrigerators, as well as a variety of associated waste products, such as electrical wiring, printed wiring boards (PWBs), and batteries. WEEE also contains a myriad of toxic components and materials that can cause significant damage to the environment and human health if recycling and disposal is unregulated. Major categories of hazardous materials and components of WEEE that have to be selectively treated are shown in Table2.

Substance	Occurrence in WEEE	Environmental and Health relevance
Chlorofluorocarbon(CFC)	Getters in CRT	Combustion of halogenated substances may cause toxic emissions
PVC(polyvinylchloride)	light-emitting diode(LED)	High temperature processing of cables may release chlorine, which is converted to dioxins and furans.
Barium	Getters in CRT	may develop explosive gases (hydrogen) if wetted
Gallium arsenide	light-emitting diode (LED)	injurious to health
Lead	CRT screens, batteries, printed writing boards	causes damage to the nervous system, circulatory system, kidneys causes learning disabilities in children
Rare earth elements	is used on the interior of a CRT	toxic when inhale screen, mixed with rare earth metals
Toner Dust	toner cartridges for laser printers	Health risk when dust is inhaled risk of explosion

Source: Directive 2002/96/EC of the European Parliament

Table 2 Hazardous substances their occurrences and impact on environment and human health

Economic benefits

Recycling of WEEE is an important subject not only from the point of treatment but also from the recovery aspect of valuable materials. For example, the US Environmental Protection Agency (EPA) has identified seven major benefits when scrap iron and steel are used instead of virgin materials. Using recycled materials in place of virgin materials results in significant energy savings (as shown in table3 and 4).

Benefits	Percentage
Savings in energy	74
Savings in virgin materials use	90
Reduction in air pollution	86
Reduction in water use	40
Reduction in water pollution	76
Reduction in mining wastes	97
Reduction in consumer wastes generated	105

Source: US Environmental Protection Agency

Table 3 Benefits of using scrap iron and steel

Materials	Energy savings (%)
Aluminum	95
Copper	85
Iron and steel	74
Lead	65
Zinc	60
Paper	64
Plastics	> 80

Source: US Environmental Protection Agency

Table 4 Recycled materials energy savings over virgin materials

3. Recycling system and charge system for WEEE in developed countries

More advanced, more reasonable recycling and charge system for WEEE have formed and well developed in some developed countries. Their systems vary according to national conditions. Here, this paper introduces three of the most typical system for WEEE in developed countries, i.e. Germany, the Netherlands and Japan. Then responsibility system and payment pattern in charge system for WEEE in developed countries are summarized.

3.1 Recycling system and charge system for WEEE in Germany

Producers are obliged to the take back of collected WEEE form local authority collection points and its treatment in Germany. Consumer can also send WEEE to Manufacturer directly (as shown in Fig. 1).

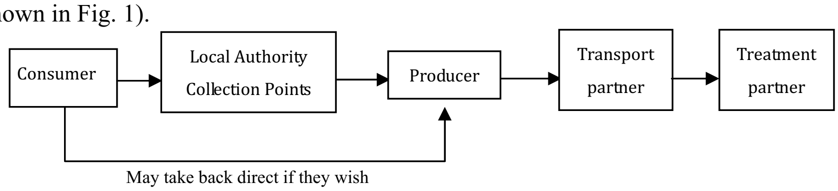

Fig. 1 German WEEE Recycling System

The fees for product take back and disposal are shared by consumer and producer in Germany. Municipalities operate and finance Local Authority Collection Points for free-of-charge take back of WEEE (this fee is paid to Municipality by consumer at ordinary times).Producer oblige the fees for transport, disposal and treatment that is caused from Local Authority Collection Points.

3.2 Recycling system and charge system for WEEE in the Netherlands

Retailers are obliged to take-back WEEE from consumers in the Netherlands. They may then transfer the WEEE to a municipal waste site, direct to the Regional sorting stations. Municipal collection sites receive WEEE and take responsibility for delivery to regional sorting stations operated by the municipalities and NVMP (The Netherlands association for the Disposal of Metal and Electrical Products).NVMP Transport contractors are responsible for the collection of WEEE from Regional Collection Station and delivery to treatment plants and recycling firms. NVMP treatment and recycling contractors are in charge of treatment of WEEE (as shown in Fig. 2).

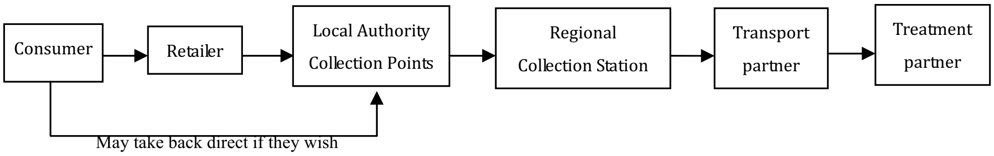

Fig.2 Dutch WEEE Recycling System

Consumers pay a visible fee on the purchase of new EE products. The fee includes a local municipal waste tax to fund general waste collection and operation of municipal sites. Consumers may return WEEE free of charge to municipal collection sites. The fee from consumers to producers is passed on by the retailer to the producer. Finally, producers pay NVMP to manage their WEEE responsibilities.

3.3 Recycling system and charge system for WEEE in Japan

Japanese WEEE take back system is a consumer/retailer based system. Retailers are primary actors to be responsible for collecting the end-of-life products from household to regional collection stations. Upon the request of consumers, the retailers are responsible for accepting a) an old appliance when selling a similar new product (old-for-new), and b) an old appliance that they themselves have sold. For other products not collected by the retailers, but municipalities and designated legal entities. The government appointed the Association for Electric Home Appliances (AEHA) is appointed as a designated legal entity by government. With regard to collection, designated legal entities collect products from remote areas in response to the request of municipalities governing the area or of local residents themselves. Producers have the obligation to establish the regional collection stations and transfer the discarded products to recycling plants. Producers also have the responsibility to recycle their products themselves or delegate their responsibility to the third party (as shown in Fig. 3).

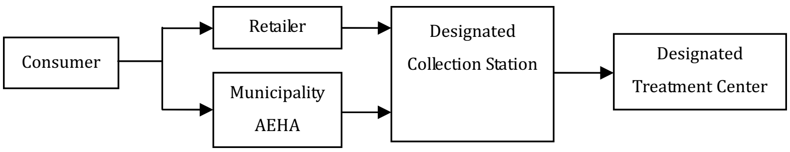

Fig.3 Japanese WEEE Recycling System

For the recycling of WEEE, the consumers pay for the collection at the time of disposal (end-user-pays). The consumers also must buy a recycling ticket (available at post offices and retail stores), which they provide to the collection agent to demonstrate the recycling fee. The fee is announced by those who are physically responsible for collection. This fee also covers the management of the regional collection stations. The cost associated with the physical responsibility of the producers (establishment of regional aggregation stations and transport of discarded products from the regional aggregation stations to recycling plants) is covered within the recycling fee.

3.4. Summing up charge system for WEEE in developed countries

Based on the above analysis on 3 typical systems for WEEE in developed countries, responsibility system and payment pattern in charge system be summarized as follows.

3.4.1 Responsibility system for WEEE

Government Responsibility: State is responsible for all costs of collection and recycling for WEEE by establish fund and collect taxes.

Producer Responsibility: Producers are responsible for all costs of the collection and recycling of their products at the end of usable life.

Consumer Responsibility: Consumers pay the recycling fees for WEEE at the time of buying or abandonment.

Multi-party Responsibility: Government, producers, 3PL and consumers all share the costs of collection and recycling for WEEE.

3.4.2 Payment pattern for WEEE

To consumers, the payment pattern can be classified into 2 main types, per-payment and post-payment.

Per-payment method (pension style) means consumers pay the recycling fees, at time of sales, to recycle returned end-of-life wastes.

Post-payment method means consumers pay recycling fees at time of discharging end-of-life products.

"Pre-payment" (pension style) is superior to post-payment scheme in prevention of illegal dumping. If we have to pay recycling fees when we return end-of-life products, we may fall into temptation to damp them illegally to avoid payment of fees. There are other aspects where post-payment is better than pre-payment. For calculability of recycling fees, under pre-payment scheme, especially for durable products such as electric appliances, how producers can accurately calculate recycling fees in many years thereafter when they sell products today? There are various factors affecting future recycling fees, which are technology innovations, fluctuations of disposal fees, price of natural resources etc. It is almost impossible to estimate them correctly.

4. Recycling system and charge system for WEEE in China and suggestions

There are many difficulties in the course of establishment of charge system for recycling WEEE in china. Of course we can learn from the experience of other countries, but never copy. This section analyzes the current situation of recycling for WEEE and updated policy of government in China. Then some suggestions on charge system are put forward based on experiences of developed countries and Chinese national conditions.

4.1 Recycling system and charge system for WEEE in China

At present, the WEEE recycling and disposal is typically disorganized in China. There are many avenues to collect the WEEE, such as Municipal collection sites, individual collectors, secondhand market and retailer etc. Then WEEE are resold or disposed by registered/unregistered treatment enterprises.

Individual collectors formed the main channel for WEEE collection. Few of them cared much about the recycling enterprises qualification except for few of multinational companies which have strong environmental consciousness. But they can give consumers a good price because of low cost when waste is collected. As a result, recycling companies which have advanced technologies, facilities and special qualifications are in the inferior position during bidding and cannot collect enough raw materials. Lots of WEEE flowed into individual collection companies which have not necessary labor and environmental protection measures and facilities. Serious environmental pollution problems often occurred.

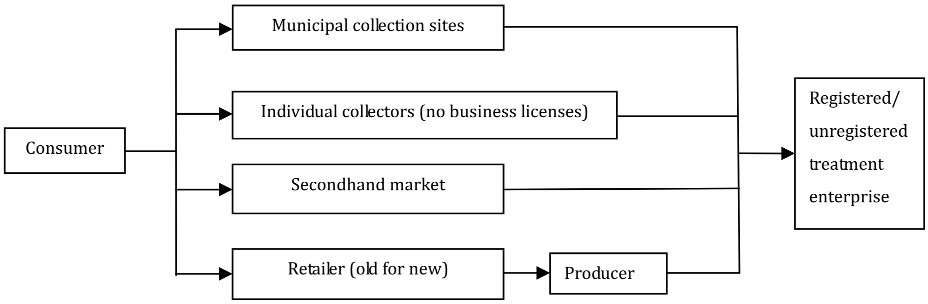

Fig.4 Chinese WEEE Recycling System

On 25 February 2009, the State Council issued the Regulations on the Recycling and Treatment of Waste Electrical and Electronic Equipment in their final form (China WEEE). The China WEEE, which will enter into force on 1 January 2011, sets out the responsibilities of relevant parties, supervision and management and legal liabilities. The nation practices the system of multi-channel recovery and centralized processing for waste electrical and electronic products. The nation implements the system of licensing for recovery processing of waste electrical and electronic products. The nation sets up a fund for recovery processing of waste electrical and electronic products which will be used to subsidize recovery processing of waste electrical and electronic products. Manufacturers of electrical and electronic products, and consignees or agents of imported electrical and electronic products shall perform their duty in making contribution to fund for recovery processing of electrical and electronic products in accordance with relevant rules.

4.2Suggestions on charge system of WEEE recycling system in China

4.2.1Responsibilities of relevant parties

In the light of present situation, the modernized large scale production day by day along with the electrical and electronic product industry, but the electrical and electronic product market competition day by day intense so that the electrical and electronic product profit margin is more and more low to manufacturer. And Chinese consumers traditionally look at their obsolete electronic appliances as valuable goods and they would prefer selling them to get some money back rather than paying for the treatment of the waste. It is also an impractical plan if the government or 3PL bears the cost. So the best strategy is adopting responsibilities of multiple parties with respect to government, producer and consumer. The cost of recycling WEEE involved will be shared among multiple parties.

Government

The electrical and electronic manufacturing industry has become one of the pillar industries in the country. And government can get economic benefits from tax. So the government establishes a fund for the disposal of WEEE to be used as allowance for the recovery and disposal of WEEE.

Producer and retailer

Producer and retailer sell the electrical and electronic product at a profit. They must report the sales of electrical and electronic product to relevant department. They need to perform their obligations of contributing to the fund for WEEE disposal according to the sales of electrical and electronic product.

Collection and treatment enterprise

Chinese Collection and treatment enterprise of WEEE are in their beginning stage, and they not formed marketization and industrialization yet. Therefore they can get the allowance for the recovery and disposal of WEEE from government. At the same time, they are obligated to declare the operation, such as quantities of recovery and treatment.

Consumer

Consumers benefit from using electrical and electronic product. Therefore, they are not the subject of financial resources, but they deserve to bear a part of recycling fees.

4.2.2 Payment pattern

In China, consumers traditionally think of the waste electrical and electronic product as valuable goods and they sell them to get money back. In addition, citizens do not realize yet the importance of recycling electrical and electronic product. It is difficult to realize if consumers pay recycling fees at time of discharging end-of-life products. And it is also likely to cause illegal dumping of wastes. Therefore, the payment pattern prefers pre-payment method to post-payment method that suits national conditions. It should taken making reasonable recycling fee into the payment system in practice.

5. Conclusions

China faces great pressure to tackle WEEE problem. Chinese Government has strived to solve those problems from both management policy aspects and technical aspects. Government seeks for establishment of recycling system for WEEE, which is efficient, good to environment and suit to condition in China. The charge system is an important part in collection and recycling of WEEE. Based on the current status of WEEE recycling system and charge system in developed countries, and considering the current status of WEEE recycling system and charge system as well as the actual situation of current social and economic development in China, some suggestions about responsibility system and charge pattern are proposed to provide references for constructing of system of recycling WEEE in China.

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AN OVERVIEW ON HONG KONG INTERNATIONAL CONVENTION FOR THE SAFE AND ENVIRONMENTALLY SOUND RECYCLING OF SHIPS

Onur Sabri DURAK
Research Assistant, Istanbul Technical University, Maritime Faculty
duraks@itu.edu.tr

Abstract This article evaluates the "Hong Kong International Convention on the Safe and Environmentally Sound Recycling of Ships (Hong Kong Convention)". Chapter 1 of this article addresses general introduction and historical background of the Hong Kong Convention. Chapter 2 focuses on legal framework of the Hong Kong Convention. Structure of the Hong Kong Convention and entry into force conditions of the Hong Kong Convention are analysed in this chapter. The issues relating to the co-existence of the Hong Kong Convention with other international legislative documents are also stated in this chapter. Chapter 3 aims to investigate the effects of the Hong Kong Convention on *marine environmental protection* in accordance with the marine environmental law approach. In addition to that, advantages and disadvantages of the Hong Kong Convention are discussed in this chapter. Chapter 4 addresses the concluding remarks and further recommendations on ship recycling facilities in regard to marine environmental protection.

Keyword: *Ship recycling, marine pollution, Hong Kong Convention.*

1. Introduction

The disposal of ships at the end of their economic life has great significance for the continual renewal of the merchant marine fleet [12] and for sustainable development [9]. Ship-recycling facilities, however, also have negative effects in terms of the environment and occupational health and safety.

On one hand, ship recycling facilities contributes to sustainable development and is the environmentally friendly way of disposing ships and [6] and economically integrated to life chain of ships.On the other hand, the ship-recycling industry has a potentially negative impact on the marine environment and some economic disadvantages. In addition, if there is no appropriate integrated system for the recycling or reusing of ship-related steel, machines, auxiliaries and even furnishings, such materials will remain unused and useless to the economy at the end of a ship's life cycle. Ship recycling costs are comparatively higher in the European Union (EU) and the United States of America (USA) than in Asia because of the strict regulations relating to environmental issues and occupational safety and health issues. Thus, ship-recycling facilities in the EU and the USA are not economically viable and as a consequence of cost consideration, ship recycling facilities are particularly located in Asian States and in Turkey.

At the end of a ship's life cycle, the ship contains not only various recyclable materials but also a range of hazardous and toxic substances [3]. In Europe and in Member States of the Organisation for Economic Co-operation and Development (OECD), materials that contain hazardous and toxic substances are subject to monitoring, and their disposal is strictly regulated. Most of those substances in ships are defined as hazardous and toxic under the existing 1989 Basel Convention on the Control of Transboundary Movements of Hazardous

Wastes and their Disposal (1989 Basel Convention). The reality is that, currently, the global shipping industry relies on developing countries to dispose of decommissioned ships through the process of ship recycling. As a result, the ship-recycling industry avoids the burden of complying with the high cost standards in developed countries in order to manage the hazardous wastes involved in decommissioning. Subsequently, occupational safety and health issues emerge—particularly in association with the dismantling of beached ships in India, Bangladesh and Pakistan [8].

Ship-recycling workers live under the constant threat of occupational accidents due to the inherent risks of ship dismantling. In the above-mentioned countries, most of the workers do not wear protective equipment such as helmets, masks or goggles, and there are no warning signs of danger. Most of the workers have no occupational training in working with blowtorches or with the hazardous substances involved in ship recycling. Furthermore, many workers do not wear safety goggles to protect their eyes from the sparks. The paint and coatings cladding the ship's hull may be flammable and/or may contain toxic ingredients such as polychlorinated biphenyls (PCBs), heavy metals and pesticides such as tributyl tin (TBT) [4]. Toxic fumes are released during the blowtorch-cutting process and afterwards while the paint and coatings may continue to smolder. The workers who use cutting torches routinely inhale the toxic fumes from, for example, the steel coated with toxic paints.

The rise of environmentalism has influenced the development of policies in developed countries and international organizations, particularly the International Maritime Organization (IMO), the United Nations dedicated legislator of the global shipping industry since the catastrophic maritime catastrophes that took place in the 1960s [2]. The IMO has been challenged with establishing a globally applicable and comprehensive maritime environmental legal system to achieve the goal of sustainable development. Taking into consideration shipping activities and sustainable development, the maritime environmental legal system covers the following periods:
– the ship-construction period,
– the operation and utilization period of the ship for any maritime,purpose at sea and
– the ship-recycling period.

In the first instance, the IMO aims to develop goal-based construction standards for new ships, which were introduced by the 89th session of the council in November 2002. The recommendations on 'goal-based ship-construction standards' indicate that the IMO should develop initial ship-construction standards that permit innovation in design but ensure that ships are constructed to a suitable standard and, if properly maintained, will remain safe for their entire economic life. In addition, the standards should also ensure that all parts of a ship can be easily accessed to permit proper inspections and maintenance. With regard to these considerations, the IMO Assembly adopted the strategic plan for 2004– 2010 and Resolution A.944 (23), which restated that, ''the IMO would establish goal-based standards for the design and construction of new ships."

Subsequently, the IMO, taking into consideration ship-operating periods, adopted international legal instruments that aimed to challenge vessel-sourced marine pollution. The documents, which were adopted by the IMO, comprise a broad range of marine pollution-related issues, including the prevention of pollution by oil, the carriage of chemicals by ships, the prevention of pollution by harmful substances carried by sea in packaged form, the prevention of pollution by sewage, the prevention of pollution by garbage, the prevention of air pollution and the prevention of marine pollution through the dumping of waste.

Although the IMO aims to establish a global maritime environmental legal system, legal actions relating to the ship-recycling period are still in their infancy compared to the laws governing the ship-construction and ship-operation periods. The environmental impact of ship-recycling facilities has been a topic of concern since the 1980s. The first noteworthy attempt to consider ship-recycling facilities was the 1989 Basel Convention. However, the 1989 Basel Convention was not entirely adequate to challenge all risks and problems arising from ship-recycling facilities [10]. The 1989 Basel Convention briefly mentions the transportation of hazardous materials; however, it does not indicate detailed rules for the recycling process. With regard to these considerations, the IMO took ship recycling and its environmental impact into its agenda. Since 2003, the IMO has adopted the Guidelines and Circulars for the purpose of achieving a green ship-recycling industry. In addition, joint efforts with the IMO, the International Labour Organization (ILO) and the Conference of Parties to the 1989 Basel Convention were also made to establish a Joint Working Group on Ship Scrapping. Finally, in May 2009, the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships was adopted, which was aimed at ensuring that ships, when recycled after reaching the end of their operational lives, do not pose any unnecessary risk to human health and safety or to the environment.

2. Legal Framework

2.1. The structure and general characteristics of the Hong Kong Convention

During the meetings of the IMO to establish the new ship-recycling system, it was agreed that the system should include regulations for the design (for new ships), construction, operation and preparation of ships (for new and existing ships) to facilitate safe and environmentally sound recycling without compromising safety and operational efficiency. It is also important to consider regulations for the operation of ship-recycling facilities in a safe and environmentally sound manner. Regulations for the establishment of an appropriate enforcement mechanism for ship recycling were also taken into account.

The Hong Kong Convention includes 21 Articles that cover the general obligations of Party States, definitions, application of the Convention, controls related to the ship recycling, the survey and certification of ships, the authorization of ship recycling facilities, the exchange of information, the inspection of ships, the detection of violations, the violations, the undue delay or detention of ships, the communication of information, the technical assistance and co-operation, the dispute settlement, the relationship with international law and other international agreements, procedures, entry into force requirements and proceedings, amendment, amendment procedure, denunciation, depositing procedure and official languages of the Convention.

The Annex to the Convention includes four chapters. Chapter 1 addresses the General Provisions of Regulations 1–3. Chapter 2 introduces the requirements for ships in Regulations 4–14. Chapter 3 discusses the requirements for ship-recycling facilities in Regulations 15–23. Finally, Chapter 4 notes the reporting requirements in Regulations 24–25.

In addition to the Annex, there are seven appendices established under the Convention. Appendix 1 deals with the control of hazardous materials. In order to control hazardous materials, the appendix first lists the type of hazardous material, defines it and then notes the control measures. The 'minimum list' of items for the inventory of hazardous materials is introduced in Appendix 2. Appendix 3 comprises the 'form of the international certificate on inventory of hazardous materials,' 'endorsement to extend the certificate if valid for less than five years where regulation 11.6 applies,' 'endorsement where the renewal survey has been completed and regulation 11.7 applies,' 'endorsement to extend the validity of the certificate until reaching the port of survey or for a period of grace where regulation 11.8 or 11.9 applies,' and 'endorsement for additional survey.' In dealing with ship-recycling facilities, Appendix 4 indicates the, 'form of the international ready for recycling certificate' and 'endorsement to extend the validity of the certificate until reaching the port of the ship-recycling facility for a period of grace where regulation 14.5 applies.' Consequently, the form of the authorization of ship-recycling facilities is adopted under Appendix 5. Appendix 6 goes through the form for reporting a planned start of ship recycling. Finally, Appendix 7 addresses the form for the statement of completion of ship recycling.

The Hong Kong Convention was developed under the auspices of the joint International Maritime Organization/International Labour Organization and the Basel Convention Working Group on Ship Scrapping. These three international organizations influenced the drafting process of the Hong Kong Convention in accordance with their own legislative backgrounds, considerations and future prospects. The Hong Kong Convention reflects the considerations of almost every part of shipping industry, such as; ship yards, ship owners, ship managers, ship recycling facilities, flag states, port states, and employees and so on. And the Hong Kong Convention was developed under the consensus of all above mentioned parties.

The Hong Kong Convention intends to be legally binding, globally applicable and easily enforceable. The Hong Kong Convention sets out mandatory system and Parties to the Convention are not entitled to establish a lower degree requirements or conditions aside the Hong Kong Convention. In other words the Hong Kong Convention has an imperative character and Party States are obliged to obey the Hong Convention. To achieve this purpose, the Hong Kong Convention was developed under the auspices of the joint working group and was consulted to all relevant shipping industry parties.

The Hong Kong Convention creates an integrated system. As the Article 1.5 states that, the Annex to the Convention forms an integral part of it and unless it is expressly provided otherwise, a reference to the Convention constitutes at the same time a reference to its Annex. As a consequence of this article, Parties can not object to the Annex or raise reservations about the Annex.

2.2. The enforcement of the Hong Kong Convention

Article 3.1 of the 2009 Hong Kong Convention states that, unless otherwise expressly addressed in the Convention, the Convention shall apply to the following:

– ships entitled to fly the flag of a Party or operating under its authority (3.1.1) and
– ship-recycling facilities operating under the jurisdiction of a Party (3.1.2).

Article 3.1.1 allows the application of the Convention in a broader range, using the phrase 'operating under its authority' rather than just 'ships entitled to fly the flag of a Party.' However, this drafting also introduces ambiguity related to the definition of 'operating under its authority.' The Convention does not define the operation of a ship, a state's authority and how to limit that authority. This drafting is expected to lead to further problems in the future.

Despite this problem, some delegations during the discussions argued that the exclusions were not consistent with the spirit of the Convention [6] because Article 3.2 excludes the application of the Convention to any warships, naval auxiliary ships or other ships owned or operated by a Party and used for governmental, non-commercial services. Article 3.3 states that the Convention shall not apply to ships of less than 500 GT. Article 3.3 also states that ships operating throughout their life only in waters subject to the sovereignty or jurisdiction of the State whose flag the ship is entitled to fly are excluded from the application of the Convention. For the non-Party States, Article 3.4 states that the Parties shall apply the requirements of this Convention to ensure that favorable treatment is not given to such ships.

Article 15 regulates the relationship between the Convention and other international agreements. In accordance with Article 15.1, the Convention shall not prejudice the rights and obligations of any State under the United Nations Convention on the Law of the Sea (UNCLOS) and under the customary international law of the sea. In addition, Article 15.2 states that the Convention shall not prejudice the rights and obligations of Parties under other relevant and applicable international agreements. Even though the article aims to achieve co-existence of the International Conventions and customary law with the 2009 Hong Kong Convention, such an article may cause several problems related to

– the inconsistencies in practice among the International Conventions, particularly UNCLOS and the 2009 Hong Kong Convention,
– the lack of global application of the 2009 Hong Kong Convention and
– the membership status of the States that are Parties to the 2009 Hong Kong Convention to other International Conventions.

One of the most noteworthy points in the Convention is Article 16.4, which deals with States that comprise two or more territorial units in which different systems of law apply to a matter dealt with by the Convention. This approach will allow States to apply the Convention to one, two or more or all of their territorial units together or separately if the State has two or more territorial units that have different legal systems. As often as possible, the Convention aims to achieve the signature, accession and ratification of States—particularly China, as it is one of the largest participants in the ship-recycling industry.

Article 17 of the Convention requires three conditions to be complied with simultaneously for the enforcement of the Convention. These conditions are listed below.

– At least 15 or more States should sign the Convention without reservation as to ratification.
– The combined merchant fleets of the States that have already signed the Convention should represent at least 40% or more of the gross tonnage of the global merchant shipping volume.
– The combined maximum annual ship-recycling volume of the States that have already signed the Convention should constitute at least 3% or more of the gross tonnage of the combined merchant shipping of the same States during the preceding 10 years

3. Impacts and Prospects of the Hong Kong Convention on Marine Environmental Law and Policy

3.1.The current capacity of the world merchant fleet

In accordance with Article 17, the capacity of the operating world merchant marine fleet is one of the key issues in the enforcement of the Hong Kong Convention. The world fleet changes continuously, old ships are replaced by new ones and, though some of the old ships are sent for recycling, some are used for other purposes such as stores, hotels or restaurants. In addition, some ships are removed from the world merchant fleet as a result of an accident.
However, due to the non-existence of a global ship-registration system, the flag of convenience and the lack of Flag State's reporting and information, the certified capacity of

merchant marine fleet varies from one database to another.

As Mikelis [7] revealed in 2005, the capacity of the world merchant marine fleet over 100 GT comprised 92,105 ships and that the capacity of the fleet over 500 GT comprised 47,258 ships. By 2006, the capacity of the fleet over 100 GT had increased to 94,936 ships and the capacity over 500 GT had increased to 49,213 ships. Sundelin [9] stated that the capacity of the merchant marine fleet over 500 GT was estimated at more than 50,000 ships in 2008. These reports, however, include ships that are owned by governments for non-commercial services or are used solely for domestic voyages. Article 3 of the Hong Kong Convention excludes ships that are owned by governments for non-commercial services and ships that are used solely for domestic voyages. Thus, the capacity of the merchant marine fleet that is subject to the Hong Kong Convention is estimated at approximately 42,000–45,000 ships.

Despite this, Mikelis [7] stated that the estimated request capacity for ship recycling is over 900 but less than 1000 per year. Vedeler [11] reported that approximately 4000 vessels per year are sent to recycling yards around the world. A study by Andersen [1] stated that the annual expected scrapping rate is around 500–700 vessels per year. The discrepancies among the reports are based on several reasons:

– a lack of reports and information from the ships that are subject to the recycling process,
– some ships that are already reported as recycled are subsequently found to have been traded onwards,
– many of the ships that are subject to ship recycling are reported a considerable time after they were recycled,
– the reports of the details of ships subject to recycling vary from one year to another due to a lack of timely ship-recycling reports, thus making the accuracy of the data questionable,
– the differences in the reports published by the different maritime data providers and
– the inaccuracy of the ship-recycling databases, particularly for the smaller-sized merchant marine fleet.

In addition to the general factors of the ship-recycling market, there are two main factors to be considered. First, as a result of the global financial crisis, some ships, particularly old ships, have been retired and then sent for recycling. Secondly, in order to try to prevent tanker incidents and the subsequent marine pollution, the IMO set a timetable for phasing out single-hull tankers. In accordance with the International Convention for the Prevention of Pollution from Ships 1973 (MARPOL 73) and its modified Protocol 1978 (known as MARPOL 73/78) Annex I, Regulation 13 G, the final phasing-out date for a Category 1 (pre-MARPOL 73/78) tanker was established in 2005. The final phase-out date for Category 2 and 3 tankers was first established in 2005 and then changed to 2015. The EU Member States and other leading maritime merchant States declared, however, that they will not allow single-hull tankers to sail to their ports. This restriction may be a reason for ship owners to renew their tanker fleets and, therefore, send their aged single-hull tankers for recycling [5], [11].

3.2. The future impact and prospects of the 2009 Hong Kong Convention on marine environmental law and policy

The ship-recycling industry has a negative influence on the natural and marine environment. On the other hand, the working conditions, occupational safety and health issues in recycling yards can pose a threat to the life and health of workers. Prior to the Hong Kong Convention, there were no specific internationally recognized standards addressing the above-mentioned issues. The Hong Kong Convention will certainly have an impact on the designation of a global marine legal system and policy. As stated in the preamble of the Hong Kong

Convention, there is concern about the environment and occupational safety and health, yet it is recognized that the ship-recycling industry contributes to sustainable development. This drafting method aims to achieve a consensus between economic demands and expressed concerns. The Hong Kong Convention introduces the following control instruments:

– a Flag State control system is established to ensure that the ships entitled to fly its flag or operate under its authority shall comply with the requirements set in the Convention,
– the State in whose jurisdiction the ship-recycling facilities operates establishes a control system to ensure that the above-mentioned ship-recycling facilities comply with the Hong Kong Convention,
– the new surveying regime envisages an initial survey to verify the inventory of hazardous materials, surveys during the operating life of the subject ship and a final survey prior to entering into the recycling process,
– the authorization regime of the ship-recycling facilities should be established by the States in accordance with the Hong Kong Convention,
– the introduction of an information exchange system between the Parties,
– the list of hazardous materials whose installation or use is prohibited and/or restricted in ships, shipyards, ship repair yards or offshore terminals,
– the inventory of hazardous materials, specific to each ship,
– the ship-recycling plan, which includes details relevant to subject ships, including particulars and inventory,
– the introduction of an issuing process for an international, ready-for-recycling certificate,
– the introduction of the ship-recycling facility plan, which ensures attention is given to addressing occupational safety and health issues, providing appropriate information and training workers, establishing an emergency preparedness and response plan, designing a system for monitoring the performance of ship recycling and record-keeping systems,
– the establishment and utilization of procedures to prevent adverse effects on human health and the environment,
– the introduction of safe and environmentally sound management systems for hazardous materials,
– the establishment of reporting systems for incidents, accidents, occupational diseases and chronic effects and
– the introduction of a final reporting system upon the completion of ship recycling.

From an environmental perspective, the Hong Kong Convention aims to create a comprehensive regime throughout the life cycle of a ship and to integrate it into the global marine environmental system. Article 1.1 states that Party States are obligated to give full and complete compliance to its provisions in order to prevent, minimize and, to a practical extent, eliminate injuries and other adverse effects on human and environmental health caused by ship-recycling activities. To achieve this comprehensive purpose, Annex Chapter 1, Regulation 3 stipulates that Party States shall take measures to implement the requirements of the regulations of the Annex, taking into consideration the relevant and applicable technical standards, recommendations and guidance developed under the 1989 Basel Convention. In addition, Annex Chapter 2, Regulation 8 requires that ships that are subject to recycling shall only be recycled at ship-recycling facilities that are authorized in accordance with this Convention and fully authorized to undertake the entire ship-recycling process. As a result, ship recycling has been prohibited unless the ship-recycling process is conducted in a fully authorized ship-recycling facility. In order to avoid any adverse effects on the environment, the owners of ships that are subject to ship recycling shall conduct all operations in the period prior to entering the ship-recycling yard.

Article 4.1 sets forth the Flag State control system and, to achieve this purpose, Article 5 states that each Party State shall ensure that ships flying its flag or operating under its authority are subject to survey and certification. With regard to these Articles, Annex Chapter 2, Regulation 10 stipulates that the Administration (Flag State Administration) shall survey the ships by taking into consideration the guidelines adopted by the IMO. Regulation 10.4 states that, in every case, the Administration shall be responsible for ensuring the completeness and efficiency of the survey and shall ensure the necessary arrangements to satisfy this obligation.

Article 6 of the Hong Kong Convention states that each Party State will ensure that ship-recycling yards will be operated under its jurisdiction. Furthermore, Article 4.2 states that each Party State shall require the ship-recycling facilities under its jurisdiction to comply with the requirements set forth in the 2009 Hong Kong Convention and shall take effective measures to ensure such compliance. Detailed requirements for ship-recycling facilities are prescribed under Annex Chapter 3. Regulation 15 of the Annex states that each Party State shall establish legislation, regulations and standards that are essential to ensure that ship-recycling facilities are designed, constructed and operated in a safe and environmentally sound manner. In accordance with Regulation 15.2, ship-recycling facilities should meet the requirements of the Hong Kong Convention. To achieve this purpose, each Party State is obliged to establish an authorizing mechanism for ship-recycling facilities whether or not those facilities meet the requirements. In addition, Regulation 15.3 states that each Party State should establish a mechanism for inspections of the ship recycling yards. The authorization and inspection systems, which concern ship-recycling yards, aim at an integrated, comprehensive and continuous recycle-controlling system.

Furthermore, Regulation 17 of the Annex requires that ship recycling facilities shall establish management systems, procedures and techniques that should prevent, reduce, minimize and, where possible, eliminate adverse effects on the environment caused by ship recycling, taking into consideration the guidelines adopted by the IMO. In accordance with Regulation 17.2, ship recycling facilities are only allowed to accept ships that

– comply with the Hong Kong Convention or
– meet the requirements of the Convention.

In addition to these regulations, Regulation 18 of the Annex stipulates that ship-recycling facilities shall adopt a ship-recycling facility plan and this plan shall include the following:

– a policy that ensures environmental protection,
– an emergency preparedness and response plan,
– a system for monitoring the performance of ship recycling,
– a record-keeping system and
– a system that reports discharges, emissions, incidents and accidents causing damage or with the potential to cause damage to the environment.

Ship-recycling facilities shall ensure the safe and environmentally sound removal of any hazardous material contained in a ship, certified in accordance with Regulations 11 and 12 of the Annex. Waste management and disposal sites shall be identified to provide for the further safe and environmentally sound management of materials. Furthermore, all waste that is generated from the recycling activity shall be kept separately from recyclable materials and equipment shall be labeled, stored in appropriate conditions and finally, transferred to a waste-management facility that is authorized to deal with its treatment and disposal in a safe and environmentally sound manner.

For any emergency, Regulation 21 states that a ship-recycling facility shall establish and maintain an emergency preparedness and response plan. The plan shall ensure that an information communication and a coordination system that provides protection for all people and the environment is established and provides first aid, medical assistance and fire-fighting services and a strategy for evacuation and pollution prevention.

The Hong Kong Convention introduces a new system that aims to exchange information between Party States via the IMO. If one of the Party States so requests, the State where the ship recycling facilities are authorized under its jurisdiction shall provide the relevant information to the IMO and should be exchanged in a swift and timely manner. The Hong Kong Convention pays particular attention to inspections of the subject ships and states that the ships subject to recycling may be inspected by officers for the purpose of determining whether or not the ship complies with the requirements of the Convention. This inspection is mainly based on and limited to a valid 'International Certificate on Inventory of Hazardous Materials' or 'International Ready for Recycling Certificate.' If, however, the ship does not carry a valid certificate or there are clear grounds for believing that

– the condition of the ship or its equipment does not correspond substantially with the particulars of the certificate and/or the inventory of hazardous materials or
– there is no procedure implemented on board the ship for the maintenance of an inventory of hazardous materials

a detailed inspection may be carried out, taking into consideration the guidelines developed by the IMO.

In summary, the Hong Kong Convention establishes control and enforcement instruments related to ship recycling, determining the control rights of Port States and the obligations of Flag States, Parties and recycling facilities under its jurisdiction. The Convention also controls the communication and exchange of information procedures, establishes a reporting system to be used upon the completion of recycling, and outlines an auditing system for detecting violations.

3.3. Deficiencies arising from the Hong Kong Convention

The 2009 Hong Kong Convention aims to achieve a comprehensive, globally and continuously applicable, environmentally sound ship-recycling regime. Nonetheless, the structure of the Hong Kong Convention has deficiencies. Despite the entry into force of the conditions, the application of the Convention has experienced difficulties that have caused problems. In addition, the Hong Kong Convention itself does not introduce a compulsory and environmentally sound ship-recycling method.

The Hong Kong Convention establishes a comprehensive system, working on a timely basis, which covers instruments for such aspects as outlining the Flag State, Port State, State Party and ship recycling facilities under its jurisdiction, detecting violations, requiring inspections and controlling waste management. The system should take into account the periods before recycling, during recycling and after recycling. The Convention only stipulates rules for the periods before the recycling and during the recycling. While the Convention stipulates the rules relating to waste management (after scrapping has been concluded), it does not address how to deal with the management process during the final stage. The final management of waste generated from the ships has not been stipulated in the Convention and has not been expressly integrated with the other international environmental protection regimes. Despite the fact that the Convention stipulates the co-existence of the relevant international legal instruments, in practice, problems may arise from such ambiguities.

Second, due to the lack of a global ship-registration system, estimations regarding the future of the ship-recycling industry are far from clear. As a result, the survey, inspection and reporting systems of the Convention may not work as well as expected in practice.

Third, the application of the Hong Kong Convention does not comply with the ultimate aim of the environmental approach and has some significant exclusions. The new Convention excludes warships, naval auxiliary ships or other ships owned or operated by a Party and used only on governmental, non-commercial service. Thus, the Convention is solely applicable to commercial ships. In addition, the Convention excludes ships that solely operate in waters subject to sovereignty or jurisdiction of the State whose flag the ship is entitled to fly. Finally, the new Convention is also not applicable to ships of less than 500 GT. These exclusions limit the global application of the Convention and may thus limit its efficiency and success.

Furthermore, the Hong Kong Convention requires three pre-conditions that must be complied with simultaneously before becoming effective. The first condition requires that at least 15 or more States sign the Convention, which is the easiest step to be achieved. The EU members and the OECD members have a consensus to sign and enforce the Convention. As a result, the combined maritime merchant fleet capacity of these States constitutes at least 40% of the gross tonnage of the world's merchant shipping capacity and, consequently, meets the second pre-condition. However, the third pre-condition depends on the signature of the five main ship recycling States, including Bangladesh, China, India, Pakistan and Turkey. Among these States, the only OECD Member State is Turkey, and this omission poses a problem.

It is fortunate that China has the legal framework and preparedness order to meet the new Convention's requirements. In contrast, Bangladesh, India and Pakistan are still far from complying with the requirements of the new Convention and have reservations about signing the new Convention. Thus, the success of the Hong Kong Convention is questionable so far.

Last, but not least, the new 2009 Hong Kong Convention does not introduce compulsory and environmentally sound methods of ship recycling. There is no prohibition or restriction on grounding or beaching a ship. Although the Convention requires pre-cleaning, survey and certification, grounding a ship on the beach may still cause marine environmental pollution. The grounding of a ship, in any way, offers potential risks to the marine environment and the new Convention does not introduce any improvement measures to tackle that matter. Based on the above discussion, the Hong Kong Convention is still far from achieving the ultimate aim of sustainable development.

4. Concluding Remarks

The new Hong Kong Convention introduces a comprehensive regime to achieve environmentally sound ship-recycling methods and obliges Party States to take appropriate measures to establish a domestic legal framework in order to prevent, reduce, minimize and eliminate the adverse effects on the environment caused by ship recycling. The new Convention categorizes the obligations of Port States and Party States in situations where the ship-recycling facilities operate under their jurisdiction. Furthermore, the new Convention stipulates rules for the procedures involved in the operation and recycling of ships, such as the survey, inspection and certification of ships. In addition, the new Convention sets obligations for the ship-recycling facilities, such as preparing a ship-recycling facility plan to exchange information if so requested and to report the completion of ship recycling. The general principles have been stipulated under the Convention and further details are explained and stated within the Annex. Other relevant information, documents and lists are included under 7 Appendices of the Convention. This system shows that the IMO would like to establish a comprehensive and globally applicable ship-recycling regime and integrate it with the marine environmental protection regime via transition and the enforcement articles. By adopting the IMO's single-hull phase out regime and in recognition of the results of the global financial crisis, there are more ships sent for recycling than expected. The above circumstances reiterate the significance and importance of a global and comprehensive ship-recycling regime.

Although the new Convention is an essential development for the marine environment protection regime and the industry, it still has deficiencies. These deficiencies arise from the structure of the Convention, as it lacks an integrated regime for the protection of the marine environment. Furthermore, the success of the Convention depends on the signatures of Bangladesh, China, India, Pakistan and Turkey. However, aside from China and Turkey, the remaining countries have reservations about signing the Convention and these issues may affect its future viability. The application of the Convention is limited to ships of 500 GT or above, so almost half of the ships sailing around the world are excluded from the Convention. In addition, the Convention does not offer a clearly defined method or methods for the recycling process and leaves this to the authority of the States' domestic laws and regulations. The result is that the methods may vary between States. Even so, it is important to note that the new Hong Kong Convention will offer a necessary improvement in the global marine environment protection regime upon its coming into force.

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STCW 78 ,as amended in 2010: concepts and trends

Vladimir Loginovsky
DSc, Professor
Admiral Makarov State Maritime Academy
vl.loginovsky@rambler.ru

Abstract. This paper has been composed by materials of IMO STW meetings and Diplomatic Conference in Manila devoted to comprehensive review of STCW 78 Convention and Code , that have an impact on IAMU members activities ,their development and capacity building. The "Leximancer" software was used to make the conceptual and relational models and produce the selected analysis of STCW 78 Convention and Code of 1995 and 2010 versions, as appropriate.

Keyword: *STCW 78, Manila amendments, training, fatigue, safety.*

1. Introduction

The Diplomatic Conference of Parties to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers,1978, was held in Manila from 21 to 25 June under the auspices of the IMO. The amendments, to be known as "The Manila amendments to the STCW Convention and Code".

In 2007 prior to beginning the comprehensive review of Convention and Code, the STW sub-committee agreed that the review should only embrace the following principles [1]:

a) *retain the structure and goals of the 1995 revision;*
b) *not to down scale existing standards;*
c) *not to amend the articles of the Convention;*
d) *address inconsistencies, interpretations, MSC instructions, clarifications already issued, outdated requirements and technological advances;*
e) *address requirements for effective communication;*
f) *provide for flexibility in terms of compliance and for required levels of training and certification and watchkeeping arrangements due to innovation in technology;*
g) *address the special character and circumstances of short sea shipping and the and the offshore industry;*
h) *address security-related issues.*

Perusing the text of STCW 78, as amended in Manila and taking into account all STW outcomes of hot discussions during these years one can conclude the following:

In new amendments the goals of Convention were retained and the structure has been not changed (a). No doubt, that a lot of standards were considerably raised and improved (b). The appeared general trend , if to compare 2010 with 1995 amendments, is to make the requirements as more "goal -based" type. Articles were not amended (c).A lot of hard work to follow principle (d) was carried out across the Convention and Code. Now it is up-to-date version. It's to recognize that all the requirements for communication have become more clear and run through the entire document (e).

Flexibility of wordings is really provided (f) together with the raised standards, for example the most vividly it can be traced through the texts of Chapters III and VIII and appropriate sections of the Code.

Regulation I/3 and appropriate sections of the Code have been updated (g). Principles governing near-coastal voyages were developed. *Guidance on application of the provisions of the STCW Convention to mobile offshore units (MOUs)* was composed instead of the Resolution 10 of previous (1995) text of amendments. *The Guidance regarding training and qualifications of masters and officers in charge of a navigational watch on board offshore supply vessels* has been developed and adopted also.

The security issues (h) are included in all the appropriate regulations of Convention and sections of the Code. Chapter VI now has a new name "Emergency, occupational safety**, security,** medical care and survival functions"

If to look critically through the new amendments it's possible to conclude that all the principles stated by STW 38 were kept. The so called Manila Amendments reflects the mainstream trends in shipping and launches the innovative areas for MET activity ,which can improve safety and raise essentially the quality of seafarers. It becomes more significant especially in this Year of Seafarer, when the shipping industry as a whole is recognizing that education, training are central to so many issues which now faces the industry. Safety, security, shipping's environmental credentials, and indeed the whole future sustainability of the industry are all dependent to a great extent on the cultivation of a capable and effective manpower resource.

2. Important changes

Amongst the amendments adopted, there are a number of important changes to each chapter of the Convention and Code, including [2]:

i) Improved measures to prevent fraudulent practices associated with certificates of competency and strengthen the evaluation process (monitoring of Parties' compliance with the Convention);

j) Revised requirements on hours of work and rest and new requirements for the prevention of drug and alcohol abuse, as well as updated standards relating to medical fitness standards for seafarers;

k) New certification requirements for able seafarers;

l) New requirements relating to training in modern technology such as electronic charts and information systems (ECDIS);

m) New requirements for marine environment awareness training and training in leadership and teamwork; obtaining and maintaining situational awareness, situation and risk assessment.

n) New training and certification requirements for electro-technical officers;

o) Updating of competence requirements for personnel serving on board all types of tankers, including new requirements for personnel serving on liquefied gas tankers;

p) New requirements for security training, as well as provisions to ensure that seafarers are properly trained to cope if their ship comes under attack by pirates;

q) Introduction of modern training methodology including distance learning and web-based learning;

r) Training in celestial navigation;

s) New training guidance for personnel serving on board ships operating in polar waters; and

t) New training guidance for personnel operating Dynamic Positioning Systems.

In addition to two resolutions adopting the aforesaid amendments, the Conference also adopted 17 resolutions in frames of Convention and Code.

3. Leximancer analysis of selected concepts and trends

In principle, the Leximancer research submitted here is the logical continuation of analysis made by author in previous IAMU papers , but here only STCW amendments of 1995 and 2010 were compared.

However, due to impossibility to embrace all changes of STCW Convention and Code on pages of a short paper, and therefore we have selected 24 key concepts from 100 automatically identified by Leximancer software to check their roles and relative importance as concepts in two texts separately.

We have compared the results executed by conceptual and semantic analysis applied to the 1995 and 2010 versions of amendments to understand the most probable general trends, concepts and their mutual relations, which have occurred for the last 15 years.

The certain basic areas have been addressed for research. Leximancer software was used for the data extraction from both texts of STCW 78. These concepts extracted were as follows: *certification, communication, Ecdis, education, English, fatigue, knowledge, leadership, learning, medical (standards), officers, offshore (industry), polar (navigation), protection (of environment), quality, ratings, risk, safety, security, situation (awareness), standards, training, voyages, watchkeeping.*

The resulted data submitted in the paper enable the readers to make their independent analysis and conclusions.

By Leximancer ideology, the approaches to content analysis fall into two major categories: conceptual analysis and relational analysis. In conceptual analysis, documents are measured for the presence and frequency of concepts. Such concepts can be words or phrases, or more complex definitions, such as collections of words representing each concept. Relational analysis, by contrast, measures how such identified concepts are related to each other within the documents.

In accordance with [12] ,the information is displayed by means of a conceptual map that provides a bird's eye view of the material, representing the main concepts contained within the text and how they are related. Apart from viewing the conceptual structure of the information, this map allows users to perform a directed search of the documents in order to explore instances of the concepts or their interrelations.

The Leximancer's conceptual maps for selected concepts are presented on Fig. 1, where these concepts are united (circled) in thematic groups.

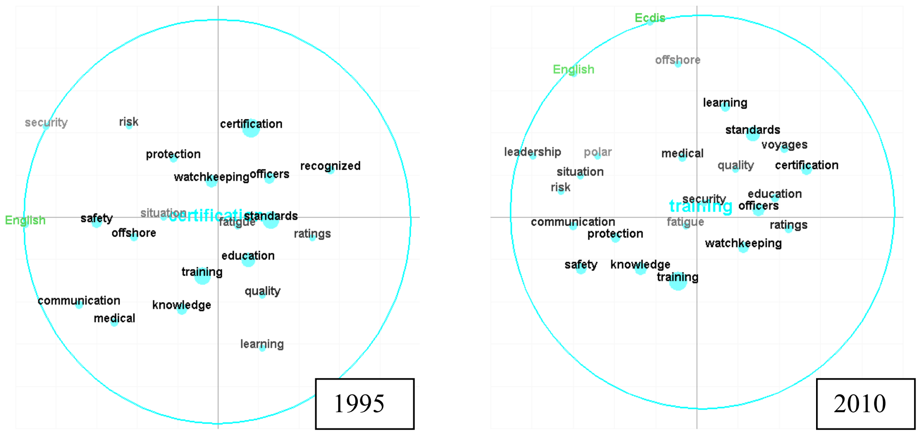

Fig.1 Selected conceptual maps of 1995 and 2010 STCW amendments

The maps provide three main sources of information about the content of documents:

(1) The main concepts contained within the text and their relative importance;
(2) The strengths of links between concepts (how often they co-occur);

In addition to maps, you can see Table 1 including the relative importance of selected concepts.

Concept	1995	2010	Concept	1995	2010
certification	100	31.9	Quality	6.1	2.7
communication	12.3	9	Raitings	3.8	8.8
education	47.8	9.3	Risk	3.5	3.3
English	2	1.7	Safety	37.8	34.4
Fatigue	2.6	1.2	Security	0.5	6.7
knowledge	26.6	41.8	Situation	0.8	5.2
Learning	3.2	22.4	Standards	70.6	51.6
Medical	17.3	8.1	Training	69.2	100
Officers	30.7	37.5	watchkeeping	33.7	24.9
Offshore	13.4	0.9	Ecdis	0	3.1
protection	12.3	17.2	leadership	0	4
Quality	6.1	2.7	Polar	0	0.7

Table 1. Relative frequency (relative importance) of the selected concepts (%)

If to look through the table , all the trends within the selected set of concepts can be clearly traced. For instance, the moving the “center of gravity” from the concept *certification* (1995) to *training* (2010) is to be recognized as a very much positive move.

(3) The similarities in the context in which they occur

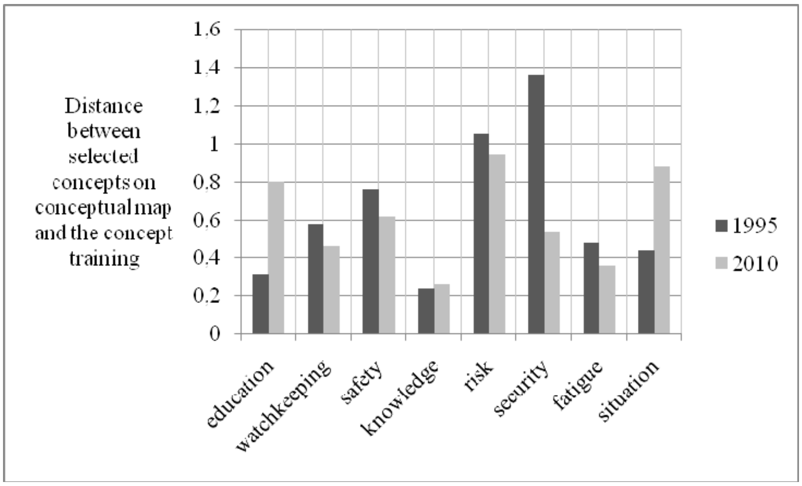

Fig. 2 Similarity trends of some selected concepts with the concept *training* (as per Fig.1)

The more closer together the concepts appear, (see Fig. 1) the more contextual similarity they have. So, *knowledge*, *watchkeeping* and *fatigue* are the most contextually similar to the concept *training*, (see Fig. 2). In Manila Amendments the following concepts have become more contextually similar to the concept *training*: *watchkeeping, safety, risk, security, fatigue,* though the types of *fatigue* (mental or physical) are not mentioned in both versions.

From this observation we can conclude, for instance, that the concepts *fatigue* and *training* are conceptually related. The epigraph to the paper may be rephrased: “The higher quality of your training, the less you feel fatigue on board” , (see Fig.3) .It means, that one of the real ways to reduce the level of fatigue of seafarers, is to raise the quality of training (and education), including **on-board-training**.

There is no doubt that the terms *training* and *competence* travel together in STCW 78. Some supporting findings extracted from [3] the following : ” As the degree of training increases, the quality of the bridge crew competence also increases. If the quality of the bridge crew competence is bad, then the individual is more likely to suffer loading, as his/her own workload may increase because he/she feels he/she has to double check the work of the other crew...” - so, this is the real way to be fatigued.

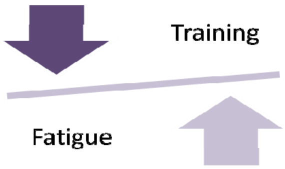

Fig. 3 The relations of two concepts: *fatigue* and *training*

The relationships between concepts are described by relative frequency (probability). Below, on Fig. 4 it is possible to see some results of data processing of both selected texts.

The latent information mined from set of texts is as followes:

- Concept *fatigue* has probabilistic relationships with almost all the concepts selected for research, except *polar, ECDIS, risk* and *communication*. Is this absence of links can be considered as gaps in Manila Amendments or not ? Logically these concepts are to be linked in text.
- Concepts *training, whatchkeeping, safety and officers* occur more frequent with *fatigue,* than *English, situation, education.*
- Very strict and increasing relations of the concepts *fatigue* and *training* confirm again the statement that both concepts are worth to be developed, treated , researched and used in regulations **only together as directly linked concepts.**

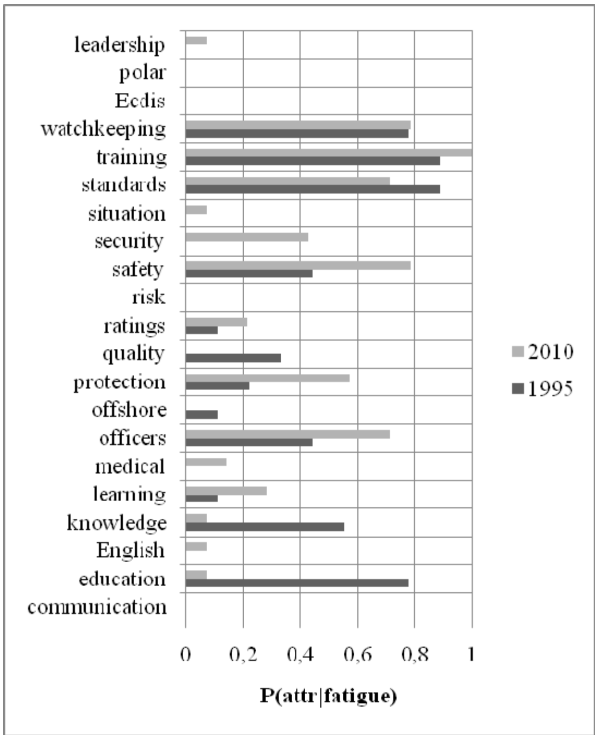

Fig. 4 Relationships between concept *fatigue* and some its attributes

It is known, that indirect links between concepts are accounted for, meaning that a significant semantic relationship can exist between concepts even when there are, in the main, only indirect relationship between them [9], as we can observe in *fatigue* and *training*.

Selected examples from Manila Amendments show that in the text there are no direct links between concepts *fatigue* and *training* , provided that the relative frequency is equal to 0.9 (1995) and 1 (2010).It's really can be seen on Fig, 4. These concepts are linked through *safety* and *watchkeeping,* (See Fig.5).

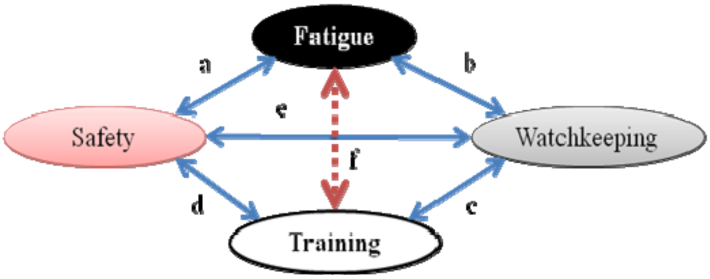

Fig. 5 Rlations beyween selected concepts.

The textual examples of concepts, extracted by Leximancer from Manila Amendments , are the following (as per Leximancer format):

(a) <u>Concepts: safety and fatigue (direct link).</u> STCW/CONF.2/DC/1, ANNEX, Page 36 CHAPTER VIII. Watchkeeping. Regulation VIII/1. Fitness for duty. 1 Each Administration shall, for the purpose of preventing **fatigue**: .1 establish and enforce rest periods for watchkeeping personnel and those whose duties involve designated **safety**, prevention of pollution and security duties in accordance with the provisions of section A-VIII/1 of the STCW Code; and .2 require that watch systems are so arranged that the efficiency of all watchkeeping personnel is not impaired by **fatigue** and that duties are so organized that the first watch at the commencement of a voyage and subsequent relieving watches are sufficiently rested and otherwise fit for duty, [4].

(b) <u>Concepts: fatigue and watchkeeping (direct link).</u> STCW/CONF.2/DC/2 ANNEX 1 Page 220 CHAPTER VIII Standards regarding **watchkeeping** Section A-VIII/1 Fitness for duty 1 Administrations shall take account of the danger posed by **fatigue** of seafarers, especially those whose duties involve the safe and secure operation of a ship. 2 All persons who are assigned duty as officer in charge of a watch or as a rating forming part of a watch and those whose duties involve designated safety, prevention of pollution and security duties shall be provided with a rest period of not less than: .1 a minimum of 10 hours of rest in any 24-hour period; and .2 77 hours in any 7-day period [5].

(c) <u>Concepts: watchkeeping and training (direct link).</u> 4 Every candidate for certification as officer in charge of a navigational **watch** on a seagoing ship of less than 500 gross tonnage engaged on near-coastal voyages shall: .1 be not less than 18 years of age; .2 have completed: 2.1 special **training**, including an adequate period of appropriate seagoing service as required by the Administration, or 2.2 approved seagoing service in the deck department of not less than 36 months, [4];

(d) <u>Concepts: training and safety (direct link).</u> 6 For the purpose of updating the knowledge of masters, officers and radio operators, each Administration shall ensure that the texts of recent changes in national and international regulations concerning the **safety** of life at sea, security and the protection of the marine environment are made available to ships entitled to fly its flag. Regulation I/12 Use of simulators 1 The performance standards and other provisions set forth in section A-I/12 and such other requirements as are prescribed in part A of the STCW Code for any certificate concerned shall be complied with in respect of: .1 all mandatory simulator-based

training; .2 any assessment of competency required by part A of the STCW Code which is carried out by means of a simulator; and .3 any demonstration, by means of a simulator, of continued proficiency required by part A of the STCW Code, [4].

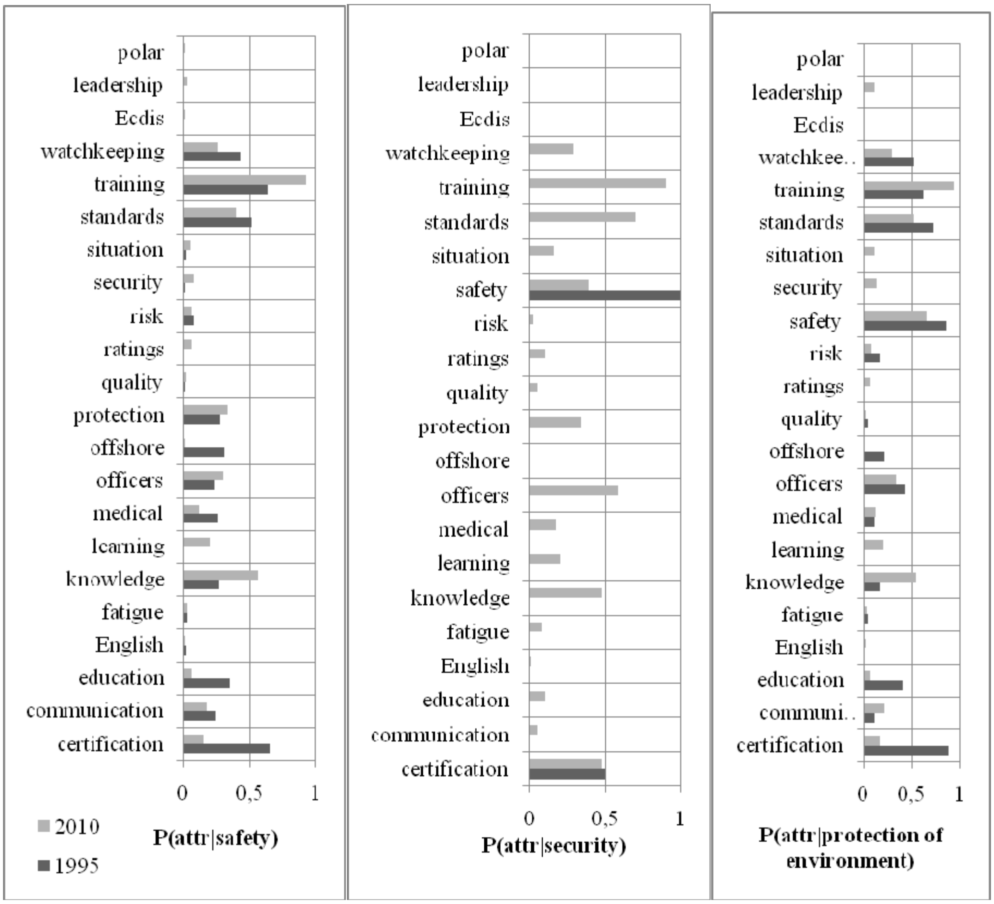

Fig. 6 Relationships between concepts *safety,security, protection* and some their attributes in 1995 and Manila Amendments to STCW 78

(e) <u>Concepts: safety and watchkeeping (direct link).</u> **Watchkeeping** personnel shall notify the master/chief engineer officer/officer in charge of watch duties without any hesitation when in any doubt as to what action to take in the interest of **safety**,[5].

(f) <u>Concepts: fatigue and training (**indirect link**) .</u> In particular, the minimum rest periods specified in section A-VIII/1 should not be interpreted as implying that all other hours may be devoted to watchkeeping or other duties; the frequency and length of leave periods, and the granting of compensatory leave, are material factors in preventing **fatigue** from building up over a period of time; and the provisions may be varied for ships on short sea voyages, provided special safety arrangements are put in place ,[6].

So, the mining of direct and indirect links between two concepts as *fatigue* and *training* from both texts of amendments shows the relative importance of concepts for STCW versions and indicates the appropriate trend that can be applied for future research and improvements of STCW 78, as amended.

The observation confirms the statement, that it is possible to reduce fatigue by appropriate education and training of seamen, [10].

Every other concepts can be investigated by the same way and reader can use the data presented in the paper, (See Fig.6), to make his/her own initial conclusions on the 1995 and 2010 texts.

The other selected concepts and their trends can be seen also on Fig. 6, where it's possible to observe relationships between concepts *safety,security, protection* (of environment) and their selected attributes in 1995 and Manila Amendments to STCW 78.

4. Findings and results

The Leximancer formal research of selected concepts and their trends extracted from 1995 and 2010 STCW amendments revealed the following:

- As per Manila Amendments, the concept *fatigue* , which is extremely responsible for safety at sea in general ,is very much influenced by the *training* and there is a trend of increasing this link. It also proves the substantially increasing role and significance of MET.
- The importance of such concepts as *training , knowledge, situation* (awareness), *protection* (of environment) and *leadership* for *safety* is increasing, as well; It is challenge for MET institutions to follow and reflect the trend in timely manner.
- As a *security* is a new concept in STCW Convention and Code, the significance of all security's attributes is formally raised, except *safety.* This result was not investigated in the paper.

At the end, it is to say that the issue of *manning* is not investigated in this paper. We have no reasons to do it. Resolution 6, *Standards of training and certification and ships' manning levels*, adopted by the Diplomatic Conference affirms that the STCW Convention and Code are instruments concerned with standards of training and certification and do not determine ships' manning levels; But however taking this into account and also ,whereas the strict relationship between the concepts *training* and *fatigue,* and *manning* and *fatigue* exists as well [11], it should be concluded that the concept *manning* in principle has a link with the *training* and this relationship is not to be ignored in development of regulations.

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Towards STCW 2012: an analysis and discussion of selected topics

Fred Anstey
Coordinator of Programs, Fisheries & Marine Institute of Memorial University,
fanstey@mi.mun.ca
Catherine Dutton
Head School of Maritime Studies, Fisheries & Marine Institute of Memorial University,
cdutton@mi.mun.ca

Abstract A diplomatic conference was convened in Manila in June of 2010 to adopt major revisions to the Standards of Training, Certification and Watchkeeping for Seafarers (STCW). The original 1978 Convention and Code were designed to establish basic requirements for training, certification and watchkeeping on an international level. In 1995 STCW was revised to give greater oversight, and to provide strict implementation obligations. The International Maritime Organization (IMO) has required the latest comprehensive review to reconcile inconsistencies and to address current global challenges. The call for submissions saw those with vested interests putting forward their views on needed changes. While all submissions had the interest of the global shipping community at heart, it is inherent, that with such diverse interests, the inevitable and resultant lobbying and negotiations would impact the final outcome. The revisions pertaining to marine security stipulate mandatory training for all levels of shipboard personnel as dictated by the International Ship and Port Facility Security (ISPS) Code. Mandatory training for the shore-based position of Company Security Officer (CSO) will continue to be ignored. Bridge and Engine-room Resource Management has been moved to the mandatory section of the Code but with an apparent reduction in requisite training elements. Advances in technology have created the need for and recognition by STCW of the electro-technical officer. With an overall increase in training as detailed by the revised STCW it will become increasingly difficult to monitor conformance, including adherence to the requirements for refresher and revalidation training. This paper will review these selected subject areas that have undergone changes in this latest iteration and due to enter into force in January 2012. A brief analysis of STCW training requirements for marine security, Bridge Resource Management (BRM), the electro-technical officer, and for refresher training and certificate revalidation has been undertaken and is presented as a catalyst for thought and discussion.

Keyword: *Electro-technical, resource management, MET, refresher training, security, STCW.*

1. Introduction

In 2006 the Maritime Safety Committee (MSC) of the IMO at its 81st session [1] initiated the process for a comprehensive review of the Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 as amended in 1995 (STCW) and the STCW Code to ensure that it continues to meet the new challenges facing the shipping industry. The initial work of defining the issues for review was delegated to the Sub-Committee on Standards of Training and Watchkeeping (STW), with a target completion of 2008. A subsequent draft text of amendments was prepared for consideration at the Diplomatic Conference held in Manila in the Philippines, June 2010. The adoption of these amendments will have impact on a number of areas for the training and certification of seafarers at all levels. Although each administration that is party to STCW is required to meet this Code, interpretation and application due to the individual regulatory structures will no doubt create variance in the actual standards applied.
This paper will focus on a several areas where the changes to STCW (1995) will still need clarification. The additional requirements related to marine security - familiarization, awareness, and for those with designated security duties – needs clarification as to who will need what level and type of training and who will provide the training and certification. Moving Bridge Resource Management (BRM) and adding

Engine-Room Resource Management (ERM) to the operational level along with an emphasis on leadership and decision-making at the operational and management level will impact Maritime Education and Training (MET). With the advancement in technology for electrical and electronic equipment on board the modern vessel, and the introduction of the electro-technical officer and rating, we may see a reduction in the role of the marine engineer as it now exists. Administrations may or may not require this new certificate for manning purposes, so clarification will be needed as to who will maintain and repair this sophisticated equipment. Although STCW identifies requirements for refresher training and revalidation of certification the varying methods recognized and used for establishing continued professional competence may vary from country to country to the extent that the same standard is not always achieved.

2. Marine Security Training

The events of 9/11 and the subsequent development and implementation of the ISPS Code by IMO called for security specific training. The focus of the STCW 1995 did not reflect the current threats to shipping from a security perspective. It was imperative that the newest iteration of STCW would be designed to help meet the IMO mission statement of ‘safe, secure and efficient shipping on clean oceans’.
Other papers by Anstey [2] [3] had previously identified problems with the STCW 95 in the context of security training. Unfortunately the STCW as adopted in Manila [4] does not recognize all of the training realities as created by IMO through the ISPS Code including the shore-based positions of Company Security Officer (CSO) and Port Facility Security Officer (PFSO). This paper will not otherwise revisit this matter but instead focus on how the revised STCW now proposes to address the other required security training.

2.1 Ship Security Officer

There are two significant changes noted in Chapter VI of the STCW as revised. Section A-VI/5 outlines mandatory requirements for the Ship Security Officer (SSO). This section had been previously modified by IMO through Resolution MSC.209 (81) [5]. The June 2010 modifications do reflect these changes listing the minimum mandatory requirements for the SSO and the standard of competence. Table A-VI/5 lists five competences relating to the implementation of the security plan; risk assessment; security inspections; operation and maintenance of security equipment; and vigilance and awareness. The listing of only five competencies may suggest an equal weighting for each which would not necessarily reflect the emphasis required by ISPS. The primary duty of the SSO is the implementation of the ship security plan (SSP) and thus this identified competency is an important one. However three of the other listed competencies relating to security equipment, security inspections, and security awareness are normally addressed in sections of the security plan and in practice would be subsets of this competency.
The competency relating to risk assessment is beneficial for the SSO as ongoing risk assessment is an important function for any security regime. However it must be noted that the CSO has the overall responsibility for conducting risk assessment used in the design or modification of the Ship Security Plan (SSP). The SSO would not normally be tasked with formal risk assessment or the use of risk assessment tools.
The associated ‘knowledge, understanding, and proficiency’ (KUPs) as listed in Table A-VI/5 do generally reflect requirements as listed in the ISPS Code. However there is one notable difference. In seven different KUPs there is now specific mention of piracy and armed robbery. None of the competencies and KUPs denotes any other specific security threats. The ISPS Code centers on risk assessment as it pertains to each vessel, when developing the ship security plan. For example some vessels may trade in areas with a high incidence of stowaways. Others of course would be in areas with high levels of piracy. Normally then risk assessment will determine what risks are likely and the security plan will detail the associated security measures to be in place. Piracy is not new. The rate of piracy was high at the time of 9/11 and the development of the ISPS Code. It may be argued that the inclusion of just one

specific threat may skew the emphasis of the security plan instead of basing it on individual risk assessment. To be frank, the ISPS Code was developed mainly in response to terrorism. Piracy now appears to be the current security 'flavor of the month'. Some will argue that the inclusion of specific mention of 'piracy and armed robbery' in the STCW revision reflects certain current realities. However others may see it as reactionary to the high profile piracy attempt of the American flagged Maersk Alabama in April 2009, and this opinion may be supported through the timing of the position paper by the United States [6] in October 2009 and accepted by the sub-committee on STW [7] as evidenced in its report of January 2010.

2.2 Security Familiarization and Awareness Training

The most notable change in the newest version of the STCW is the inclusion of a new Section A-VI/6 which stipulates mandatory minimum requirements for security related training and instruction for seafarers. This issue had not previously been addressed by the STCW although the ISPS Code [8] does identify training requirements for both shipboard personnel who have specific security duties and for personnel who do not have such duties. The ISPS Code states that persons *should have* this training, while the latest version of STCW now specifies mandatory training. This current version also allows for transitional provision until January 1, 2014, however this aspect will not be further discussed in this paper but rather it will focus on the new mandatory requirements.

Section A-VI/6 identifies standards of competence for three areas, namely security-related familiarization training; security-awareness training; and training for seafarers with designated security duties. Only the latter two have associated tables specifying competence, KUPs, methods for demonstrating competence and criteria for evaluating. It is unclear exactly how the three are suppose to relate to each other with an apparent redundancy with the inclusion of 'security-related familiarization training'. Are the three areas of training to be treated separately or are the latter two to be considered to be a subset of the 'security-related familiarization training?

The standard for security-related familiarization training applies to all seafarers on vessels covered by ISPS and identifies only three topics namely, reporting to, and responding to security threats and incidents, and training related to security emergency procedures. It appears that this training is to be part of the onboard orientation as it is stipulated that it is to be conducted by the SSO or similarly qualified officer. It is important to note that this training is to be approved but the entity conducting approval and how, is not specified.

The standard for security-awareness training stipulates training for seafarers in any capacity on ISPS applicable vessels other than those with security related responsibilities. There are three listed competencies but with ten broad-based KUPs, all of which are a subset of the standards for seafarers with designated duties. The standards require appropriate approved training and evidence of meeting the standard through a demonstration of competence and by examination or continuous assessment as part of an approved training program. How this standard is to be monitored is not quite clear.

The standard for seafarers with designated duties stipulates a demonstration of competencies as identified in Table A-VI/6-2, and by examination or continuous assessment. The Table identifies four main competencies with twenty-one broadly based KUPs. It is the only standard where certification is specifically identified in Part A of the STCW Code. Interestingly Table B-I/2 identifies a 'Certificate of Proficiency' for both this and the awareness training however neither endorsement or registration or revalidation is required for either.

From this educator's experience in maritime security training the new requirements of STCW regarding training as covered in A-VI/6 and B-VI/6 is convoluted and to some degree nonsensical. For one, it requires training for seafarers on ISPS applicable vessels only. This may be more pertinent if the seafarer was to work on only one ship throughout their career. However for most this is unlikely and as they move through their seagoing career it is unclear who is to keep track of the level of training that was required; that was provided; and how it was recorded. Additionally is it only those persons on ISPS applicable vessels that should require the training? For example a Declaration of Security (DoS) is required when a port facility or vessel interfaces with vessels that do not have a security plan. Further, a vessel to which

ISPS does not apply and that is interfacing with an ISPS compliant facility, and with a crew not required to have the above noted training, at least theoretically, would not know the requirements of ISPS, including typical access control requirements, security levels, restricted areas and so forth.

The guidance in Part B of the STCW Code states that *for each* of the three above mentioned training scenarios as applicable, seafarers should complete the training at least one time in their career. The purpose of the training for the seafarer with designated security duties, as stated in Part A of the revised STCW, is to enable every candidate to perform the designated ship security duties. The ship specific security plan is based on the vessel risk assessment and will take into account the nature and area of the trade, and the unique vessel operational and physical characteristics. How will one set of training apply to each subsequent vessel? Further if a seafarer with designated security duties and receiving applicable training subsequently joins another vessel where she does not have those duties, is she now required to receive training in security awareness?

The mandatory requirements of A-VI/6 insist that seafarers receive approved security training or instruction for security-related familiarization training and for designated security duties. It further states that security-familiarization training is to be conducted by the SSO or an equally qualified person. The guidance of Part B-VI/6 of the STCW - referring to pertinent sections of the Code - states that security training does not have to meet the standards as normally required by STCW in the areas of structure, training, assessment, or instructional competence. How then will these standards be monitored and by what entity? An addition to Section A-I/4 of the STCW Code specifies that for seafarers with designated duties the assessment - normally by port state control officers - is only to be conducted in the case of clear grounds that security duties are not being carried out. For all other training, assessment appears to be proactive instead of in this reactive manner.

Equally important is that training now appears to be shifting more and more to the ship's officer. These officers are normally hired based on seagoing qualifications, competencies and abilities. Where are the similar quality training standards to those that are thrust upon MET institutions? Is the ship's officer qualified as an educator / trainer, and in fact does he want to be involved in the provision of training? Through the proliferation of codes, conventions, regulations and so on we have placed a tremendous burden on ships' officers. Why then do we wonder that it so difficult to attract more people to this profession?

The newest version has some evidence of covering the topic of security in a more holistic manner with mention of security in other sections such as chapter VIII on watchkeeping. However when reviewing the STCW revisions *in toto* it appears that this topic is not interwoven throughout to the degree expected considering the current version of the IMO mission statement and the emphasis placed on security, rather it is addressed by interspersing the word 'security' in some of the broad statements.

A more simplistic and appropriate approach for security training, for *all* seagoing personnel, would be mandatory training similar to that done for safety training. For example a one-day course covering similar topics as covered in the SSO course but at a reduced level maybe the appropriate method. All mariners would then have a basic understanding of the security regulations. Specific security duties pertaining to each ship and voyage could be undertaken on board ship, facilitated due to the mariner having the previously mentioned basic but mandatory security training.

3. Bridge Resource and Engine-Room Resource Management Training

Bridge Resource Management (BRM) was incorporated into Part B (guidance section) of STCW when amended in 1995. However it, along with Engine-Room Resource Management (ERM), will become mandatory with the new STCW revisions. The rationale for this change is simple – numerous marine casualties and incidents have been attributed to poor BRM practices [9]. Transportation Safety Board (TSB) reports have concluded that approximately 80% of these accidents are related to human error [10]. Although these authorities have not clearly defined human error, it is generally accepted to be related, in part to, management skills, operator status, the work environment, knowledge, or decision-making

practices. It was therefore proposed to include key elements of BRM in Part A of the Code. What then are these key elements?
Currently Section B V-III/2 of the STCW Code outlines BRM principles in order to ensure that duties are clearly assigned and understood and that qualified individuals are able to carry out these duties as assigned. It stipulates that the necessary equipment must be available and working; that distractions are removed; and that communication is clear. Members of the navigational watch must at all times be prepared to respond efficiently and effectively to changing circumstances [11].
Examples of accepted definitions for BRM include, "the effective management and utilization of all resources, human and technical, available to the Bridge Team to ensure the safe completion of the vessel's voyage" [12] and "the study of human behavior in a specific circumstance: humans operating ships" [13]. The scope covered by these definitions is broad, and the interpretation for development and delivery of BRM training to date has not always been consistent. What then will be the standard under the STCW as amended? Using the principles as now outlined in STCW, current BRM courses have been developed ranging in time from three to five days and although common topics include situational awareness, master/pilot relationship, error-chain analysis, passage planning and the human factor, other courses also include crowd and crises management and cultural awareness.
Traditionally BRM has been taught at the management level and the initial proposal, for inclusion as mandatory training, was to insert BRM in Table A-II/2. However, as the officer-in-charge of the navigational watch (OOW) is responsible for assessing how bridge watch resources are being allocated and used during his/her watch it is now suggested that situational awareness along with communications, leadership, and the allocation and prioritization of resources be additionally included at the operational level. A new emphasis on leadership and decision-making at both the operational and management levels further expands the role of all shipboard personnel. We do need to be cautious on the scope of the training for the OOW - which typically includes cadets. BRM training taken by senior officers, as it has been conducted to date, may not be fully appreciated by or applicable to the OOW. Do they have the skill sets and experience as an officer-in-training to reach to the same level as we would expect of a master or experienced ship's officer?
It is possible that we need two levels of training in order to cover both bridge teamwork, and the leadership and management aspects of the operation. At the operational level it is necessary to understand and effectively apply procedures for bridge teamwork as part of maintaining a safe navigation watch. Knowledge of leadership and team-working skills will have some part to play. At the management level additional emphasis will be required for leadership and management styles training.
What will become the standard for this training has yet to be determined. We have an IMO model course for Ship Simulator and Bridge Teamwork – will this satisfy the requirements for BRM under Table A-II/1 of STCW?
Although the emphasis has typically been in BRM, the whole area of Engine-Room Resource Management and the leadership and management skills as outlined in Tables A-III/1 and A-III/2 needs to be addressed in a similar manner. The scope of the actual training at the operational versus the management level will need to be addressed by national regulators and by MET.

4. Electro-technical Officer Training

The roles and responsibilities of the marine engineer have changed in the past decade due to the evolution of technology and advances in control systems and automation. We have seen the training for marine engineers change to meet these new requirements. The eventual addition of the electro-technical officer and rating to the STCW Code may in the long term also impact the role of the marine engineer.
Maintaining new electronic navigation and communications technologies for shipboard systems such as Automatic Identification Systems (AIS), Electronic Chart Display and Information Systems (ECDIS), Automatic Radar Plotting Aids (ARPA), and Global Marine Distress and Safety System (GMDSS), will become the responsibility of the electro-technical officer. Although, specifying the competence necessary will ensure that people employed as electro-technical officers are duly trained and certified, there is an

apparent overlap with the certification of the marine engineer. Does this mean that we will see a lessening of the training requirements for the marine engineer and with a resultant impact of their role on board ship?

If, with the introduction of more automation and control systems, there has been a reduction in the workload of the marine engineer, while at the same time they are required to have detailed understanding of electrical and electronic system we are left to wonder what will the marine engineer of the future look like. With the advances in technology, both electrical and electronic, and the need to have a person capable of maintaining and repairing these new systems we are seeing the job increasingly being undertaken by trained electrical or electronic technologists, who although have a knowledge of electrical and electronic systems, lack in the knowledge of marine (shipboard) systems [14]. In Canada we are currently seeing the education of the marine engineer being expanded to include marine computer science and networks [15]. There have also been attempts to "marinize" land-based electricians, with varying results.

It is possible that the electro-technical office and the marine engineer would require the same competence in maintaining and repairing electrical and electronic equipment but the electro-technical officer would not be required or have the same level of knowledge in terms of the operation and repair of traditional marine equipment. Given that the training for the marine engineer also includes the electrical and electronic systems tied to the ship's propulsion, could not their training be expanded to include the other systems, particularly the bridge navigation and communications? In the long term we would produce a stronger marine engineer who was capable of dealing with all the systems on board the vessel. Although there are new requirements outlined in the amended STCW for the electro-technical officer and rating, it may ultimately be a matter of what industry decides that it requires and potentially in conflict with how administrations decide to interpret and implement the revised STCW.

5. Refresher Training and Revalidation of Certificates

During the comprehensive STCW review process there was a call by a number of parties for refresher courses in a number of areas. For example the Philippines [16] in a submission noted approximately 27 areas related to chapter VI of STCW where, in their opinion, training could not be conducted on board the vessel and where short refresher courses might be preferable. Although the revised version of STCW does not stipulate this wide-spread usage of such courses there is some provision for refresher and revalidation training. While of benefit this does create some difficulty in implementation.

The revised STCW has some specific requirements for refresher training, notably in the area of 'crowd and crisis' training. Regulation V/2 specifies mandatory minimum requirements for the training of ship personnel on passenger ships. However it further stipulates, at intervals not exceeding five years, appropriate refresher training or provision of evidence that the mariner has achieved the required standard of competence within the previous five years.

The STCW as revised also requires, through section A-I/7 and Regulation I/7 that administrations review the full instrument in order to identify where refresher training will now be required in order to update the standard of competence that will keep mariners current with the Code. It requires those administrations to provide to IMO an outline of the refresher and upgrade training as mandated. Additionally it requires through Regulation I/14 that administrations hold ship operators responsible for ensuring that seafarers will receive requisite refresher training.

In the cited examples it may be questioned as to the standard measure for such training or the standard measure of competence previously gained. Will some administrations require refresher training while others rely on the mariner's competence? If so what will be the length and composition of the training and will it be consistent with that of other administrations? If not how will the standard of competence previously gained by the seafarer be ascertained, by whom, and how will that test compare to other administrations?

The revised STCW has amended but maintained the process of revalidation of certificates. The primary purpose of this section A-I/11 is to maintain professional competence. The section stipulates that competence may be established by, *inter alia,* approved seagoing service of twelve months in the previous five years; passing an approved test; or successfully completed approved training course(s). Regulation A-I/11 (revalidation of certificates) requires that seafarers holding a certificate and wishing to continue to qualify for seagoing service must establish continued professional competence in accordance with section A-I/11. A number of methods therefore may be used by varying contracting states to measure this 'professional competence'.
In Canada the Marine Personnel Regulations [17] allows continued proficiency to be demonstrated through twelve months of sea-time within a five year timeframe; or, a refresher course in marine emergency duties along with a written and oral examination; or, successful completion of a ship management course and refresher training in marine emergency duties. Currently no MET institution within Canada offers a recognized refresher course in marine emergency duties.
In the United States, the Code of Federal Regulations [18] stipulates, among other things, that seafarers applying for continued proficiency must have twelve months sea-time in the previous five years; or, pass a comprehensive and open-book exercise covering general subject matter; or, complete an approved refresher training course; or, be employed in a position related to the operation, construction, or repair of vessels and demonstrate knowledge on an applicable Rules of the Road open-book exercise.
These examples show some consistency but also some variance in how member states are applying this section of the STCW. Similar questions may be asked with regards to revalidation as was asked regarding refresher courses. How will the varying measures used by a member state compare? How will the standards of one member state compare to others - recalling that the examples given are for only two such states? This challenge will be further complicated with the new changes to STCW and in how states now perceive the changes and then include these changes into their national regulations.

6. Conclusion

The revisions to the STCW continue to outline the basic requirements for training, certification and watch-keeping on an international level with mandatory requirements to ensure oversight and to ensure global consistency. Additionally they strive to reconcile past inconsistencies and to address current global challenges. This updated convention and code has been designed by the global maritime community and it is they that will be impacted. As with any significant and far-reaching legislation the implications and impact will be fully realized only in the passage of time.
Some revisions will achieve the desired objective of improving the STCW while other areas will have continued or new flaws and deficiencies. This paper has discussed only four selected areas in the revised STCW. The required training for marine security is now included but potential problems exist with application, oversight and certification. Mandatory standards of competence, outlining the knowledge, understanding and proficiencies for bridge and engine-room resource management may need to be applied differently to junior officers as compared to senior officers. The new requirements for the electro-technical officer may have impact on safe-manning but will certainly require MET, in consultation with national administrations to provide new and updated training, along with pertinent professional development for faculty. Administrations will undertake a mandatory and comprehensive review of their national regulations in comparison to the newly revised STCW in order to determine what refresher training is required and how it will be developed and provided. The process for certificate revalidation has the potential to vary significantly from signatory to signatory. Interpretation for implementation is the challenge that lies ahead not only for signatories to STCW but also MET. Undoubtedly the challenges created by these revisions will require a major overhaul of course content and hence a significant allocation of resources. The expected entry into force of the revised STCW in January of 2012 will herald significant and in some cases unexpected change. Are we ready?

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Countering Maritime Piracy: An Analysis of "Best Practices"

Dr. Donna J. Nincic
Professor, California Maritime Academy, dnincic@csum.edu

Abstract While many anti-piracy recommendations for ships transiting the Gulf of Aden and adjacent waters make sense, there is little beyond anecdotal evidence of their effectiveness. Using the maritime piracy data provided by the International Maritime Organization from 2008 to the present, this paper presents an empirical study of the tactics and techniques used by vessels off the coast of Somalia in their attempts to counter pirate attacks. This study looks closely at what techniques ships have actually and successfully used against pirate attacks; and documents the common actions (or inaction) of vessels that were actually captured by pirates. In this way, we should have a considerably clearer picture of the ***true effectiveness*** of the recommended best practices.

Keyword: *Maritime Piracy, Somalia, Gulf of Aden, Anti-Piracy Measures*

1. Introduction

The threat of maritime piracy off the coast of Somalia has increased significantly in recent years. The International Maritime Organization has long advised mariners to remain at least 200 nm off the Somali coast when transiting the Gulf of Aden to and from the Red Sea. Despite these warnings, pirate attacks – and particularly ship hijacking and hostage taking – are on the rise, making Somali waters some of the most dangerous in the world.

At least three trends in maritime piracy in Somalia have been particularly worrisome. First, Somali pirates have acquired the ability to operate well offshore, now well over 200 nautical miles from land. This is significantly different from piracy in other parts of the world, where attacks tend to be significantly closer to shore. Second, pirates in Somalia have been targeting relief vessels from the World Food Program, impacting the ability of the international community to respond to the humanitarian crisis in the country. Third, many of the attacks on vessels are actually hijacking for ransom. Unlike national governments (most of which have adopted a strict "no negotiations" policy in response to all ransom demands), ship owners are actually highly motivated to pay. If they do not, they will not be able to find crews for their vessels in the future. Hostage-taking is especially problematic in Somalia: For example, of the 292 crew members taken hostage in 2007 worldwide by pirates, 154 were taken in Somalia [1].

At approximately US $2-3 million paid per ship in ransom on average, hijacking for ransom has become a lucrative business in Somalia. The recent rise in attacks since 2008, and the number of hostage-taking incidents, led to a UN resolution (sponsored by France, Panama and the United States) allowing foreign military vessels to pursue pirates into Somali territorial waters and to apprehend them. However, as empirical evidence will show, while the various international coalition forces (for example, the Combined Task Forces 150 and 151, and Operation Atalanta) assisted by the naval forces of non-coalition countries, have possibly had a deterrent effect on maritime piracy in the Gulf of Aden region, their utility in stopping attacks that are *actually underway* has been extremely limited. This has meant that mariners are generally left to themselves as "first responders" to maritime pirate attacks. What, then, are the most effective measures ships can take to prevent themselves from being captured or taken hostage by pirates in this increasingly dangerous part of the world?

2. Background and Statistics

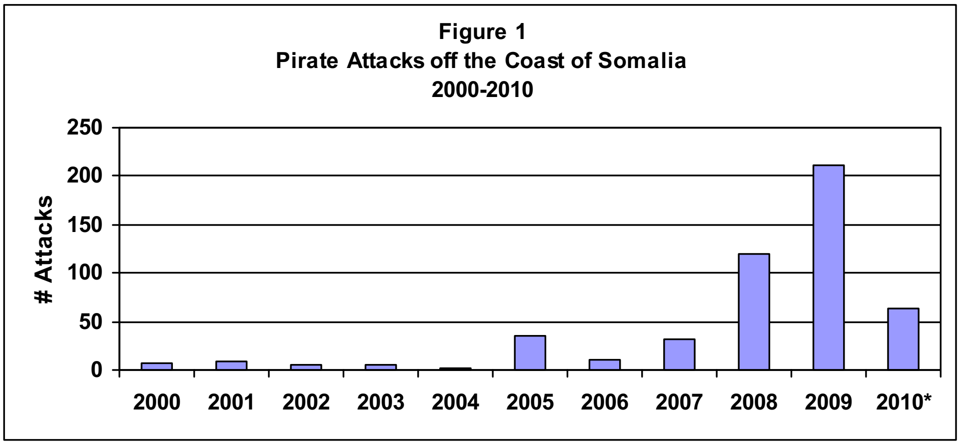
2.1 Background

While the first pirate attacks in Somalia were only recorded in any significant numbers in 2000, the roots of the current crisis date back to 1991 when Mohammed Siad Barre was overthrown, leaving the country without an effective central government and locked in civil conflict. Since then, *de facto* authority has largely resided in the hands of the governments for the unrecognized entities of Somaliland and Puntland, and the UN-recognized interim Transitional Federal Government (TFG).

In May 2006, a group of Islamic Sharia Courts seized control of Mogadishu and formed a rival administration to the Transitional Federal Government. Known as the Islamic Courts Union (ICU), they were briefly able to exert control over most of southern Somalia; only Somaliland and Puntland remained outside their control. With the assistance of a US-backed Ethiopian military intervention, the ICU was ousted in late 2006 and gave up control of Mogadishu in January 2007. Kenyan and US forces enforced a border patrol and naval blockade, followed by US airstrikes against suspected Al Qaeda members embedded within the ICU militias. Fighting within the country continues to this day.

Taking advantage of decades-long civil conflict, rival warlords carved out influence over regional territories – first on land, and then increasingly at sea. Fishermen, dismayed at the inability of the central government to protect their country's exclusive economic zone, and at the number of foreign fishing vessels illegally exploiting their traditional fisheries, took matters into their own hands. Initially arming themselves to chase off the foreign invaders, they quickly realized that robbing the vessels was a lucrative way to make up for lost income. Seeing their success, land-based warlords co-opted some of the new pirates, organizing them into increasingly sophisticated gangs. By 2008, four separate, highly-organized and well-armed pirate "gangs" were operating in the country [2].

As can be seen in Figure 1, pirate attacks increased dramatically from seven in 2000 to over 200 in 2009, with the International Maritime Organization reporting 64 from January through April 2010.



** January-April*

Sources: *Reports on piracy and armed robbery*; *Piracy and armed robbery against ships*

Despite a 2005 IMO resolution encouraging UN member states with naval vessels in the region to be "vigilant" for piracy incidents, prior to 2006, the international community took little interest in addressing the piracy problems in the region. Vessels supporting the US-led coalition in the global war on terror patrolled the area in support of anti-terrorist operations (for example, firing missiles at suspected Al Qaeda terrorists) but were often visibly reluctant to become involved in anti-piracy operations.

Three events occurred which began to change international attitudes towards maritime piracy in the region: 1) The rise to power of the Islamic Courts Union (ICU) and suggested links between piracy and terrorism; 2) increasing attacks on UN relief vessels responding to the humanitarian crisis in the country, and 3) the general increase in the violence and incidence of attacks after the collapse of the ICU.

2.2 The Islamic Courts Union

During their brief tenure in power, the Islamic Courts Union took a firm stand against maritime piracy. They were also able to extend their military control over the known "pirate bases" of Harardheere and Hobyo. The capture of Harardheere was particularly significant: The Somali Marines pirate group operating there had the most sophisticated capabilities of any of the four separate pirate groups operating in the country (The "National Volunteer Coast Guard" near Kismaayo, the "Marka group" (using fishing boats); the "Somali Marines," and 4) fishermen operating near Hobyo [3]. With the ability to operate the furthest offshore, they were responsible for most of the attacks on larger vessels, including hijackings for ransom [3]. As the ICU exerted its control, they declared piracy a crime and imposed strict penalties (including cutting off both hands); as a result, piracy dropped to only ten attacks in 2006.

2.3 Links between Piracy and Terrorism

After the ICU was ousted and the TFG returned to nominal power, Somalia soon became one of the world's major piracy "hot spots," and came to be considered a safe haven for Al Qaeda [4]. Calls for the United States to take a larger role in combating maritime piracy were made in the context of fighting terrorism, or preventing terrorists from gaining a stronghold in the deteriorating region [5]. At the same time, some analysts began to suggest that Islamic terrorist groups operating in Indonesia and throughout Asia (e.g., Jemaah Islamiyah, Abu Sayyaf, Gama'a el Islamiyah, and Al Qaeda), would begin cooperating with pirates [6]. Of increasing concern is the recent rise of the Al Qaeda-linked group known as Al Shabaab, which has a stated goal of undertaking maritime terrorist activity in the region.

While not all analysts agree on the pirate-terrorist link [7], others began to argue that piracy should be seen as a form of terrorism [8]. As Al Qaeda operatives are widely believed to have remained in Somalia in support of the ICU and its continued efforts against the UN- and Ethiopian-backed Transitional Federal Government, many in the international community began to take a more active role in the region, paying closer attention to maritime piracy.

2.4 Attacks on Humanitarian Relief Vessels

At the height of its relief efforts, the World Food Programme (WFP) of the United Nations carried 32,000 tons of food each month into Somalia where civil war, combined with a series of devastating droughts, had created a humanitarian crisis worse, by some estimates, than that occurring in Darfur. Two WFP-chartered vessels were hijacked in 2005, forcing the UN agency to suspend all deliveries of WFP food assistance by sea to Somalia for weeks. Two more vessels were hijacked in the first half of 2007: The *M/V Rozen* in February, and the *M/V Victoria* in May.

The *Rozen* and her twelve-member crew were hijacked by armed pirates while underway off the Somali coast. The Somali authorities were notified and intercepted the ship, but despite a heavy exchange of gunfire, the authorities were not able to board the vessel and the pirates escaped. After intervention by tribal elders in Puntland and subsequent mediation efforts, the *Rozen* was subsequently released in early April, with her crew unharmed. The *Victoria* was attacked 60nm from Merka. It issued a distress call, resulting in two boats dispatched by the ship contractor. While these boats were able to intercept the pirates before they could board the *Victoria*, one guard was wounded in a gunfire exchange, and later died. According to the WFP, "Close to 80 per cent of WFP's assistance to Somalia is shipped by sea but, because of piracy, we have seen the availability of ships willing to carry food to the country cut by half" [9].

2.5 Increase in Scope and Violence of the Attacks

After the ouster of the ICU and the restoration to power of the TFG, there was a sharp increase in the number and violence of the pirate attacks in the region. Attacks resumed up to and beyond the 200nm warning given by the IMO, leading many to conclude the Somali Marines were back in action. Supported by a suspected "mother ship," they began attacking up to three or four vessels underway in a 48-hour period, simply turning to the next ship passing by if the first proved too difficult to attack.[1] More and more mariners began to heed the UN warning to stay beyond 200 nautical miles from the Somali coast when transiting. Soon, however, Somali pirates began to operate well beyond the 200nm warning zone. Ransoms demands began to increase from $500,000 per vessel, to tens of millions (with an average payout of $2-3 million per ship).

As a result of these and other factors, the international community began to step up its surveillance, and demonstrated an increased willingness to intervene on behalf of the victims of piracy.

3. UN Security Council Resolution 1816

3.1 UN Security Council Resolution 1816

The direct foreign military response to the deteriorating piracy situation came in two stages. First, foreign military vessels began to escort World Food Program relief vessels in 2007. Naval vessels from France, Denmark and the Netherlands provided direct escort from late 2007 through June 2008; Canada took over in August 2008. During this period, and despite an upsurge of piracy in the region, no WFP vessels were attacked.

Second, on June 2, 2008 the United Nations Security Council unanimously adopted Resolution 1816 authorizing foreign military vessels to enter Somalia's territorial waters, with the consent of the Somali government, to use "all necessary means" to combat maritime piracy "in a manner consistent with international law." In response to requests from UN Secretary General Ban Ki-moon and Somalia's Transitional Federal Government, and strongly supported by France and the United States, the resolution passed only after assurances that the authorization would apply strictly to Somali territorial waters only. Somali opposition leaders have condemned the resolution, stating the UN intended to "usurp" the Somali coast and "loot maritime resources" [10].

While the international community responded to the piracy problem in Somalia with naval forces from many countries, it has been argued that the intervention has had only limited effectiveness, particularly in responding to pirate attacks which are actually imminent or underway.

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[1] This happened in the case of the November 2005 attack on the cruise ship *Seaborn Spirit* some 200 nm off the Somali coast. Having failed to board the vessel successfully, the pirates subsequently attacked the *Great Morning* on the same day, and the *Selin* and the *Laemthong Glory* on the next day. While the attacks on the *Great Morning* and *Selin* were unsuccessful, the pirates hijacked and held for ransom the crew of the *Laemthong Glory*; they were released unharmed once the ransom was paid.

4. Methodology

The dramatic increase in the number and violence of pirate attacks in the Gulf of Aden region, coupled with the marginal effectiveness[2] of the international forces operating there, has raised the question of where this leaves the mariner in this particularly dangerous region of the world. There are generally considered to be three options:

1. Hope that foreign military surveillance and intervention will become more successful in deterring attacks while they are actually in progress;

2. Hire armed guards and security personnel to protect ships transiting the Gulf of Aden and surrounding areas;

3. Follow "best practices" as recommended by various international organizations.

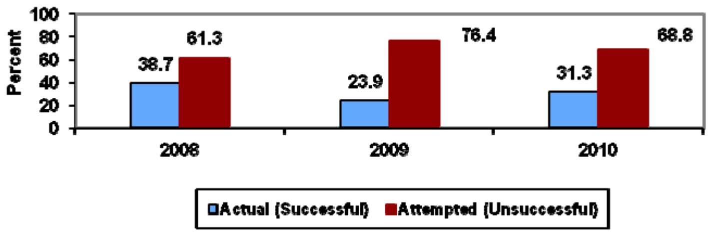
While many of these recommendations make sense, there is little beyond anecdotal evidence of their effectiveness. Using the maritime piracy data provided by the International Maritime Organization from 2008 to the present, we can present empirical evidence of the effectiveness of the tactics and techniques used by vessels off the coast of Somalia in their attempts to counter pirate attacks. By looking closely at those techniques ships have actually and successfully used against pirate attacks; and documenting the common actions (or inaction) of vessels that were actually captured by pirates, we will have a considerably clearer picture of the ***true effectiveness*** of the recommended best practices.

4.1 Use of the IMO Database

In its monthly reports, "Reports on Piracy and Armed Robbery Against Ships," the International Maritime Organization distinguishes between actual pirate attacks, and attempted pirate attacks. They also give a brief description of the actions the ships took in attempting to fend off the attacks. An analysis of the actions taken by ships successfully fending off attacks, and those ships that were not successful, should give us a better sense of what actions work best against maritime pirates.

An important point to consider is that most pirate attacks off the coast of Somalia are not successful; that is, the pirates attempt to board or capture a vessel, but do not succeed in doing so. This could be for two reasons: 1) the pirates simply do not have the skill and ability to capture a vessel successfully; or 2) the ship under attack was able to undertake measures to thwart the attack successfully. Figure 2 shows the ratio of actual (successful) pirate attacks to attempted (unsuccessful) pirate attacks for 2008 through April 2010:

Figure 2
% Actual vs. Attempted Attacks:
2008-April 2010



[2] There has been a slight decline in the percentage of successful attacks.

An analysis of the actions taken by individual ships during this time will give us a better understanding of what actions work best to deter successful maritime pirate attacks. The analysis was conducted as follows: Each attempted and actual attack was coded according to whether the ships relied on international forces, used armed guards, or adopted recommended "best practices" (again, the three most common suggestions made for vessels transiting the region). In the case where no action was reported, the event was coded "don't know."[3]

For those ships undertaking recommended best practices, the event was further broken down into the type of best practices adopted (sounding the alarm, increasing speed, etc). Furthermore, "best practices" were broken down even further into "active" and "passive" measures. "Active" measures are those where the ship itself *while under attack* took some direct action to thwart a successful attack. This would include evasive manoeuvres, increasing speed, anti-piracy measure, using fire hoses and flares against the pirates, and the like. Passive measures are considered those taken by a ship under attack that could not in of themselves deter the attack. Passive measures would include sending distress signals, contacting coalition forces, locking doors, activating the Ship Security Alert System (SSAS), etc.

Note: It is important to remember the limitations of the IMO Reports on Piracy and Armed Robbery Against Ships; the data contained in the reports is self-reported by the ships themselves, and is therefore not a complete compendium of all attacks occurring in the region. Additionally, ships reporting to the IMO report various levels of detail regarding the attack; in some cases data is missing, making conclusions drawn from the data qualified conclusions at best. This said, it is generally considered that the IMO data is becoming more reliable and, as the only detailed database of pirate attacks which lists the details of each individual attack, it provides a useful heuristic tool for the analyst.

A complete listing of the actions undertaken by vessels during this time period appears in Appendix 1 (Actual/Successful Attacks) and Appendix 2 (Attempted/Unsuccessful Attacks).

5. Where Does This Leave The Mariner?

As previously mentioned, three options are often mentioned for vessel protection against pirates in the Gulf of Aden: 1) reliance on foreign military surveillance and intervention in the hope it will become more successful in deterring attacks or responding while they are actually in progress; 2) Hire armed guards and security personnel to protect ships; 3) Follow those "best practices" recommended by various international organizations.

5.1 Reliance on International Security Forces

There are many instances of ships notifying international security forces while under attack by pirates, but for the purpose of this study, only those events where international forces actually responded are included in this section. In 2008, many ships that were successfully pirated reported the incident to international forces in the region, but in only one instance did international forces respond to the attack. In 2009, only two cases are reported where coalition forces were able to prevent an attack while it was underway. It is clear the pirates had begun to acquire a very sophisticated ability to avoid and evade the coalition forces operating in the area. While it could be argued that coalition and international forces have a deterrent effect on piracy in the region – perhaps even a significant deterrent effect, this has led many to question the determination and effectiveness of the external military presence in the region in responding to *actual* attacks.

[3] These events were necessarily excluded from the study. It is impossible to know whether this means the ship took no action, or simply did not report the action taken.

5.2 Use of Armed Guards and Security Personnel

While there is anecdotal evidence of the use of armed guards on vessels transiting the Gulf of Aden and adjacent waters, no ships reporting to the IMO mentioned their use during the time frame of this study (See Appendix 1 and Appendix 2). Therefore, it would be premature to gauge their effectiveness. This said, the use of armed guards is currently very limited, due to the cost; it is likely, therefore, that this will not be considered the best deterrent against pirate attacks.

5.3 Adoption of "Best Practices"

The IMO has made a number of recommendations of actions ships can take to protect themselves against pirate attacks [11]. These include (but are not limited to):

- Maintaining vigilance;
- The need for enhanced surveillance, and the use of lighting, surveillance and detection equipment;
- Sounding alarms, alerting other ships and coastal authorities, illuminating the suspect vessel; undertaking evasive manoeuvring, initiating response procedures;
- Increasing speed; use of flares, fire hoses, etc.
- Following radio alarm procedures.

While these and the other more comprehensive recommendations make sense, there has little in the way of beyond anecdotal evidence of their effectiveness. The following study is illuminating.

As can be seen in Appendix 1 and Appendix 2, ships have adopted a wide range of "active" and "passive" security measures when under attack by pirates. A review of the data shows that ships employing active measures are far more likely to be successful in defending themselves against pirate attacks. Ships captured by pirates, or which were otherwise successfully attacked, employed active measures far less frequently.

Figure 3 illustrates the success of active versus passive measures in more detail. Of those ships reporting implementing some form of "best practices" (active and passive) in response to pirate attacks, the following figure shows how many took "active" measures:

	Total Ships Reporting Taking Some Action	**"Active" Measures During Actual (Successful) Attacks**	**"Active" Measures During Attempted (Unsuccessful) Attacks**
2008	(1 Actual, 71 Attempted)	0 (0%)	62 (87.3%)
2009	(9 Actual, 158 Attempted)	2 (22.2%)	154 (97.5%)
2010	(34 Actual, 40 Attempted)	3 (8.8%)	38 (95%)

Fig. 3 Ships Reporting "Active" Anti-Piracy Measures

Of those vessels captured or otherwise successfully attacked by pirates, 22.2% or less reported engaging in active anti-piracy measures, limiting their actions largely to sending distress signals, or notifying other vessels in the area. On the other hand, of those ships successful in defending themselves against pirate attacks, between 87.3% and 97.5% of them used some form of active measures.

Figure 4 looks only at those ships taking "active" anti-piracy measures.

	Total Ships Reporting Active Anti-Piracy Measures	During Actual (Successful) Attacks	During Attempted (Unsuccessful) Attacks
2008	62	0 (0%)	62 (100%)
2009	156	2 (1.3%)	154 (98.7%)
2010	41	3 (7.3%)	38 (92.7%)

Fig. 4 Utility of "Active" Best Practices

That is, of the 62 ships reporting active anti-piracy measures in 2008, 100% were successful in fending off the pirate attacks. In 2009, 156 ships employed active anti-piracy measures; of these 98.7% were successful in thwarting the attacks. And in 2010, 92.7% of ships taking active measures were able to fend off the attacks successfully. It is important to note that simple, active measures such as increasing speed, taking evasive manoeuvres, activating the fire hoses, etc, have proven to be overwhelmingly successful in fending off pirate attacks during a time when the pirates have become increasingly sophisticated in their tactics, and have adopted increasingly lethal weaponry.

6. Conclusion

Despite active efforts by the international community, and some impressive intervention successes, it is clear that mariners will always be the first (and often only) responders in the event of a maritime pirate attack. Recommendations that ships follow "best practices" have been put forward by the International Maritime Organization, in the New York Declaration, by various international organizations such as the Baltic and International Maritime Council (BIMCO), and by numerous individual shipping companies; without necessarily differentiating between those measures that are most effective, and those that are less so. This preliminary analysis of the IMO reports on pirate attacks shows an overwhelming advantage to those vessels undertaking what can be called "active" measures in their own defence. They are more likely to be successful in thwarting attacks than vessels relying on more passive measures, or on the intervention of regional coalition and international forces. Additionally, the very act of undertaking active measures means that vessel under attack stands a very high chance of successfully avoiding a successful attack.

While it is good news for the mariner that fairly simple measures have had such a great degree of success to date, it should be noted with concern that there have been a few recent attacks in the Gulf of Aden region that are being attributed to terrorist groups. An increase of maritime terrorism in or near the Horn of Africa – coupled with, or independent of, maritime piracy – could significantly and detrimentally affect the safety and security of mariners in this region in the future.

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Appendix 1
Actions Taken By Vessels During Actual (Successful) Pirate Attacks*

	Coalition and International Forces	Armed Guards and Security Forces	Best Practices		Not Reported
			"Active" Measures	"Passive" Measures	
2008	0	0	Increased Speed: 1 Anti Piracy Measures: 4 Used Fire Hoses: 1 Evasive Manoeuvres: 1	Alarm Raised: 22 SSAS Activated: 4 Closed Ship Compartments: 1 Sent Distress Message: 4	13
2009	0	0	Evasive Manoeuvres: 2 Sent Distress Msg: 2	Alarm Raised: 1 SSAS Activated: 6	42
2010	0	0		Crew locked themselves in engine room: 1	19

* Note: Since many vessels undertook more than one action in response to the attack, the totals reported here are greater than the actual number of attacks reported in Figure 1

Appendix 2
Actions Taken By Vessels During Attempted (Unsuccessful) Pirate Attacks*

	Coalition and International Forces	Armed Guards and Security Forces	Best Practices		Not Reported
			"Active" Measures	"Passive" Measures	
2008	1	0	Increased Speed: 26 Altered Course: 3 Evasive Manoeuvres: 51 Anti-Piracy Measures: 9 Activated Fire Hoses: 13 Fired Rocket Flares: 2 Released Foam: 1 LRAD: 1 Detached Ladder: 1	Increased Deck Patrols: 1 Turned on Search Lights: 1 Raised Alarm: 37 SSAS: 6 Crew Mustered: 13 Informed Other Ships: 7 Sent Distress Signal: 3	2
2009	2	0	Evasive Manoeuvres: 140 Released Empty Drums, Bottles, Timber, Etc: 4 Lit bamboo sticks: 1 Increased Speed: 85 Anti-piracy Measures: 22 Activated Fire Hoses: 37 Fired Rocket Flares: 18 Removed Pirate Ladder: 1 Deployed Smoke Screen: 1 Deployed Molotov Cocktails: 1 Moved Towards Coalition Warships: 2	Crew Mustered: 17 Raised Alarm: 63 Contacted Coalition: 15 Sent Distress Signal: 13 Activated SSAS: 11 Turned on Extra Lights: 1 Locked all Access: 2 Contacted IMB	4
2010	0	0	Raised Alarm: 17 Evasive Menoeuvres: 24 Increased Speed: 24 Anti-Piracy Measures: 12 Activated Fire Hoses: 3 Fired Rocked Flares: 1 Shone Lights on Pirate Boats: 1	Crew Mustered: 3 Sent Distress Signal: 3 SSAS: 5 Contacted Coalition: 4 Locked All Doors: 2	4

* Note: Since many vessels undertook more than one action in response to the attack, the totals reported here are greater than the actual number of attacks reported in Figure 1

STCW-2010's New Rules and Effects to Maritime Education and Training

Cengiz Deniz
Assistant Professor, Istanbul Technical University, denizc@itu.edu.tr
Cemil Yurtoren
Assistant Professor, Istanbul Technical University, yurtoren@itu.edu.tr
Yavuz Keceli
Assistant Professor, Istanbul Technical University, keceli@itu.edu.tr
Volkan Aydoğdu
Ph.D., Korean Maritime University, yusufvolkan18@yahoo.com

Abstract In order to fulfill the requirements of the modern maritime industry; STCW Manila meeting which is held in May, 2010 brought new obligations to worldwide maritime education. The newly proposed changes in STCW contain a lot of new regulations rather than amendments. It is a serious issue how those new regulations will be applied to maritime education and what kind of methods will be followed for efficiency. Thus; in this paper the new regulations and amendments of STCW 2010 will be analyzed and the educational aspects that needs to be applied in maritime education so that the newly graduated students would be able to comply with the requirements without any need for additional certification courses.

Keyword: *STCW 2010, Maritime Education and Training*

1. Introduction

Due to the improvements in shipping industry and the accidents occurring on ships, several amendments in STCW (Standards for Training, Certification and Watchkeeping) Convention became almost inevitable. First signed in 1978 and became effective in 1984, The 1978 STCW Convention was the first to establish basic requirements on training, certification and watchkeeping for seafarers on an international level. It underwent extensive amendments in 1995 in order to resolve the problems for establishing an international standard [1]. Ambiguous expressions in the original version such as “satisfactory by the administration” were replaced by more solid and explicit regulations that can provide a basis for an international standard. Seafarers were divided into three levels; i.e. management level, operational level, support level, and proficiency of seafarers in each level were explicitly defined. For this purpose, training courses and contents were explained using detailed tables, especially for the officer level. An auditing system was established for the acts of each administration in both national and international level. Administrations of each member country were enforced to establish a “Quality Standards System” and training institutions of each level regarding training, certification and examination were obligated to be included in this system. According to this quality standards system, every institution has to establish a quality system, execute this quality system effectively, and improve it through “internal auditing”.
Administrations must check the compliance of the training institutions to the systems via an “independent evaluation”. Independent evaluation means an “evaluation by suitably qualified persons, independent and external to activity being evaluated, to verify that the operational procedures at all levels are managed, organized, undertaken and monitored internally”. One of the most important amendments in STCW convention in 1995 is that international auditing mechanisms were formed. Administrations in each country are obligated to report the activities to IMO (International Maritime Organization) as an annual country report. On behalf of IMO, teams of “Competent Persons” who are

approved in MSC (Marine Safety Council) meetings evaluate the country reports to verify whether they fully and completely comply with the standards.
During the past 15 years, accumulation of acquired experience and emerging innovations has created a need for new rules and additional amendments in the convention. These amendments were discussed and approved in a diplomatic conference in Manila, 21 -25 June 2010 [2]. For this reason, any institution providing maritime education must adjust their courses and curriculum according to the new requirements. Thus, this paper aims to present the major amendments in STCW 2010 in an educational point of view.

2. Amendments of STCW Convention Done in 2010

In the convention, the following issues are discussed and determined:

1. Training and certification standards of newly introduced seafarers; i.e. able seafarer deck, able seafarer engine, electro-technical officer and seafarers.
2. Definition of ISPS Code Seafarer Security Representative, ECDIS, bridge and engine room resource management trainings under Code-A chapter.
3. Revision of deck and engine officer trainings in operational and management level according to modern technological requirements.
4. Promotion of awareness towards marine pollution
5. Definitions of leadership trainings.
6. Comprehensive revision of theoretical and practical trainings of engine officers.
7. Training requirements of alternative certification.
8. Definition of mandatory health requirements for seafarers, determination of working and resting times, prohibition of alcohol and drug use.
9. Precautions against illegal issuing and forgery of certification documents.
10. Enhancement of compliance of the administrations to the convention.
11. Training requirements of seafarers working in the polar zones, off-shore industry and those who work in ships with dynamic positioning system.
12. Basics of distant web-based education.
13. Updating training standards of seafarers working on tankers, definition of new training and certification requirements for those working on liquid gas tankers.

The most important amendments that concerns training institutions are listed in Chapter II, Chapter III, and Chapter V. Chapter II of the STCW and the associated sections of the STCW Code, are devoted to the requirements for the officers and ratings who serve in the deck department, and those who perform functions relating to navigation; cargo handling and stowage; controlling the operation of the ship and care for persons. Amendments in operational level are given in Table 1, whereas amendments in management level are given in Table 2.
When these amendments are examined, it can be easily noted that subjects related to ship and human management are shifted to lower levels; i.e. subjects related to Bridge Resource Management (BRM), leadership and management skills are now included in the operational level of seafarer training. Since VTS (Vessel Traffic System) has become an important tool for safe navigation and accident prevention by regulating and managing ship traffic, VTS training is also included in the seafarer training. Due to the 2010 amendments in STCW, a lot of subjects which were simple courses or certificate programmes in the past, are now considered as undergraduate courses
Chapter III of the STCW and the associated sections of the STCW Code, are devoted to the requirements for the officers and ratings who serve in the engine department, and those who perform functions relating to marine engineering; electrical, electronic and control engineering; maintenance and repair; and controlling the operation of the ship and care for persons on board. In this chapter several amendments were introduced not only on course contents but also on the duration of onboard training. The duration of onboard training is increased from. 6 months to 12 months. The amendment about onboard training is expresses as “have completed combined workshop skill training and an approved seagoing service of not less than 12 months as part of an approved training programme which includes onboard training which meets the requirements of section A-III/1 of the STCW Code and is documented in an approved training record book” in Regulation III/1, Rule 2.2. Besides the

increase in the duration of onboard training, a new concept called "workshop skill training" is also introduced. Thus, a new challenge is waiting for administrations and training institutions, since from now on just onboard training on ships is not enough and the candidates must also undergo a workshop skill training programme, whose location and duration must be determined and approved by the administration. Training in workshop skills ashore can be carried out in a training institution or an approved workshop.

The amendments in operational level are given in Table 3, whereas Tablo 4 summarizes the amendments in management level. As shown on these tables, important amendments are done related to engine-room resource management, application of leadership and team working skills, manage the operation of propulsion plant machinery, plan and schedule operations, manage operation of electrical and electronic control equipment, manage troubleshooting restoration of electrical and electronic control equipment to operating condition, use leadership and managerial skills. In addition to training related to marine diesel engines, marine steam turbine, marine gas turbine and marine boiler trainings should also be given in equal importance. Moreover, the content of subjects related to electrics and electronics must be increased in the educational curriculum.

Competence	Knowledge, understanding and proficiency
Maintain a safe navigational Watch	The use of information from navigational equipment for maintaining a safe navigational watch Knowledge of blind pilotage techniques The use of reporting in accordance with the General Principles for Ship Reporting Systems and with VTS procedures *Bridge Resource Management* Knowledge of bridge resource management principles including: .1 allocation, assignment, and prioritization of resources .2 effective communication .3 assertiveness and leadership .4 obtaining and maintaining situational awareness
Use of ECDIS to maintain the safety of navigation	*Navigation using ECDIS* Knowledge of the capability and limitations of ECDIS operation including: .1 a thorough understanding of Electronic Navigational Chart (ENC) data, data accuracy, presentation rules, display options and other chart data formats .2 the dangers of over reliance .3 familiarity with the functions of ECDIS required by performance standards in force Proficiency in operation, interpretation, and analysis of information obtained from ECDIS, including: .1 use of functions that are integrated with other navigation systems in various installations, including proper functioning and adjustment to desired settings .2 safe monitoring and adjustment of information including own position, sea area display, mode and orientation, chart data displayed, route monitoring, user-created information layers, contacts (when interfaced with AIS and/or radar tracking) and radar overlay functions (when interfaced) .3 confirmation of vessel position by alternate means .4 efficient use of settings to ensure conformance to operational procedures, including alarm parameters for anti-grounding, proximity to contacts and special areas, completeness of chart data and chart update status, and backup arrangements .5 adjustment of settings and values to suit the present conditions .6 situational awareness while using ECDIS including safe water and proximity of hazards, set and drift, chart data and scale selection, suitability of route, contact detection and management, and integrity of sensors

Table 1. Amendments in Table A-II/1

Competence	Knowledge, understanding and proficiency
Maintain the safety of Navigation through the use of ECDIS and associated navigation systems to assist command decision making	Management of operational procedures, system files and data, including: .1 manage procurement, licensing and updating of chart data and system software to conform to established procedures .2 system and information updating including the ability to update ECDIS system version in accordance with vendor's product development .3 create and maintain system configuration and backup files .4 create and maintain log files in accordance with established procedures .5 create and maintain route plan files in accordance with established procedures .6 use ECDIS logbook and track history functions for inspection of system functions, alarm settings and user responses Use ECDIS playback functionality for passage review, route planning and review of system functions Assessment of evidence obtained from one of the following: .1 approved in-service experience .2 approved training ship experience .3 approved ECDIS simulator training Operational procedures for using ECDIS are established, applied, and monitored Actions taken to minimize risk to safety of navigation
Use of leadership and managerial skill	Knowledge of shipboard personnel management and training A knowledge of related international maritime conventions and recommendations, and national legislation Ability to apply task and workload management including: .1 planning and coordination .2 personnel assignment .3 time and resource constraints .4 prioritization Knowledge and ability to apply effective resource management: .1 allocation, assignment, and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership including motivation .5 obtaining and maintaining situational awareness Knowledge and ability to apply decision-making techniques: .1 allocation, assignment, and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership including motivation .5 obtaining and maintaining situational awareness Knowledge and ability to apply decision-making techniques: .1 Situation and risk assessment .2 Identify and consider generated options .3 Selecting course of action .4 Evaluation of outcome effectiveness Development, implementation, and oversight of Standard operating procedures

Table 2. Amendments in Table A-II/2

Competence	**Knowledge, understanding and proficiency**
Maintain a safe engineering watch	*Engine-room resource management* Knowledge of engine-room resource management principles including: .1 allocation, assignment, and prioritization of resources .2 effective communication .3 assertiveness and leadership .4 obtaining and maintaining situational awareness .5 Consideration
Use internal communication systems	Operation of all internal communication systems on board
Operate main and auxiliary machinery and associated control systems	Basic construction and operation principles of machinery systems including: .1 marine diesel engine .2 marine steam turbine .3 marine gas turbine .4 marine boiler .5 shafting installations including propeller .6 other auxiliaries including various pumps, air compressor, purifier, fresh water generator, heat exchanger, refrigeration, air conditioning and ventilation systems .7 Steering gear .8 automatic control systems .9 Fluid flow and characteristics of lubricating oil, fuel oil and cooling systems .10 deck machinery
Operate electrical, electronic and control systems	Basic configuration and operation principles of the following electrical, electronic and control equipment: .1 electrical equipment .a generator and distribution systems .b preparing, starting, paralleling and changing over generators .c electrical motors including starting methodologies .d high-voltage installations .e sequential control circuits and associated system devices .2 electronic equipment functions, .a characteristics of basic electronic circuit elements .b flowchart for automatic and control systems .c functions, characteristics and features of control systems for machinery items including main propulsion plant operation control and steam boiler automatic controls .3 control systems .a various automatic control methodologies and characteristics .b Proportional–Integral–Derivative (PID) control characteristics and associated system devices for process control

Table 3. Amendments in Table A-III/1

Competence	**Knowledge, understanding and proficiency**
Maintenance and repair of electrical and electronic Equipment	Safety requirements for working on shipboard electrical systems Safety requirements for working on shipboard electrical systems including safe isolation of electrical equipment required before personel are permitted to work on such equipment Maintenance and repair of electrical system equipment, switchboards, electric motors, generator and DC electrical systems and equipment Detection of electric malfunction, location of faults and measures to prevent damage Construction and operation of electrical test and measuring equipment Function and performance tests of the following equipment and their configuration: .1 monitoring systems .2 automatic control devices .3 protective devices The interpretation of electrical and simple electronic diagrams
Application of leadership and team working skills	Working knowledge of shipboard personel management and training A knowledge of related international maritime conventions and recommendations, and national legislation Ability to apply task and workload management including: .1 planning and coordination .2 personnel assignment .3 time and resource constraints .4 prioritization Knowledge and ability to apply effective resource management: .1 allocation, assignment, and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership including motivation .5 obtaining and maintaining situational awareness Knowledge and ability to apply decision-making techniques: .1 allocation, assignment, and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership including motivation .5 obtaining and maintaining situational awareness Knowledge and ability to apply decision-making techniques: .1 Situation and risk assessment .2 Identify and consider generated options .3 Selecting course of action .4 Evaluation of outcome effectiveness

Table 3. Amendments in Table A-III/1 (continued)

Competence	Knowledge, understanding and proficiency
Manage the operation of propulsion plant machinery	Design features, and operative mechanism of the following machinery and associated auxiliaries .1 marine diesel engine .2 marine steam turbine .3 marine gas turbine .4 marine steam boiler
Plan and schedule operations	Propulsive characteristics of diesel engines, steam and gas turbines including speed, output and fuel consumption Heat cycle, thermal efficiency and heat balance of the following .1 marine diesel engine .2 marine steam turbine .3 marine gas turbine .4 marine steam boiler
Manage operation of electrical and electronic control equipment	*Theoretical knowledge* Marine electro technology, electronics, power electronics, automatic control engineering and safety devices Design features and system configurations of automatic control equipment and safety devices for the followings : .1 main engine .2 generator and distribution system .3 steam boiler Design features and system configurations of operation control equipment for electrical motors Design features of high voltage installations Features of hydraulic and pneumatic control equipment
Manage troubleshooting restoration of electrical and electronic control equipment to operating condition	*Practical knowledge* Troubleshooting of electrical and electronic control equipment Function test of electrical, electronic control equipment and safety devices Troubleshooting of monitoring systems Software version control
Use leadership and managerial skills	Knowledge of shipboard personnel management and training A knowledge of related international maritime conventions and recommendations, and national legislation Ability to apply task and workload management including: .1 planning and coordination .2 personnel assignment .3 time and resource constraints .4 prioritization Knowledge and ability to apply effective resource management: .1 allocation, assignment, and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership including motivation .5 obtaining and maintaining situational awareness Knowledge and ability to apply decision-making techniques: .1 allocation, assignment, and prioritization of resources .2 effective communication on board and ashore .3 decisions reflect consideration of team experiences .4 assertiveness and leadership including motivation .5 obtaining and maintaining situational awareness Knowledge and ability to apply decision-making techniques: .1 Situation and risk assessment .2 Identify and consider generated options .3 Selecting course of action .4 Evaluation of outcome effectiveness Development, implementation, and oversight of Standard operating procedures

Table 4. Amendments in Table A-III/2

Chapter V covers special training requirements for personnel on certain types of ships
Special requirements were introduced concerning the training and qualifications of personnel on board Ro-Ro passenger ships and on tankers. Most important amendments in this chapter are related to tanker trainings. According to the new amendments, tankers are considered under three distinct categories; i.e. oil tankers, chemical tankers and gas tankers. Moreover, separate tables are prepared for both basic training and advanced training of each tanker type, as given below.

- Table A-V/1-1-1 Specification of minimum standard of competence in basic training for oil and chemical tanker cargo operations,
- Table A-V/1-1-2 Specification of minimum standard of competence in advanced training for oil tanker cargo operations,
- Table A-V/1-1-3 Specification of minimum standard of competence in advanced training for chemical tanker cargo operations,
- Table A-V/1-2-1 Specification of minimum standard of competence in basic training for liquefied gas tanker cargo operations,
- Table A-V/1-2-2 Specification of minimum standard of competence in advanced training for liquefied gas tankers cargo operations.

3. Conclusion

The educational aspects of STCW 2010 discussed in this paper can be summarized as below;

1. Over the past years, subjects like management skills, leadership, human factors have been given to the trainees as certificate programmes. On the other hand, according to STCW 2010, these subjects are given in the operational level and are included in the curriculums of collages and universities.
2. In order to achieve navigational safety and accident prevention, it is aimed that awareness and consciousness of responsibility of seafarers should be enhanced.
3. Human-focused educational models have been increasingly maturated in the past few years. Thus human factor which has been generally neglected in the field of navigational safety, is becoming the center of safety concept.
4. It has been proven that the effect of perfect hardware and machinery on safe navigation is definitely not more than that of seafarers receiving adequate and qualitative training. Thus, human-centered changes must always be considered first.
5. When it comes to solving any problem on board, it is a general principle that an educational system that provides the seafarer with strong social and psychological state, teaches the seafarers to investigate, to produce alternative solutions is always preferred over that is entirely based on memorizing the existing subjects.

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Competent Students and Staff: Where Do We Find Them?

Prof. Capt. Stephen J. Cross
Director of Projects
Maritime Institute Willem Barentsz
P.O.Box 26, 8880 AA Terschelling West ,The Netherlands.
sjcross@hetnet.nl

Abstract The global shortage of seafarers continues despite events resulting from the economic downturn, such as scrapping of older vessels, cancellation of newbuilding orders, laying up of vessels.This means that any efforts for retention of seafarers or recruitment of new intake are as essential now, as have ever been in the past.
Numerous efforts have been developed and initiated over the years to attract new generations of youngsters into the industry. A few examples are highlighted in this paper.

A shortage of seafarers will also result in a shortage of teaching staff. How to attract teachers and what career is available for them is a further essential component to consider in assuring that qualitative MET will be available in the years to come.
In the Netherlands at one time there was a qualifying academic programme for maritime lecturers and instructors. This system was abandoned a number of years ago due to the reorganization of teaching qualifications and academic programmes.

However the lack of well prepared, trained, educated, MET providers is beginning to become a major concern in the industry. Lower educational standards. outdated educational programmes, more and more short teaching programmes, followed by instant on board promotion and thus lower standards of competence are becoming reality.
In order to offer a proper upgrading programme for MET staff a new, modular online MET staff development programme is being initiated which, when fully completed, will lead to an MSc degree in dedicated maritime education and training.

Keyword: *MET, students, recruiting, seafaring career, lecturers, staff development*

1. Seafarer shortage

The global shortage of seafarers continues to hit the industry, despite actions resulting from the economic downturn, such as scrapping of older vessels, cancellation of new-building orders, laying up of vessels, slower sailing, utilizing vessels as storage facilities etc. This means that retention of seafarers and recruitment of new intake are as essential now as they have ever been in the past.

Various studies over the recent months have shown the following facts and figures:

- The global officer supply in 2009 is some 517000
- This is an increase of 28% since 1990 and of 11% since 2005
- Nevertheless in 2008, the officer shortage in 2009 was assumed to be 34000
- And recently in 2009 the updated shortage figure is still estimated at 33000
- The forecasted officer shortage in 2013 (with fleet growth 14%) is up to 56000
- And even if the fleet growth is 10% lower, a shortage of 42000 is estimated.

One could ask the question which circumstances have created this seemingly structural shortage phenomena which in fact has existed for many years now? And is there finally a solution to solve the problem?

It is often argued that there is too much wealth in western countries which makes the attractiveness of a seafaring career a lot less. Why bother going to sea if there is no financial need to do so?
Cheap airfares are also a lethal component in the promotion of the attractiveness of a seafaring career. 500 euro takes you halfway around the world, when ever you want, probably including full accommodation in your holiday destination as well!!

Obviously because of the decrease in numbers of seafarers the profession is becoming less well known. In the old days there were four professions for a young man: one could become doctor, farmer, administrator or seafarer. Nowadays a student in Netherlands can choose from some 388 degree programmes in the Universities of Applied Science. It will be difficult to find that single one called seafaring!!

Furthermore there is the continuous stream of mainly negative publicity about seafaring as if journalists are only trained to report on negative news. Polluting accidents, sinking ferries, pirate hijacking, all do not improve the perception the general public has of the shipping industry.
And finally the outdated perception of the profession is heard amongst youngsters, that they do not want to be away from home for 10 – 12 months!! As if this would be the case in any of the structured and reputable ship owner or ship manager routines.

When talking to young people as potential seafarers, the criminalization of the master is mentioned as a not very attractive outlook. This together with the sometimes multi- multi-cultural crew and the overall decreasing esteem of the profession makes it difficult in the western countries, to continue to interest the new generations.

2. Present generation

Whereas much of the abovementioned circumstances are related to western oriented societies, there is no doubt that in maritime developing countries these situations and attitudes will also develop, as the standard of living, in that country, rises.

Many psychologists, sociologists, marketeers , are doing their utmost to identify what the present generation is like and what it is that makes them function, be motivated and perform. There are many reasons for wanting to identify this.

Since the Second World War a distinction as below has been recognized and named

- Babyboomers 1945 – 1960
- Generation X 1965 – 1985
- Generation Einstein 1990 – now
  (also called “more and more generation”, “pc screen generation”, “image generation”,“thumb generation”,“pick and mix generation”)

With this present Generation Einstein a new approach is needed to get them involved based on their characteristics and attitudes which can be listed as:

- Fast, clever, sociable
- Society conscious
- Keen on intimacy
- Loyal, functional
- Learning visually, not verbally text based
- Creative and imaginative
- Commercially oriented

- Media smart through 24/7 information society
- Computer as a social machine and part of life
- Continuous contact by internet, MSN, chatten

Drastic and very unconventional measures will prove necessary to attract this generation of youngsters If we are really serious about manning ships with young intelligent new generation persons we will have to offer good working conditions, extreme internet access and a modern relevant and practical educational system.

3. Educational systems

Obviously what the new generations do not like is non-functionality and unnecessary work, procedures, activities. Which brings us to one of the prominent problems in many MET systems. Very often extremely traditional education forms and content are very de-motivating for our young generations.
In the Netherlands we have tried to improve this aspect by incorporating both MoE and MoT exams into one activity, as we were probably one of the rare fields of study where a student was examined twice on the same subjects, but for different authorities. (Because we have always been doing it that way??!!)

Besides that the educational system was transformed form a knowledge based system to a very practical competence based programme. Some characteristics along that path included

- Form mono to dual purpose
- Subjects to modules to competences
- Knowledge based was transformed to competence based
- Examination to assessment
- Diploma to degree incl. Dublin descriptors
- European Credit Transfer System was introduced
- Quality Assurance systems initiated

Assuming we will find enough interested youngsters to take up seafaring and believe in the industry, our worries for the quality of this MET should become apparent.

Seafarer shortage automatically implies teaching staff shortage. And if we can find individuals willing to change from sea to shore, decent employment conditions (read salary) is the least requirement necessary. Once that is solved the teaching capacity of the ex seafarer must be evaluated and where necessary upgraded and updated.
The way this was achieved in the past in Netherlands is described hereafter. However what is a past without a future, so how are we going to meet the needs to come.

Obviously it will be very beneficial similar to any professional education that the teaching staff has some experience in the field he or she is supposed to teach. Apart from a good theoretical background having had the own hands on experiences is important.

4. Staff development

As an established maritime nation the maritime education and training system in The Netherlands has a long history and excellent reputation. This reputation is partly due to the high standards required of the teaching staff.

After the highest professional qualification and ample seatime the prospective MET lecturers seeking the highest level of teaching competence were required to follow a dedicated teacher training programme of five years fulltime compressed into a parttime format.

This programme was unique in it's kind and officially known as the "Vereniging Cornelis Douwes" courses. There were four specializations in the course depending on the entrants background and chosen topics: Navigation, Seamanship, Engineering, Radio Communications. The course resulted in a multiple MSc and provided the assurance of a fixed contract in the then Higher Dutch MET institutes.

However, the efforts required during a five year period, usually aside a teaching job necessary to make a living, hardly generated a great popularity for the programme. The number of students in these teacher training programmes slowly decreased and since some years there are no entrants at all and the system ceased to exist.

5. MET Master

Apart from the seafaring bachelor level staff, many organizations in the maritime field have the need for further educated professionals. Besides that, numerous students both seafaring and maritime shore-based have the potential and ambition to take on further relevant studies.

With this in mind a number of new Master programmes have and are being initiated both by MIWB and in various MIWB collaboration arrangements with other organizations. These consist of tie ups with Dutch and European universities focusing on transport and logistics, nautical and engineering sciences as well as the unique programme of MET Master.

Where there is a global demand for scores of quality seafarers the realization is coming about that without proper MET educators and trainers there are no qualified seafarers. Many shortcuts and adhoc solutions are sought to try to overcome the existing shortage of qualified teachers.

The MET Master course objectives are clearly to enhance the professional expertise of those wishing to pursue a career in the maritime education and training field by offering indepth knowledge and background information on maritime subjects. Furthermore all elements of pedagogics and teaching didactics are offered.

As MET teachers or instructors, a good deal of personal expertise is required to offer a qualitative teaching programme. Therefore one of the entry requirements apart from the academic basic qualifications is the possession of a certain certificate of competence in the nautical and or engineering discipline.

As the maritime business is an international activity and as the maritime language is English is seems obvious that the MET Master programme is conducted in English. This also makes entry by foreign participants from any maritime country an easy route to follow.

The fields of study are various but the programme modules can be divided into general and specific modules.

- General module topics such as

International regulations, Management, Law, Applied mechanics and mathematics, Computer technology, Teaching pedagogics and didactics, Simulation, Marine pollution and prevention.

Depending on the background expertise a choice can then be made between the nautical or technical stream covering

- Nautical module topics a.o.:

Shipping economics, Cargo and transport, Shiphandling, Naval architecture, Navigation and systems, Communications, Safety and survival, Meteorology and oceanography

- Marine engineering module topics such as :

Automation and control systems, Diesel engines, Steam systems, Refrigeration systems, Marine electrical engineering

For those not wishing a career in MET a selection of the professional modules can be chosen and for those not wishing to complete the entire Master programme individual modules can be followed as postgraduate courses during a suitable timeframe.

6. Conclusion

In this way we hope to offer both the right content for individuals and the new ideas for institutions to improve the overall quality of MET and make the MET profession an appreciated career change.
Hopefully this will bring the quality of seafaring and shipping overall to a level that once again is something to be proud of and an enviable and natural choice for the generations to come.
Within the present day situation, where economics seem to be overruling anything and everything, anywhere and everywhere, anytime and every time, it seems important to realize that students and staff are really very essential in both MET and far beyond!!

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Prof. Capt. Stephen.J.Cross

- 10 years seagoing career in all nautical ranks
- 11 years certified MET lecturer, simulator instructor, examiner.
- 4 years lecturer of MET at World Maritime University.
- 7 years senior advisor Kongsberg Maritime Simulation.
- 9 years managing director of Maritime Institute Willem Barentsz.
- Presently Director of Projects at MIWB for international relations, business development, project acquisition and management
- Visiting Professor at World Maritime University

Professional memberships :

- (IMLA) International Maritime Lecturers Association (Committee)
- (INSLC) International Navigation Lecturers Conference (Steering Group)
- (IAMU) International Association of Maritime Universities
- (Global MET) Global Association of MET Institutes (Advisor)
- (NI) Nautical Institute (Fellow)
- (RIN) Royal Institute of Navigation (Associate Fellow)
- (IFSMA) International Federation of Shipmasters Associations
- (IMSF) International Marine Simulator Forum (Chairman):

The Need of Introductory Maritime English Course for Non-Native English Speakers

N. Demydenko
PhD, Head of ESP Department, Kyiv State Maritime Academy, Ukraine,
nademar@gmail.com

Abstract The article purposes to analyse methodological, linguistic and extra-linguistic aspects of up-to-date Maritime English teaching/learning materials for beginners in Navigation and Marine Engineering.
The strategy of teaching in the countries where English is not the native language is of upper priority for ESP departments of Maritime Universities. The contents, structure, quantity and quality of exercises involved or topics chosen, self-assessment materials and tests of the Course Books for Elementary and Pre-Intermediate students may be of some interest for practical teachers. It is supposed that the new ideas will result in higher national and international standards of MET. Inspired by the participation in Leonardo da Vinci MarTEL Project, Kyiv State Maritime Academy initiates the discussion of varieties of Maritime English (ME) Course Books applied on a local level
and suggests inter-national or multinational projects in creating ME materials for beginners.

Keyword: *ME materials, non-native speakers, Course Book for beginners*

1. Introduction.

Kyiv State Maritime Academy located in the capital city of Ukraine represents all-national challenge in the spheres of Navigation, Marine Engineering, Maritime Law, Water Transport Management which requires its continuous development. It is foreseen that in the nearest future Kyiv State Maritime Academy becomes the educational and science-research centre with multiple sophisticated infrastructure of the European level. Academy's mission: is to provide higher educational services in the fields of Navigation on Marine and Inland Waterways and Power Plant Installations to various groups of population of Ukraine from different areas and regions (close or distant from the capital city), thus giving the opportunity to receive Bachelor or Master Degree and corresponding qualification certificates. Supporting the traditions of training seafarers, the Academy responds to the all-national demand of the younger generation in Water Transportation. As the latest experience shows the Academy's graduates and postgraduates correspond to the up-to-date requirements in qualification of different ranks and professions working both onboard and onshore. In 2009 Kyiv State Maritime Academy joined the project MarTEL (UK/07/LLP-LdV/TOI-049). It's known that Ukraine occupies the 5th place in the world in manpower for different ranks and specialities working on multiple flagged vessels. The participation of the Ukrainian higher educational institution in this project comes to be the proof of international co-operation in order to reduce merchant vessels incidents and accidents caused by the human factor in the situations of Maritime English communication failure on board ships among the members of international crews.The purpose of MarTEL (Maritime Tests of English Language) is creating of world-wide supported Maritime English standards as well as producing the corresponding teaching/learning and assessment materials. The goals of the Project also include the establishment of Maritime English standards sets similar to those existing in General English – TOEFL, IELTS. In other words, the project purposes to create the system of Maritime English profeciency assessment tests on the basis of the model course developed by IMO (IMO Standard Marine Communication Phrases) for all ranks and specialities of merchant vessel crews.Shipping is considered to be one of the most important and dangerous sectors of world economy; therefore, the safety of seafarers, cargoes and vessels are of utmost priority for the shipping industry. Deficient or faulty communication on board a vessel is one of the major reasons of incidents and accidents. Shipping risks elimination mainly depends on how the Maritime English standards are observed by all participants of this economy's sector: government, shipowners, crewing companies, etc. The MarTEL Project partners have been working at Maritime English tests both for deck and engineering departments (ratings and officers). Much attention is being paid to dissemination of the standards, the problem of training of the teachers' staff, distance and e-learning in the system of Maritime English teaching/learning practical activities, implementation of the pilot project for the establishment of Maritime English Certification Centre, etc. (search for the detailed information at www.maritime-test.org). Participation in the MarTEL Project gives the opportunity to analyse all aspects of Maritime English functioning and to draw the conclusion about the neccessity of taking them into account when developing national and international standards including the design of effective Maritime English teaching / learning materials.

2. ME teaching materials-Current situation.

This article has been written owing to another article analising the present situation concerning the requirements to students' language proficiency, as well as availability of efficient ME Course Books, assessment materials, all necessary supplements and aids being in use of any ME teacher. Captain Li Fei from Shanghai Maritime University (the Internet, "7 ACTUALITY OF OUR COLLEGIAL MARITIME ENGLISH EDUCATION AND THE MEASURE OF BETTERMENT", 2009)insists on "uniform professional English teaching materials" and makes emphasis on the fact that the teaching materials are the most important elements in the process of seafarers' training.. He says that the quality of all teaching materials relies on the contents selected for the teaching process of the students of navigation, in particular. This opinion of Captain and of MET practitioner from China has much in common with the thoughts of ME teachers from different countries. The problem seams to be international and is not the sequence of specific features of a native language of Maritime students. Hence, this situation demands detailed and profound study in order to work out a set of methodological instructions for all Maritime Universities. It's necessary to describe not only the object of education (topics, texts, exercises, etc.) but also the way of how all this is prepared for work and then used and assessed in class. The HOW becomes more important alongside the WHAT should be taught to our students nowadays. Domination of skills development over knowledge delivery is being obvious. This is the sphere of practical methodology which usually has great achievements in non-English speaking countries but depends a lot on national tradition existing in the system of education. Different methods, approaches and techniques used by practical specialist lecturers and language teachers sometimes result in insufficient language proficiency which provides negative effects on students and trainees. Unfortunately, it happens in case of seafarers who have a rare opportunity of using ME for professional purposes in the process of studying thus comparing their language proficiency with that of other members of a multilingual crew. Here comes the point of coordination between professional and language teachers and a very sensitive matter such as methodological priorities of each of the parties. This is the core idea of any corporative research activities: Who does what? What are the domains of professional teachers and those of language teachers? How is this performed in different MET institutions all over the world? In fact, there are so many questions which should get their answers, that the problem of up-to-date efficient practical ME materials corresponding to international standards for different ranks and professions of crew members should be considered and solved as quickly as possible. Some ideas are suggested to start the exchange of opinions concerning the reasons and consequences observed in the field of practical teaching and teaching materials, in particular. We hope this discussion will make possible to analyse all aspects of Maritime English in use and to draw conclusions about the neccessity of taking them into account when developing the basics of Maritime English methodological concept.

2.1. Linguistic aspect

Researchers emphasyze on the global nature of English (Global English, International English), call English *lingua franca* (C.Cole, P.Trenkner) for the people who work in multinational surrounding. Maritime English is considered to be an operational and working language, the language with some restrictions if the functional characteristics are concerned in the specific area of merchant marine transportations (R. Ziarati). The linguistic analysis indicates the availability of considerable lexical "burden" of special terms, quite a short list of grammar structures, strikingly serious set of phonetic peculiarities in Maritime English use. Specific features of ME cause certain difficulties in mastering the system of maritime terms in which a term is not only a language unit; but represents a notion belonging to the special sphere of knowledge. In case all these linguistic factors are taken into account in university curricula, it is possible to foresee that they have a chance of being successfully used for effective training of would-be deck and engineering crew members. Still, as many professionals think, Maritime English is not the whole English language which is required for communication in different spheres of life. The idea of co-relation of General English and Maritime English comes around when developping various teaching/learning materials (study books, tests for self-assessment, in particalar) that meet all vital needs of Maritime students.

2.2. Methodological aspect

The most serious platform for practical researches is ESP -English for Specific Purposes. After the revolution in linguistics, when it was found out that any language analysis presumes the study of actual communication materials, it became obvious that the methodological aspirations should be focused exceptionally on the students' needs, meaning that the professional needs acquire priority (development of skills for employment). Students' skills – listening, speaking, writing, reading combine the competence which is defined sufficient or insufficient for their professional activities. It' s necessary to create the base of teaching/learning materials, the one that is adequate in the system of higher education. ME if a fundamental subject taught and studied for many years. In this case the methodological platform of ME department has to be created and submitted as mission of the educational institution. Nowadays this methodological concept is the reflectc functiion of the latest achievements in lingistics, IT and psychology. Since Maritime English is a specific function of the English language, the step-by-step academic course must be developed in order to cover all possible working situations at sea when English is used in oral or written form. This course may hardly comprise some old (but still being in use) approaches and techniques, for example, abundant exercises in translation or memorising words. Instead, lots of communicative tasks should be suggested for students' skills development.

2.3. Psychological aspect

Discussions on the problem of proper method selection have proved that the best one is the method which is the most adequate for the student and his vital interests. Variety of tasks, learning materials, study packs as well as sufficient level of the student's motivation guarantee the openness of both the student and the teacher, evoke the response to real communication and the interest to the future profession. Therefore, in a classroom the most efficient is oral and written communicaton which is professionaly motivated, i.e.connected with multiple functions of Maritime English used at sea. Teacher's goals concentrate on finding out the materials which correspond the student's level of the language proficiency and which are interesting from the point of view of their future occupation. Quite often some ME teachers feel it difficult to change their manner of teaching for more advanced style or think it's inapproppriate to start using the Internet as a source of original information delivered in an authentical form. In these situations the students experience lack of skills which are very important for them in the context of their individual work such as skills of searching for information and adopting it for personal needs or tasks. It shows how the trainer's qualification and personality are important for the students especially when they are restricted in their right to choose a teacher. It's a universal truth that the best teacher is the one who teaches his students how to learn and provides any help possible on this way.

2.4. Socialising

It is known, that the labour market is the best factor for motivating students in the process of their studies. In the industry of water transport this problem is being solved through acquiring by students and graduates of real communication experience in international crews when some incidents of intercultural and interconfessional nature may take place. Moreover, sociolingual and sociocultural aspects combine with specific labour conditions on a merchant vessel, climatic and weather factors in everyday work of seafarers, their working under preassure, isolation in long voyages, health problems, etc. Together with the special seafarers' status all this requires extreme oncentration and hard work in the course of their professional training including Maritime English profeciency, thus, making them achieve the highest level of professional competency in order to avoid risks at sea.

3. The new type of a Maritime English Course Book as an Option for the Problem Solution

Having acquired the latest experience in the field of Maritime Education and Training findings, the ESP Department of Kyiv State Maritime Academy has made an attempt of developing a Course book for ratings. "*The Introductory Maritime English Course"* is intended for the first- and second-year students - non-native English learners who are about to commence their Maritime academic career through a Bachelor Degree in Navigation or Marine Engineering. Three influences behind the development of the Course book and as such its contents and the form are taken into consideration. These are
a) the lack (or absence) of professional Mariitime experience of the students,
b) the lack (or absence) of Maritime English language proficiency,
c) the lack of General English language competency.
The study book is supposed to meet the interests and requirements of the future seafarers in a new sphere of knowledge and practical skills whereby the coordinated work of English language teachers and specialists' teachers is required. We hope that the Course fills in the current gaps and adds new necessary requirements by combining English language and Maritime specialist skills with the existing General English language foundations.So, it's blending of General and Maritime English which seems to be rather efficient at the very beginning of seafarers' training. The functional approach has been used which is linguistically correct and proves to be the only one to reach the goals.

3.1. The Structure of the Course Book

The Course contains 17 Units:
1) Introducing Oneself.
2) Discussing Personal Details: Occupation.
3) Discussing Personal Details: Country. Language. Nationality.
4) Describing Places and Locations.
5) Discussing General Information about People: Home. Family. Education. Likes andDeslikes.
6) Discussing One's Occupation: Functons. Duties. Daily Routine.
7) Describing Motion and Direction. Asking for Directons.
8) Describing Living and Non-Living Objects (1).
9) Describing Living and Non-Living Objects (2). Giving Definitions.
10)Describing Processes.
11) Describing Changes and Results.
12) Describing the Whole and Its Parts.
13) Describing Comparisons.
14) Describing Ways of Doing Things: Active and Passive Actions.
15) Describing Past Events.
16) Discussing Future Actions.
17) Revising. Summarising. Testing.

Each Unit is represented by descriptions of teaching goals and learning outcomes in *Language Skills Development, Maritime English Professional Competence, General English Language Competence*. Each Unit has a strict structure consisting of tasks, a series of exercises, self-assessment materials, supplementary materials, comments and keys. The concept of The Course presumes that both General English and Maritime English sources should be used in the process of learning. It certainly helps to broaden the potential skills of the language use in different life situations including professional ones.
'The Introductory Maritime English Course' has been designed according to IMO Model Course, 2001 and the latest SCTW ammendments. In connection with seafareres' job related concept of the Course it's worth noting the following:

a) the Course is cent percent ESP language issue meaning the profound linguistic research of oral and written texts on the speciality and presuming the scope of ME functions in real-life sitations onboard ship,
b) since language teachers are not competent in navigation, marine engineering, maritime law or water transport management, the contents of the Course has been verified through the expertise of specialists whose advice has been taken into account with gratitude,
c) translation as one of the methods widely used in MET till now is practically excluded from the Course as a teaching goal just because this language function doesn't "work" in real-life situations in multilingual crews, in particular. Among the series of exercises proposed one may find the task "Find equivalent in your native language"which acquires quite a new sense compared to translation. The English-Russian-Ukrainian ME Vocabulary attached to the Course comprises 1200 entries to be used by the students in the process of fulfilling individual work and, later on, performing their duties onboard,
d) the materials used in the Course are mainly adaptation of real life situations and scenarios with references provided. The exercises have been developed specifically for maritime students. Self-assessment materials take into account the idea of the MarTEL Maritime English Language Standards. The Course contains tasks purposing the individual work of students: notes, reports, PowerPoint presentations, etc.
e) the basics of Business English are present in the Course book as the most important elements ensuring proper communication of seafareres. These include personal letters, Application form, Resume, Cover letter, emails, faxes, Incoterms, Logbook, list of seafarers' certifictes, role-plays on interview, telephoning, etc.
f) one of the peculiarities of the suggested teaching material is extensive reading (both in class and at home). Different types of texts (definitions, descriptions, explanations, narrations, persuasions and others) are studied with various tasks attached (reading for detail, for a jist; scanning, skimming). Assuming the fact that the Course book has been developed for the students mostly with Elementery Level of English language proficiency, the first Units contain short texts as well as series of micro texts purposed for fast reading. Longer texts are meant for advanced students who use the information for reports and presentations,
g) multiple functions of English are represented by small talks, conversations to develop skills of asking for and giving information, expressing excuse, refusal, surprise, suggesting help, inviting people to do something, etc.
h) SMCP being the central part of the Course are suggested for word stock study, role play tasks and accompany most of the topics: emergency situatins, bunkering opertions, etc.

3.2. The Introductory Course contains the following Maritime Engish topics

1) Introducing Oneself. Filling up personal documents; types of documents; interviews.
2) Letters, numbers, colours. Maritime code words. Times at sea and at shore. Languages, nationalities, flags.
3) Maritime jobs and professions. Functions and duties.
4) Places and locations. Countries, water bodies. Other geographical names. Maps and charts. Longitude, latitude.
5) A ship: dimentions, particulars, parts, structure, functional zones.
6) Types of vessels.
7) Motion and directions: navigation, propulsion, engines.
8) Engineering: types of a vessel's equipment.
9) Running the vessel. The bridge. The engine room.
10) Watches and Watch keeping.
11) SMCP: on-board, external. Orders and commands. VHF radio.
12 Daily routines of the crew members.
13)Weather and climate, weather forecast, natural disasters.
14) Emergency situations.
15) Safety equipment and its location.
16) Steering, mooring, anchoring. Piloting.
17) Ports and port infrastructure. Administration, customs, sanitary inspection, etc.
18) Navigational aids: buoys and lighthouses.

19) Cargoes: types; loading/discharging operations.
20) Shipping documents (basics).
21) Checking supplies.
22) Incidents and accidents. Injuries. First aid.

4. Conclusion

1. The international cooperation in developing the methodological principles of Maritime English teaching should be based upon clear understanding of stratification of the national educational macro levels, especially in the secondary education, to make the transit to the higher professional education as smooth as possible. Teaching materials for beginners should be of special concern since the training in Maritime English takes a number of years. University education including ME differs from vocational training in its main aspects - duration and fundamental character. Qualification certification in ME should be foreseen for all levels of education and should be based on strict national and international standards requirements. It's advisable that the English language proficiency levels developed in Europe (The Common European Framework of Reference for Languages: Learning, Teaching, Assessment) be lapped on Yardstick of ME performance levels. Still, according to C. Cole and P. Trenkner, "When developing this Yardstick the authors deliberately did not include the identification of Maritime English communication requirements of the different shipboard rating ranks, i.e. the STCW Convention Support Levels, but restricted themselves to the personnel covered by the STCW Convention Operational and Management Levels educated and trained at higher MET institutions. The shipping industry, however, may wish to have a Yardstick available for shipboard rating ranks, too. In this case an appendix would need to be developed, together with the industry, as the Maritime English requirements set out in the STCW Convention (Part A, Chapter II, Table A-II/4 and A-III/4) regarding ratings are comparatively vague and need to be considered in the STCW Convention review. Furthermore, requirements concerning general English language proficiency have not been included explicitly as in the authors' understanding a certain command of general English is a basic prerequisite in this respect (c.f. IMO SMCP 2002)".

2. The development of the methodological aspect of ME training appears to be necessary in order to meet the two ends in the process of ME training: the status of a Beginner, Elementary Student, a Non-User (an Intermittent User, a Limited User) and that of a Pre-Intermediate Student, a Modest User , an Effective User. The "blending" of General English and Maritime English in one course book makes possible to quicken the ME training purposing to implement the primary job-related notions for ratings. The Course Book as a whole is intended to support a) Learner's Strategy ("The learners come to the class with a specific interest for learning. They are in charge of developing English language skills to reflect their native-language knowledge and skills") and b) Teacher's Strategy ("The teacher will need to look for content specialists for help in designing appropriate lessons in the subject matter field she is teaching"). So, "The focal point is that English is not taught as a subject separated from the students' real world (or wishes); instead, it is integrated into a subject matter area important to the learners". (L. Fiorito)

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Comparative Analysis between Real Life and Simulator-Based VHF Communication for ESL Cadets

Ender ASYALI
Assoc. Prof., Dokuz Eylul University Maritime Faculty, ender.asyali@deu.edu.tr
Laurie STONE
Assoc. Prof., Maine Maritime Academy, laurie.stone@mma.edu

Abstract The quality of external and internal communication is a crucial issue in maritime safety. Voice communication through VHF is a significant activity contributing to safety and efficiency. Miscommunication can result in hazardous situations. Clear communication boosts situational awareness and contributes directly to safety at sea.
Research among freshman and senior students was performed regarding their first real life and simulator-based VHF communication experiences. The results were compared in order to improve VHF communication training in English among cadets and to make recommendations to help other professors in the field guide students using English as a second language (ESL) in order to reduce anxiety when using communication devices.
Fear, anxiety, and hesitation are the most common feelings that cadets have "before" their real first VHF communication experience. They mentioned the importance of encouragement by their training officers during that phase. "During" their real VHF communication experiences, they most often reported feelings of excitement and fluctuations in confidence. Support from the training officers was important to them. "After" the real VHF experience, students reported feelings of success and confidence.
Freshmen students mentioned that they were excited and afraid of making mistakes before and during their first VHF communication practice on the navigation simulator. After, they concluded that the VHF communication practice was very good and useful; and provided an opportunity for experience in maritime English which increased their confidence before on-board training.

Keyword: *VHF Communication, Simulator, ESL, Communication Apprehension*

1. Introduction

The quality of external and internal communication is one of the most important issues in maritime safety. Both lack of communication and miscommunication can result in hazardous situations. Communication also boosts situational awareness which clearly contributes to safety during navigation. Voice-communication through VHF is one significant activity contributing to the safety and efficiency of maritime operations.

1.1 Human Communication Problems

As emphasized by Yercan et al [1], there is a shift in accident analysis from the mechanical to the human factor; and the significance of "human error" is increasing [2]. Pyne and Koester [3] defined the ingredients in the socio-technical system of the maritime domain as: humans (individual crew members), groups (the crew), technology (ship, instruments, equipment, tools, etc), work practice (procedures, conventions, traditions), organization (management, company culture, pressures, etc) and work environment (light, noise, vibration, etc). Pyne and Koester [3] categorized accidents with respect to human error: 1) Problems related to multi-cultural crews (e.g. the *Bunga Teretai Satu* accident, the death of a crew member on board *Sally Maersk*, and the *Scandinavian Star accident*), 2) Problems related to different cultures / languages among crew and pilot (e.g. the *Bright Field* accident), 3) Problems related to different cultures / languages among crew and passengers on passenger vessels (e.g. the *Skagerak* accident and *Scandinavian Star* accident), 4) Problems related to different cultures /languages with respect to external communication, VHF communication with other vessels (e.g. the *Royal Majesty* accident).

As Loginovsky [4] put it, English became the means for communication at sea which is why the overall performance of the international shipping industry, safety at sea and protection of the environment in many respects depend on a high level of command of the language. Due to the international character of maritime commerce, people from very different nationalities, languages and cultures work in a complex setting, therefore a common language must be used for communication between multinational and multilingual crews. In most cases, English is the preferred language for oral communication as determined by the Safety of Life at Sea (SOLAS) Convention, International Maritime Organization, in 1960.

Portela, et al. [5] categorized communication problems as such:
- The crew members' linguistic incompetence, as a result of low level of English
- Differences in the level of knowledge of English among the crew members
- Difficulty to assimilating different accents and understanding new and particular forms of English.
- Environmental difficulties inherent to this sector, such as voice distortions via VHF, or high noise level that hinders communication in the engine room.

According to Reason [6], communication problems fall into three categories:

1- System failures in which the necessary channels of communication do not exist , or are not functioning , or are not regularly used
2- Message failures in which the channels exist but the necessary information is not transmitted
3- Reception failures in which the channels exist, the right message is sent, but is either misinterpreted by the recipient or arrives too late.

Portela [7] tried to find a relation between communication problems and accidents. Her research showed that communication problems related to language are the cause of 20% of accidents. The maritime field is heavily reliant on constant and exact communication as well as understanding of mathematical formulas and their application to the field. Poor communication between crew members from the same culture can be a threat to the safety of a vessel. Furthermore, if crews use English as a second language (a basic factor in communication errors), the threat to maritime safety increases [8]. As Loginovsky [4] explained, the crew of a vessel should carry out precisely all the functional duties which in many respects depend not only on knowledge and skills in disciplines such as navigation or engineering, but also on the ability to apply English correctly and competently.

As Trenkner [9] reported, the basic communication skills, (i.e. listening and speaking, reading and writing, listening and then speaking) are the most complicated ones. Furthermore, listening and speaking amount to more than 85% of the total communication requirements a deck officer has to cope with in his or her services. Despite technological advances in means and procedures to facilitate the exchange of information between ships and shore services, such advances cannot have the desired positive effect if attention is not paid to the development of crew members' linguistics skills. Clearly, "linguistically under-qualified officers, either on deck or in the engine room, create a danger to the ships, crews and passengers, to other vessels and to the marine environment" [10].

Students are also expected to be proficient in English since technical jargon is mainly in English, and because of the high probability of working in a multicultural environment. Cwilewicz and Pudlowski's [11] work on didactic programs for a maritime academy in Poland state exactly this view: to ensure safety of passengers and colleagues, maritime students must also learn effective communication skills. Preparing students for the technical jargon often used by native English-speaking mariners and teaching students when and how to ask questions to clarify the jargon should be among integral pedagogical goals for maritime educators worldwide.

Portela, et al [5] emphasized that the most problematic communications are those that take place from the internal to the external: ship-to-ship and ship-to-shore; and a vague, general knowledge English is considered to the most problematic area in external communications. This occurs most frequently because of differences in pronunciation and accent. Mariners who speak English as a second language (ESL) often have knowledge of a standardized vocabulary and pronunciation which then impedes fluent communication because those mariners cannot fully comprehend the poly-pronunciations and accents of English.

Loginovsky [4] mentioned two problems during communication:

1) Professional incompetence of the student and the teacher in navigation. The closer the social and professional experience, the more easily people understand each other.
2) Communication failure may arise as a result of differences in social experiences of interlocutors.
3) Communication failure may be due to the big difference in levels of English, which is why standardization is necessary.

Metze and Nystrup [12] defined four dimensions of verbal communication in a professional context. Any communication sequence (conversation, statement, order, question, answer, etc.) can be analyzed according to these four dimensions:

1- Cognitive (knowledge and sense, exchange of exact information) – affective (feelings and intuition)
2- Expanding (long conversation or dialogue, questions which lead to comprehensive answers) – limiting (closing the conversation as quickly as possible, short answers, yes/no)
3- Confronting (focus on problems and conflicts) – concealing (hiding problems and conflicts)
4- Listening (paying attention to what is said and showing that by gestures and answers)- not listening (not paying attention, indifferent, no eye contact)

Pyne and Koester [3] emphasized that the need for clear verbal communication between parties in the commercial marine environment is multi-faceted as the ship is the working environment, learning environment and social environment for its personnel. The multinational crew must interact and communicate in a common language to maintain "social harmony" in an off duty context and in their everyday "teamwork" to ensure effective day-today operations. The most commonly recognized failures occur in understanding English between ship-to-ship and/or ship-to-shore communications under conditions of restricted maneuverability, or when under critically congested circumstances where little time or space can be afforded for mistakes.

1.2 Communication Apprehension

One of the issues often raised in public speaking is "communication apprehension" or CA which is essentially defined as "an anxiety syndrome associated with either real or anticipated communication with another person or persons" [13]. Miscommunication due to cultural differences and the perceived lack of proficiency in the English language of these maritime students is identified as a source of concern in the language classroom [14]. As McCroskey and Richmond [15] emphasized, people tend to avoid communication in ethnically/culturally divergent groups.

There are 4 major types of CA[15]:

1- CA as a trait: trait, or personality-type, CA is an individual's general orientation toward communication regardless of the context or situation.
2- CA in a generalized situation: This type of CA is related to generalized types of communication situations.
3- CA with a given individual or group across situations: Almost 95 percent of the population report having CA about communicating with some person or group in their lives. The target producing this CA may be the boss, dad, teacher, a peer or virtually anyone else in the person's environment. This type of CA is person (or group) specific. Another person or group in the same context would not experience the CA.
4- CA with a given individual or group in a given situation. Virtually all of us experience CA from time to time with some person or group in some situation.

Jung and Croskey [16] underscored that second language situations could create and amplify CA. Neuliep and McCroskey [17] also defined intercultural communication apprehension as "fear or anxiety associated with either real or anticipated interaction with people from different groups, especially different cultural or ethnic groups." They also emphasized that intercultural communication apprehension is a context of communication marked with unusually high uncertainty. Such uncertainty leads to anxiety, a causal ingredient in communication apprehension.

Klopf [18] studied communication apprehension in seven different cultures and found different levels of CA across cultures. These differences are even found within geographically very close or in presumably very similar countries. For instance, substantial differences were revealed between geographically close Korea and Japan. According to research, the Japanese have the highest CA and Koreans have the lowest CA between the two nationalities.

Jung and McCroskey [16] concluded that the first language CA is the basis for the second language CA. In other words, first language CA determines the level of second language CA.

2. Methodolgy

Qualitative research among freshman and senior students at Dokuz Eylul University Maritime Faculty Marine Transportation Engineering Department was performed regarding their first real life and simulator-based VHF communication experiences. A total of 25 essays from senior students and 48 essays from freshmen were collected. The essays were analyzed at three phases: before, during and after the communication.

2.1 First Simulator-based VHF communication practice experiences of freshmen students.
Research among freshmen students who do not have any onboard experience was performed regarding their first simulator-based VHF communication practice experiences in English. Freshmen class students were asked to write in a short essay the feelings and thoughts that they had during that practice. The classroom has a total of 56 students and a total of 48 short essays were collected.

Some extracts from freshmen student essays:
… As I do not have very much English practice, I feel myself under stress [during practice]. But I feel the responsibility… (Freshman student no 43)

…it was a very good feeling. As my English is not enough I'm afraid a little bit … (Freshman student no 38)

… I think this is a good experience. Before this practice I had some doubt about ship reporting with VHF but now I have got self confidence about ship reporting…(Freshman student no 34)

...I was very excited when I first entered the bridge [mock up]… As the communication language is in English through VHF this made me afraid... (Freshman student no 31)

...With this practice we gained experience for real life, English speaking and improve self confidence... (Freshman student no 16).

2.2 First real life VHF Communication Experiences of senior students.
Research among senior students was performed regarding their first real life VHF communication experiences during their seagoing training phase. Senior class students were asked to write an essay about their feelings and thoughts during their first real life VHF communication experiences. The classroom has a total of 59 students and a total of 25 essays were collected

Some extracts from student essays:
... amongst all of the intricacies of working on a ship, one of the most difficult thing to learn is how to communicate using the VHF technology. During one's first time aboard a ship, it can be very difficult to figure out how to perform necessary tasks. My first time was no exception. When the master commanded me to answer the coming call on VHF, I was very excited but scared at the same time. In fact, I was so excited that when I answered the call, I could not remember what to say. It was not until the second officer in command helped me that I was able to answer properly. I felt very disappointment in myself because I let my excitement get the best of me and momentarily forgot what I had previously learned about using the VHF system……although it was difficult, with the help from officers and through sheer repetition, I was able to become more and more comfortable using the VHF system to communicate… (senior student no.24)

…when I spoke with the VHF for the fist time I was in Tunisia at anchor. My vessel was waiting instruction for the port entrance. While I was on the bridge for anchor watch, port control called the ship for giving port entrance information and the time of pilot on board. At the beginning I was so excited. My voice trilled and I was afraid of making mistake. But then I relieved and I got back my self-confidence. I spoke with port control fluently and I did not make any mistake … (Senior student no.20)

…chief mate encouraged me to call the vessel approaching to us…I was so excited to make a mistake but I made it. That day I decided that when I become an officer I will also use that method to help cadets to relief their fears and improve their self confidence... (Senior student no.25)

… I made my first VHF communication with a Russian vessel at open sea with the enforcement of chief mate. We made a short conversation. My communication style was not proper. Instead of saying "What is your last port of call? I said "Where are you coming from?" That conversation made me understand that I had to improve my VHF communication skills…(Senior student no.6)

…..chief mate supported me to talk through VHF. He encouraged me to talk with other vessels. First I was inhibited and excited but then I understand that I could not learn without making mistakes, so by using it I gained self confidence. According to me the most important thing is helping and supporting cadet during familiarization period and to teach them the right way… (Senior student no.3)

The results were compared in order to improve VHF communication training among ESL cadets and to make recommendations to help other professors in the field guide their students in order to reduce anxiety when using communication devices; particularly when English is not the first language of the students.

3. Findings

The essays were analyzed at three phases; before, during and after the communication. Fear, anxiety, and hesitation are the most common feelings that cadets reported **"before"** their real first VHF communication experience. They mentioned the importance of encouragement from their training officers during that phase.

"During" their real VHF communication experiences, they most often reported feelings of excitement and fluctuations in confidence. Support from the training officers was important to them.

"**After"** the real VHF experience, students reported feelings of success and confidence.

Freshmen students mentioned that they were excited and afraid of making mistakes "**before and durin**g" their first VHF communication practice on the navigation simulator. Lack of English practice and self confidence were the main reasons. After, they concluded that the VHF communication practice was a very good and useful practice; and provided an opportunity to have experience in maritime English which increased their confidence before their on-board training.

4. Conclusions

During VHF Communication for ESL Cadets, “Communication Apprehension” is found to be a common difficulty which has to be overcome with the support of both maritime instructors and training officers onboard. Since communication apprehension occurs in many situations, including maritime communications, and since maritime cadets will encounter situations which require them to use English, understand spoken English (including jargon), and act upon what they hear for the safety of all aboard ship, it is imperative that maritime academies provide plenty of practice in VHF communications in English. It is also imperative that maritime instructors encourage students and work closely with them in order to reduce student levels of anxiety.

5. Future Research Possibility

This paper delineates research done among Turkish cadets at a Dokuz Eylul University Maritime Faculty. Because cadets of all nationalities experience CA when using a VHF radio, we propose to study what level of CA is experienced by native English speakers attending a U.S. maritime academy. We hope to get comparative data that will guide us toward developing instructional guidelines and benchmarks to improve the simulated VHF experiences and real-life experiences of students making their first few VHF communications. By reducing student anxiety through improved instruction and encouragement, it is hoped that all cadets who choose to enter the maritime industry will be both more competent and more confident when using English to communicate either ship-to-shore or ship-to-ship.

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Learning Maritime English
SMCP Measured Against Abridged

George Meegan
Kobe *University, Graduate School of Maritime Sciences*
Serdar Kum
Istanbul Technical University, Maritime Faculty
Masao Furusho
Kobe University, Graduate School of Maritime Sciences

Abstract There are numerous books related to Maritime English in many languages, manuals, loose-leaf binders, in short a confusion of materials. IMO developed a standardized guide text which is called the SMCP. (1) Today this substantial book can be found in marine libraries and also aboard many ships. The SMCP was assessed in our previous studies, and from that the Abridged version was introduced into studies. After close examination, the Abridged appeared more convenient and portable (pocket size). This easier usage markedly seemed to have changed the situation in Maritime English. The explicit nature of maritime words isolated from the SMCP has in effect defined the make-up of Maritime English. This was an important step because for the first time we could clearly see what it is that we call Maritime English. So much in the SMCP is couched in Basic International English, which is not the same as Maritime English. The Abridged version did prove a revelation to the students and the feedbacks were circulated in the previous studies (IMLA-16 and IMLA-17). Authors now embark on another route to check the effectiveness of this Abridged SMCP, within this study. There were two types of lesson, and they performed into two groups of students at the Faculty of Maritime Sciences, Kobe University. In Lesson 1, two groups of students are set the same Maritime English test. (3) In Lesson 2, they revise their answers; one group of the students use the Abridged, the other group use the standard text, which in Japan has Japanese language notes throughout; the Abridged version has no such thing. This style, made up of different tests, will continue through the six lessons of this terms course. The results will be based on this ongoing programme.

Keyword: *Maritime English**;** SMCP; Abridged*

1. INTRODUCTION

SMCP or ABRIDGED. What if any difference? We have been using the Abridged SMCP in Kobe Maritime Sciences for some years. Its “user friendly” aspect has always been popular and the students had no real trouble in digesting the unique maritime vocabulary. Something came about when our marine library, one of the very best in Japan purchased a new book, which gave not only the full SMCP but also translation into the native language, in this case of course Japanese. Surely this must be easier for Japanese students to use? Could this be shown in order to be proved? This was a prime objective.

1.2 As an interesting side-experiment, half way into the lessons I uniquely set out to find out what Basic English knowledge a student *thought* they had? We then used our One Page Dictionary to estimate accurately what they did indeed know. This can be seen at 4.2 - 4.7.

1.3 We only have a very few lesson to do research and those are irregular, what with breaks for other activities, national and university holidays, an every other week schedule and those who simply don’t bother to turn up. One week [Group Alpha] they completely abandoned my lesson on maritime English, when two English girl students joined them (same age)! We have two groups Alpha & Bravo operating in tandem. With each group Some students had been with the Abridged before, others before, others not; this further confused the matter. I therefore, because of this mixing, was unable to do anything comparative between groups. I then looked at within the groups, splitting those who had at some point used the Abridged and those who had not. After initial assessment, which I always do, I decided to try to use the different books in the process of revision, when the assessment test is repeated. This sample was clearly too small to make any judgement on way or another. Never-the-less we tried, markedly restricted by the brevity of lesson time available to us. This anyway is what we got.

2. METHOD & Subjects

The students were split and as has become customary here, into two Groups: Alpha (18 students) and Bravo (18 students). Mostly young men with a few female students. They were third year and fourth year and as a consequence have quite a bit of sea-time. EACH having spent one full month aboard the training ship "*Taisei Maru.*" In 2008, they had spent a further one full month aboard the same ship, or a solid number served instead aboard T/S *Shintoku Maru.* These vessels are all managed by Japan Sea Training.

2.1 Procedure

Before all else, it was important to know what was their level of familiarity with Maritime English. This gives us our base line. What do they know? Therefore what do they not know? The set-up for these special classes was standard, and similar to every other classroom in the education world. We did however have air-con, making getting out into the field that much more difficult!

Because of time constraints and organizational issues we would essential left with just three lessons, kicking off as always with "Assessment." No use of any textbooks here. The lesson is 90-minutes but the dryness of the material would put the odd student into a peaceful slumber. Those (who stayed awake) would hand in after about 45-minutes, and then knock off early.

As in past papers Izmir 2008 & Accra 2009, one hundred questions were taken directly from and quoting the full SMCP. The second lesson later, sometime much later, would be the return of the marked paper. This was where the split would take place; those who had any familiarity with the Abridged, and those without. The latter section within the group, were then issued the SMCP book with Japanese notation. We were in the campus library and so I got them into two groups as far away as possible. They then processed with revision, using the mistakes identified in there individual assessment paper. The correct answers they sort in the Abridged or the Full SMCP. However, I did notice some contamination, with the occasional person would visit the other section, such is the nature of friendship. The third time together and they do - the same - one hundred questions as of the assessment.

3. RESULTS

3.1 Measuring SMCP knowledge and after Study

In the evaluation of students' score for Initial Assessment and Final Assessment, Table 2 shows their score in 100 points, also the ratio of their success. It is also obvious how the students' learning ability has increased after revision, based on their answering of questions on Maritime English.

	Used booklet		used the IMO SMCP	
	Assessment 3rd Jun 2010 (%)	Study and Revision tested again 1st July 2010 (%)	Assessment 3rd Jun 2010 (%)	Study and Revision tested again 1st July 2010 (%)
GROUP A	52	96	30	86
	23	99	46	absent
	33	89	33	99
	36	32	33	98
	68	98	51	99
	37	98	39	84
	31	57	25	95
	22	92	21	98
	100	97		

Table 1. Comparison of use between two texts [Group A]

	used booklet		used the IMO SMCP	
	Assessment 22nd April 2010 (%)	Study and Revision tested again 1st July 2010 (%)	Assessment 22nd April 2010 (%)	Study and Revision tested again 1st July 2010 (%)
GROUP B	52	96	30	86
	6	97	15	40
	24	50	8	62
	13	absent	24	59
	7	60	14	34
	62	74	35	77
	11	11	30	79
	48	57		
	29	39		
	14	52		
	absent	65		

used **booklet** : used our booklet for revision - SHIPBOARD ENGLISH for Non-native Speakers 2009
used **IMO SMCP**: used the IMO STANDARD MARINE COMMUNICATION PHRASES with Japanese notation throughout 2008

Table 2. Comparison of use between two texts [Group B]

4. DISCUSSION

4.1 Japan has, it has been said, the poorest record of mastering Maritime English among all maritime nations. This parallels exactly the situation nation-wise, throughout Japan, where English itself is the single greatest failure. Therefore in this country it is a particularly daunting challenge to the MET need of Maritime English.

4.2 To endeavour to compensate for this glaring gap, we constructed another tool to help in this urgent remedial area. This is the Kobe University One page dictionary of Basic English, made up as it is, from the actual English language usage in the port town of Gillingham. This is a sister city with Japan, and is singularly appropriate because the great Elizabethan Pilot captain William Adams was born there. Adams holds the title of "Founder of the Japanese Navy."

4.3 The dictionary, less than 2,000 words is indeed a powerful tool. A whole working language can be put onto a single sheet of A4 paper. And this immediately breaks the back of misconception rife, that English is so vast that it cannot easily be approached. It defeats this misconception, because as with the Abridged, the language becomes manifestly possible. This can be found on the Faculty website. It is exciting to see the students and other faculty eagerly marking the words that they don't know. Finding instead that they know a vast vocabulary already!

4.4 The Kobe One Page Dictionary

How it began: This is a companion to 'SHIPBOARD ENGLISH for Non-Native Speakers, Kobe University. The students had became sick of using dictionaries containing so very many words, many almost never spoken in such as my English hometown of Rainham, Kent. So, we decided to simply remove them. By its nature however, the dictionary must be "subjective" {This is the only non-Basic term in the dictionary.} Words such as 'ascent' have been cut because we do have (in this letter) 'climb.' Similarly, 'abroad' is replaced because we have 'international' and 'shop' goes because of 'bread-shop.' 'Hotdog' removes the need for 'dog.' {English as spelled in England is usually used.}

Oxford's great OED once estimated that Basic English is made up of about 5,000 words. Our university requires for a doctorate an English vocabulary of 1,300 words. Naturalist C. W. Nicol told me that many an East Londoner once managed on "about 500 words." In our One Page Dictionary we have fewer than 2,000 words, plus this more complex letter. You probably already know many words in English; just think about: **BOOKS** and **MOVIE** titles, **FILM-STARS**, other **NAMES** in the news, the famous **HI-TEC** companies changing the world; other **HOUSEHOLD** brands, etc. How many Olympic **SPORTS** were there in Beijing? There are over 200-plus **COUNTRIES** in the world; and very many **INTERNATIONAL CITIES.** The Human **BODY, MEDICAL** contain many, many words. And how about **ANIMALS** / **FASHION**? **MONTHS / DAYS / COLOURS / NUMBERS**. And of course you can add new words as you go around and hear them.

However, NOT appearing here are these necessary words, often used in sentence making:- *'again any be before between but come down give go here let near only put quite still than though through too up well while why'* You may also notice that the words in this Introduction do not appear, but <u>are</u> part of the dictionary – Basic English. (They serve to give us an example of how English can be used).

To give a better balance of generation/age a linguist, Norbert Fekata of Hungary, who learnt English as a second language, kindly advised on this dictionary. At first glance, to climb the mountain of English can seem an impossible challenge. So, I explain to my classes that Basic English is much, much less; "Indeed, it can entirely fit onto a single sheet of paper!" This they can see as literally true. This piece of paper is held up before them. Morale soars! {There's a word in here, not BASIC, thrown in as a joke. If you find it, let me know.}

Let's think of this dictionary as a plateau. Higher peaks, such as TOEIC can be seen in the distance, with Shakespeare far off, a kind of Everest. But now – at long last – no longer will students be overwhelmed by these peaks. That the challenge is, after all possible! Students will discover that their journeys can extend over the entire, not so high, plateau, and where most English speakers actually live. And the map of this new, exciting world of International Basic English – Why of course, the *Kobe One Page Dictionary!*

… And Remember, English is Just ONE Piece of Paper!!

4.5 "You know more than you Think!"

A big message in Japanese society is that English is impossible; an Everest-like challenge, if you will. To indicate that that is not the case needs a practical use of the One Page Dictionary.

4.6 Additional Method for Sub-Experiment

The class as whole completely look through the entire dictionary, almost twice over. They then take these random but alphabetical words and mark those they do not understand. What is the gap between expectation and reality? (Of course this does not indicate any speaking, hearing nor sentence use.)

4.7 Results Sub-Experiment Group A and Group B

This is rough and ready. To obtain the self-estimation, I just simple walked down the isle between the desks and asked each; "How much BASIC English do you think you know, percent-wise?" They took a throwaway guess, after first surreptitious glances toward their mates. The measured result was achieved by the simple expedient of ordering each to count out the 200 words from the dictionary, shown in Appendix 8 - BASIC International English Defined, marking the words they do not know, and then multiple by 10 for a 100%. The dictionary has some 2,000 words.

GROUP A		GROUP B	
Self-estimation (%)	Measured Result (%)	Self-estimation (%)	Measured Result (%)
2	94	0	89
5	92	7	80
5	96	5	86
10	77	1	53
1	90	15	98
10	76	3	95
20	97	5	92
3	75	2	91
20	97	4	75
1	97	20	81
0	72	2	90
3	92	5	76
0	90	2	50
10	97	2	57
5	93	3	68
3	97	30	96
5	98		
10	97		
6.3 (6.1) Average (SD)	90.3 (8.8) Average (SD)	6.6 (8.2) Average (SD)	79.8 (15.6) Average (SD)

SD means Standard Deviation

Table 3. "How Much English do you Think you know?

5. CONCLUSION

5.1 Concerning Group A the question as to whether revision using a Japanese language version of the SNCP is highly inconclusive. If anything the national SMCP seems to have got a slightly better result. This was not borne out by Group B which followed the same pattern of the experiment as the A group. The rough averages being Group A (booklet to SMCP) 84% to 94%, and Group B 60% to 62%. The sample was highly mixed in ability, too small and the period of this experiment was too short and too irregular, due to students other commitments.

5.2 However, as a by-product we stumbled across the great value of the use of the One Page Dictionary, had we believe, in the area of self awareness and outright inspiration, a truly spectacular result. This was all encompassing. In all cases the students estimation of their knowledge of Basic International English was proved (to them) to be a huge underestimate. {See APPENDIX 8} From well below 10% in many cases to into the high 90s. The monumental challenge of English, as seen most especially in Japan, but elsewhere too, we decisively proved not to be a Mount Everest, but indeed a Mt. Rocco which overlooks our campus in Kobe; and once a year the students run up there! The resulting smile on the faces of the students when they could actively see that Basic International English, so defined, is our acknowledgement their contribution to this research.

5.3 It is our wish to disseminate this work throughout the non-English speaking world. It would also prove ultra convenient for those within the English speaking sphere! To finally lock this down we would need a much fuller set of Experimental results. We used 100 questions out of a possible 350 or so. I would like to pull from this pool, and then selected at random, to eliminate the rote learning factor. We want knowledge. It would be a great honour to attempt this next and final phase with another MET institution, one interested in rationalizing the field and giving new hope to young seafarers, those inspired to go to Sea. This is an important endeavour in a globalizing world.

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APPENDIX

BASIC International English Defined

FOOD & DRINK a mixed bag:- Alcohol: Guinness beer brandy cocktail gin whisky white-wine rum sake vodka champagne glass bottle barrel Coka Cola carton pub lounge bar pint health standards diner restaurant café stove oven refrigerator drive-in special offer gourmet chef cook dishwasher saucer (UFO!) tablecloth the cheque breakfast lunch dessert waiter menu plate cooker pot kettle bowl side-plate jar saucer Michelin Guide reservation butcher baker greengrocer canteen frying pan saucepan Chinese number 4 sukiyaki tofu snacks Cup Noodle TV dinner Mars-bar crisps peanuts ice-cream munchies sausages biscuit blue cheese fresh cheddar jelly roll soup can freeze pickles popcorn bar of chocolate cocoa coffee sugar sweet seafood: shark shrimp octopus squid shellfish cod & chips crab fat olive oil & vinegar salad dressing Tabasco tossed lettuce yellow pepper chop deep fry fork wheat maize tortilla meat-spread liver-paste pudding cabbage sprouts saucer spoon steam tray bacon & egg beefsteak almond baked-beans bagel bread-shop barbeque butter cake carrot coleslaw cinnamon cheeseburger chili curry custard cucumber Danish pastry doughnut eggplant espresso jam garlic gravy ham honey hotdog Kentucky Fried Chicken ginger green-tea ketchup jerky mayonnaise mushrooms mustard margarine milkshake macaroni milk potatoes salt soda spaghetti sauce toast tuna lime tomato vegetable yogurt … And we start the alphabet list with fruit:- apple apricot banana berries cherry grapefruit kiwifruit lemon orange peach pear pineapple strawberry raspberry tangerine watermelon and …

Ability abnormal above absent absolute acceleration accept accessory accident account ace achieve acid across action active actor addition address admire admit advance advertisement afford afraid Africa afternoon against age agency agent ago agreement agriculture ahead AIDs air airport alarm album alive allow alone along already also always amateur ambition America among amount amusement angel angle angry animation announcer another answer anybody apart application apply appointment April fool! Approach approve Arab area argument army around arrangement arrive art article artist ash ashamed Asia ask assist assistant association astronaut Atlantic atlas atmosphere atomic attack attempt attend attention attitude attraction audience aunt authority automatic average avoid awake awful awkward

Baby back bacteria bad balance balcony ball bank bankrupt base basic basket bath battle bear beard beat Beatles beautiful bed bee began behaviour behind belief bell belong bench bent best bet Bible big bill billion bird birth bit bite bitter black blame blank blanket blood blow bolt bomb boom boss bottom box brain brake brave break breath brick bridge brief bright brilliant bring broad broken brother brush bubble bucket budget buffalo build building bulb bulldozer bump bunch burn burst bury bus bush business bust busy butter button buy bye-bye bypass byte

Cabin cake calcium calculation calendar call camp cancel cancer candle cap capital captain car carbon card care carnival carpet cart case cash castle cat catch cause CD celebration cell cent centimeter central centre ceremony certain certificate chain chair chalk champion chance change character charge chat cheap check chemical chess chest chief child chimney choice choose Christian Christmas church cigarette cinema circle circuit civil civilization claim classic clean clever client clip clock close cloth clothes cloudy club Co2 coach coal cocaine cock code coke cold collar collect collection college comb combination comfort comment committee common community commute companion company compass competition complaint complete computer concentrate concert concrete condition conductor congratulations connect connection conscious conservation constant construction consumer contact continue continuous control convenient convince cook cool cooperation copy cork corner correct cost councillor count counter couple court cousin cover cowboy crack crash crazy credit crime crop crowd cruel crush cry crystal culture cunning cunt cure curtain curve cushion customer cute

Dad dairy damage damp dance dancer danger dangerous dark darts date daughter dead deal dear death debt decide decision decrease degree delay delicate delivery demand demonstration dentist depart department departure deposit description desert design desire desk destination destruction detail development devil dew diameter diamond die difference difficult dip direct direction dirty disappear discount discovery discussion disease disk dislike display distance distribution disturb divorce doctor document documentary-film doll dome domestic donor door dormitory doubt download drag dragon drain dramatic draw drawer dream drift drill driving drop drug drum dry duck dull dust duty DVD dynamite

Each eagle early Earth ease easily East easy echo ecology economy ecstasy edge edition education effect efficiency effort either elastic election electric-current electricity elegant elementary elephant elevator else e-mail emerald emotion empire employer empty encourage end endless endure enemy energy engine engineer enjoy enough enter entertainment entrance envelope environment envy equal equation erosion error escalator escape especially essential ethnic even event everyday evil evolution exact examination except exchange excitement excuse exercise exit expansion expensive experience experiment expert explosion export express expression extension external extinct extra extreme Europe

Face fact factory fail failure fair fake fall false family fan fantastic far fare fast fat father fault favourite fax fear feather feed feel feeling female fertilizer festival fever fibre fiction field fight figure files final finance financial find fine finger finish fireman first five fix fixed flag flame flash flat flight flood floor flour fluffer flow flower flute fly focus fog fold follow foolish football forecast foreigner forest forever forgive formula forty forward found foundation fraction frame free freedom freeze frequent fresh friction front frost frozen frustration fuck fuel fun funeral funny fur furnace furniture future

Gadget gain Galaxy game gang gap garage garbage garden gas gate gay general generation gentle gentlemen germ gesture giant gift girl give glacier glad globe glory glue goal going gone good-bye goods government grade graduate graduation grain gram grammar graphic grass grateful gravity grease greed grey grief grip ground group grow growing grown guarantee guess guest guide guitar gum gun guy

Habit hacker half hall hammer hamster handbag handball handicap handle hanger harbor hard-disc harm harmony hat hate have hay-fever health healthy heart heat heavy height helicopter hell hello helmet help helper helpless her hero hide hill him hint hire his history hit hitchhiker hobby hold hole holiday holy home-run homeless homepage homework homosexual honest hood hook hope horn horny hospital host hostile hotel hours housekeeper hug Humanity humour hundred hungry hunt hurry hurt husband hydrogen hysteric

Idea identity ill illusion illustrate image imagination imagine impact import important impression inch include increase index Indian individual indoor industry infinity inflation injury ink innocent input inside install instant institution instructor instrument insurance intelligent interesting internet-search interpret invention investigate investment invitation iron island

Japanese jazz jealousy jeep jet jewelry jigsaw-puzzle job jogging join joke joy judge jungle junior junk justice

Keen keep key keyboard kick kids kilo king kiss kit kitchen knitting knock knot know knowledge

Label labour laboratory lack lady lamp landscape lap large laser last late laugh laundry lavatory law lawyer lay layer lazy lead leaf lean least leather leave lecture left legend leisure length lent less lesson level lever library license lie lies lid life lift light limit line link liquid listen literature little living load loan local location lock locker logic lonely look loop loose lose loss lost lot lotion loud love lovely lover low loyal luggage luxury

Machine mad made magic magnet mail main maintenance male mall manager manners market marriage married mask mass master mat match mate material mathematics matter mattress maximum may maybe mean meaning measure medical medicine meet meeting mega melody melt member memory men mental mess message metal microphone middle might mild military mill million mine mineral minimum minus minute miracle mirror miss mission mist mode model modern modest money monopoly monster mood moon moral most motel mother motion motor mouse moustache move mud multiple murder museum musical musician must mystery

Narrow nasty nation national navy neat need negative neglect neighbor neither nerve nervous nest net network neutral newspaper next nice night nobody noise none noon normal north nose note nothing notice nuclear nurse Nuts!

Object observation office officer often OK old Olympic one open operation orchestra order organ organization original outside oven owe owner oxygen

Pacific packet packing pain paint pair pajamas palace parade paradise paragraph parallel parcel parent park parking part partner party pass passenger past path patience pay PC peace pearl pedal pencil pension people percent perfect performance perhaps permit person personal pet phone physical piano pick picnic picture pill pilot pinch pine pipe place plain plan plane planet plaster plastic plate player Play-station pleasant please pleasure plug plus pocket poem poetry poison pole policeman politics pollution pool popular population port pose position possible post poster postpone pot potential pour powder power powerful practice prayer present president press pressure pretty price pride priest prince prison private probable problem process produce producer professional profit program progress promise proof property protect protest proud psycho public publish pull pump punch punk pure purple push pussy

Quality quantity quarter Queen question quick quiet quit quiz

Race radar radiation radio rage rail rainbow rap rate ratio raw re-set reach reaction read reading real reality realize really reason receipt receiver recognize record recycle reference reflection regret regular relations relative relax relief relieve religion rely remain remember remote rent repair repeat report representative request rescue research resistance respect responsible rest result return revenge reverse review revolution reward rhythm ribbon rich ride right ring rip rise risk robot rock & roll rocket romance roof room root rope rose rot rotation rough round route row royal rub rude rule running rush rust

Sadness safe Sahara sail sailor sale same sample sand save saving say scale scanner school scientist scissors scratch scream screen screw sea season seat secret secretary section security seed selection self selfish sell send sense sentimental separate series service set several shade shadow shake shame shampoo shape share sharp shave she shelf ship shocking shoes shore short shot shout show shower shut shy side sight sign signal silent silk silver simple since sing sister sit size sleep slide slip slope slow small smart smash smell smile smoke smooth sneeze soap social society soft soil soldier some somebody something sometimes son song soon sorry sort soul sound south space spade spark special speech speed spirit splash sponge spring spy square stable stage stain stair stamina stamp stand state statement statistics steady steal steel stem-cell step stick sticky stiff stone stop store storm story straight strange stream street strength stress strike string strip strong studio study stuff stupid subject subway succeed success suddenly suggestion sum summer super support sure surface surgeon surprise surround suspicious swallow swimming swing switch symbol sympathetic system

Tail tailor talent talk tall tap tape task tattoo tax taxi teacher teaching team tear technician technology television tell tent term terrible test text thank theatre theory they thick thief thin think thirst thought thread threat throw thunder thus ticket tide tight time tip tire tired tissue-paper title together toilet tomorrow tone tongue tonight tool tooth top topic total touch tough tour toward towel tower toy track tractor trade tradition traffic tragedy train tramp transfer transmission transparent transport trap trash treatment tree triangle trick trillion trip trouble truck trumpet truth try tube tune tunnel turn twin two type typist

Ugly umbrella unbelievable uncle understanding uniform unit united Universe unknown unlucky upper urban urgent use useful

Vacation valley value variety Venus version victim victory video view village violence violet VIP virgin virus visa vision visit vitamin voice volcano volt volume vote voyage

Wage wait waiting walk wall wallet waltz want War warm was wash waste wave wax way we weak weapon wear weather website wedding weekdays weep weight welcome went were west wet what wheel whenever wherever whether which whistle whole wide widow wife wild win wind Windows wing wink winter wire wise wish without woman wonder wonderful wood wool word work worm worry wound write wrong

X-ray

Yacht yard yawn year yell yes yet YMCA young youth

Zebra zero zigzag zipper zone zoo zoom

Development of Postgraduate Maritime Education at Turkey

Ersan Başar 1
Dr.Capt., Karadeniz Technical University, ebasar@ktu.edu.tr
Ercan Köse 2
Prof., Karadeniz Technical University, ekose@ktu.edu.tr

Abstract There are several faculties which give maritime related education. Post graduate degree is offered at the following subjects; Naval architecture, marine engineering, nautical science, maritime transportation, maritime management and port management.
Finding post graduate students are difficult in engineering subjects. On the contrary, it is not in social areas like maritime management, port management, and marine law. Because, some of students studying at these subjects are not from maritime departments. Especially, marine law subjects are covered at Law faculties. Marine engineering and Nautical (deck) departments have difficulties finding graduate candidate students due to working on board with high salary. Also there are others hardness to become a graduate students. This is also same for universities all over the world.
In order to solve this, post graduate studies should be supported by maritime industry and government to improve economical condition. Additionally, their project can economically be supported.

***Keyword**: Turkish Education, Maritime, Postgraduate*

1. Introduction

Postgraduate education involves learning and studying for degrees for which a first or bachelor's degree is required, and is normally considered to be part of tertiary or higher education. In Turkey, this level is generally referred to as graduate level. The organization and structure of postgraduate education varies in different countries, and also in different institutions within countries.

In most countries, the hierarchy of post-graduate degrees is as follows:

- Master's degrees (Postgraduate)

These are sometimes placed in a further hierarchy, starting with degrees such as the Master of Arts and Master of Science, then Master of Philosophy, and finally Master of Letters (all formerly known in France as DEA or DESS before 2005, and nowadays Masters to.) In many fields such as clinical social work, or library science in North America, a Master's is the terminal degree. In the UK, Master's degrees may be taught or by research: taught Master's include the MSc and MA degrees which last 1 year and are worth 180 CATS credits (equivalent to 90 ECTS European credits), whereas the Master's by research degrees include the MRes (Master of Research) which also lasts 1 year and worths 180 CATS or 90 ECTS credits (the difference compared to the MA/MSc being that the research is much more extensive), and the MPhil (Master of Philosophy) degree which lasts 2 years (and is often granted to failed doctorates) [1].

- Doctorates (Postgraduate)

These are often further divided into academic and professional doctorates. An academic doctorate can be awarded as a PhD (Philosophiæ Doctor), or as a DSc (Scientiae Doctor). The scientiae doctor degree can also be awarded in specific fields, such as a Dr.sc.math (Doctor scientiarum mathematicarum, Doctor of Mathematics), Dr.sc.agr. (Doctor scientiarum agrariarum, Doctor of Agricultural science), DBA (Doctorate in Business Administration) etc. In some parts of Europe, doctorates are divided into the PhD or 'junior doctorate', and the 'higher doctorates' such as the DSc, which is generally awarded to highly distinguished professors. A doctorate is the terminal degree in most fields. In the United States, there is little distinction between a PhD and DSc. In the UK, PhD degrees are often equivalent to 540 CATS credits or 270 ECTS European credits, but this is not always the case as the credit structure of doctoral degrees is not officially defined [1].

This article sets out the basic types of course and of teaching and examination methods in Turkish maritime postgraduate education system.

2. General Structure of the Turkish Educational System

The basic structure of the Turkish national education system is outlined in Basic Law on National Education (Law no. 1739) [2]. This system can be summarized as follows:

Pre-school education, which is optional, aims at contributing to the physical, mental and emotional development of the children, to help them acquire good habits, and to prepare them for basic education. Pre-school education institutions include independent kindergartens, nursery classes in primary schools and preparation classes. Basic education provides children with basic knowledge and ensures their physical, mental and moral development in accordance with national objectives. It generally comprises the education of children in the 6-14 year age group. Eight years of basic education is compulsory for all Turkish citizens who have reached the age of six. This level of education is free of charge in public schools. There are also private schools under state control. Secondary education encompasses two categories of educational institutions, namely general high schools and vocational and technical high schools (lycées) where a minimum of four years of schooling is implemented after basic education. The aims of secondary education are to provide students with a knowledge of general culture, to acquaint them with problems of individual and societal nature and to motivate them to find solutions; to instill in them the strength and knowledge to participate in the economic, social and cultural development of the country and to prepare them, in line with their interests and talents, for institutions of higher learning. General high schools are educational institutions that prepare students for institutions of higher learning. They implement a four-year program over and above basic education, and comprise students in the 15-18 year age group. Vocational and technical high schools provide specialized instruction with the aim of training qualified personnel. The duration of instruction in these schools is also four years. Higher education the purpose of higher education is to train manpower within a system of contemporary educational and training principles to meet the needs of the country. It provides high level specialized education in various fields for students who have completed secondary education. The Higher Education Law (Law no. 2547) which went into effect in 1981, covers all higher education institutions and regulates their organization and functions [3]. Universities comprising several units are established by the state and by law as public corporations having autonomy in teaching and research. Furthermore, institutions of higher education, under the supervision and control of the state, can also be established by private foundations in accordance with procedures and principles set forth in the law provided that they are non-profit in nature [4].

The university is the principal higher education institution. It possesses academic autonomy and a public legal personality. It is responsible for carrying out high level educational activities, scientific research and publications. It is made up of faculties, graduate schools, schools of higher education, conservatories, two-year vocational training schools and centers for applied work and research. A faculty is a higher education unit which is responsible for high level education, as well as for scientific research and publications. Units such as departments, schools of higher education, etc., may be affiliated with a faculty. A graduate school in universities and in faculties is concerned with graduate study, scientific research and applied studies in more than one related subject area [4]. Fig. 1 shows the general structure of the educational system.

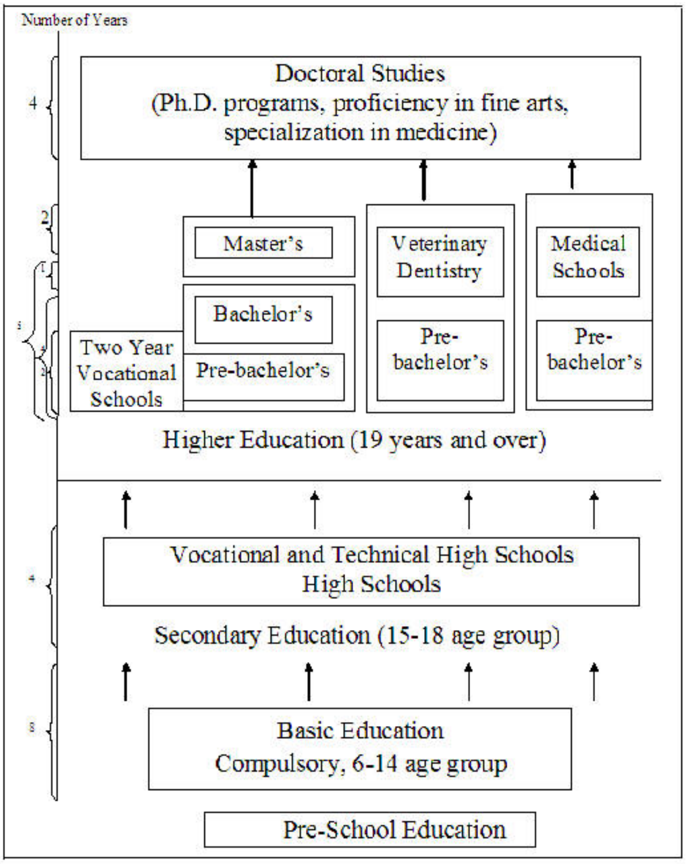

Fig. 1 General Structure of the Turkish Educational System [4]

3. Turkish Postgraduate Maritime Education

Maritime education in Turkey starts at high school level. Students who want to go to maritime high school have to pass an exam. These high schools are four years. After graduating from these schools students can work onboard or continue their education. In order to continue higher education in Turkey, students have to pass General Higher Education Examination (LYS). According to grades they get from this examination, they are placed to either vocational schools or faculties. All students passed this exam and want to go to marine engineering and nautical science have to obtain medical examination certificate to obey STCW rules.

3.1 Admission

Admission to graduate school usually requires a bachelor's degree. Standardized test (e.g., Graduate Record Examination (GRE), The Entrance Examination for Graduate Studies (ALES)), scores are required by all institutions and, especially, good letters of recommendation from undergraduate instructors are often essential. Strong recommendation letters from mentors or supervisors of undergraduate research experience provide evidence that the applicant can perform research.
Some schools set minimum ALESs scores below which they will not accept any applicants; this reduces the time spent reviewing applications. Additionally, some schools claim to consider many factors, the compatibility between the applicant's research interest and that of the faculty, the statement

of purpose and the letters of reference, as stated above. Finally, applicants from non-English speaking countries must take the Test of English as a Foreign Language (TOEFL) [5].
At most institutions, decisions regarding admission are not made by the institution itself but the department to which the student is applying. Some departments may require interviews before making the decision to accept an applicant.

3.2 Degree Requirements

Many graduate programs require students to pass one or several examinations in order to demonstrate their competence. Doctoral students generally spend roughly their first two to three years taking coursework, and begin research by their second year if not before. Many masters and all specialist students will perform research culminating in a paper, presentation, and defense of their research. This is called the master's thesis.
In the second and third years of study, doctoral programs often require students to pass a Qualifying Examination ("Quals"), examinations designed to students' grasp of a broad sample of their discipline, and/or one or several Special Field Examinations ("Specials"), which test students in their narrower selected areas of specialty within the discipline.
For the next several years the doctoral candidate primarily performs his or her research. Usually this lasts three to four years. In total, the typical doctoral degree takes between 4 and 6 years from entering the program to completion, though this time varies depending upon the department, thesis topic, and many other factors.

4. Institutes in Turkey

There are 5 universities which offers postgraduate degrees in Maritime areas. These are:

- İstanbul Technical University, Maritime Faculty and Faculty of Naval Architecture and Marine Science
- Karadeniz Technical University, Faculty of Marine Science
- İstanbul University, Faculty of Engineering, Institute of Marine Science and Management
- Dokuz Eylül University, Maritime Faculty, Marine Science and Technology Institute
- Yıldız Technical University, Faculty of Naval Architecture and Maritime

Their yearly quotas are given in table 1. Quotas can be changed according to Institutes requirements.

Institution Name	Maritime Transportation		Naval Architecture		Marine Engineering		Maritime Business	
	# of MSc	# of PhD	# of MSc	# of PhD	# of MSc	# of PhD	# of MSc	# of PhD
İstanbul Technical University	15	10	25	5	10	5	N/A	N/A
Karadeniz Technical University	15	N/A	15	N/A	N/A	N/A	N/A	N/A
İstanbul University	20	10	N/A	N/A	N/A	N/A	15	10
Dokuz Eylül University	N/A	N/A	7	5	N/A	N/A	20	10
Yıldız Technical University	N/A	N/A	10	7	N/A	N/A	N/A	N/A

Table 1. Yearly quotas of each Institutes

5. Discussions

Postgraduate education in Turkey consists of the following subjects: Maritime Transportation, Naval Architecture, Marine Engineering and Maritime Business. Some of them only offer MSc. others offer both MSc and PhD.
Postgraduate education in Naval Architecture has been offered for five decades and it was started at İstanbul Technical University, Faculty of Naval Architecture and Marine Science. Laborites are very well equipped and academicians are very well qualified. They have relationship with most Naval Architecture Faculties in the world. Additionally, they pioneered the establishment of new Naval Architecture Departments in Turkey. Yildiz Technical University Naval Architecture Department was established in 1967 and offers postgraduates degree since 1982. Karadeniz Technical University Naval Architecture Department was established in 1996 and offer MSc degree since 2007. Postgraduate education in Naval Architecture covers the requirements of business and faculties.
Postgraduate education in Marine Engineering is offered in İstanbul Technical University, Maritime Faculty. But mostly students can do postgraduate degree in different departments like Naval Architecture and Mechanical Engineering. Therefore there is no gap for academician for this area.
Postgraduate education in Maritime transportation was started at İstanbul University, Institute of Marine Science and Management. Then other three faculties Istanbul Technical University Maritime Faculty and Karadeniz Technical University Faculty of Marine Science and Dokuz Eylul University Maritime Faculty started offering postgraduate degrees in Maritime Transportation areas.
Postgraduates studies in Maritime Bussines are offered by Istanbul and Dokuz Eylul Universities. But these degrees can also be obtain economy and business departments. Subject of Marine Law is usually covered at law faculties. There is no specific faculty on Marine law at Turkey.
It can easily be seen that there is lack of postgraduate personal in all maritime areas.

6. Conclusions

Although, there are enough academic staff for postgraduate education in Naval Architecture and Marine Engineering, but there is no enough application for these.
In case of Maritime transportation, there is neither enough academic staff nor enough application. The reason for lacking of application is that graduates from these departments usually earn more money than if they stay at the university.

In order to solve this;

- Postgraduates studies should be supported by scholarships,
- Projects from these departments should be given priority,
- The number of graduates student should be increased to get more postgraduates
- International relationships should be increased

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Globalized Trends in Outcomes-Based Pedagogical Reform and Potential Implications for Maritime Education and Training

Graham Benton
Professor, The California Maritime Academy, gbenton@csum.edu

Abstract Over the past decade in the United States and in Europe there has occurred a paradigm shift in educational assessment practices characterized in part by a transition from "input-based" factors such as duration, location, and the pedagogical content underpinning a specific educational qualification toward "outcomes-based" assessment. This is not a new trend, of course, but it is one in a dramatically accelerating stage, and is gaining traction on the highest levels by national and international educational administrators and scholars. In addition to the research which suggests that such an approach improves the overall quality of educational programs, an emphasis on learning outcomes (in Europe via the Bologna Accord and in the US via national accrediting bodies) creates more efficient, competitive, compatible and comparable universities while simultaneously respecting academic autonomy and institutional diversity. This desire to find a balance between efficiency and uniformity on one hand and respect for institutional autonomy on the other can be mapped onto certain issues faced by the IAMU. For the IAMU, too, has sought to address the challenge of developing uniform maritime curricula among its international member institutions, with such ambition often thwarted by a variety of national educational infrastructure matters.
The question, then, is how do these developments in international higher education relate to Maritime Education and Training? How well do STCW requirements lend themselves to an outcomes-based platform? What issues are raised for non-STCW courses and/or degree programs? How might this shift in orientation impact the way STCW requirements are evaluated? As the IAMU has been a resource for curriculum reform issues since its inception, this paper suggests ways that the newer, outcomes-based model of educational practices may bear upon MET in order to see what may be useful to our institutions, what cannot be aligned with our educational methodologies, what may be changed, and even, perhaps, how MET practices themselves can contribute in meaningful ways to these dialogues on globalized educational reform.

Keyword: *MET, learning outcomes, assessment, educational reform*

1. Introduction

The general topic of this essay – global trends in outcomes-based education reform and its relationship to Maritime Education and Training – emanates from the confluence of three distinct objectives. The first objective is a summation and evaluation of MET in the context of international higher education assessment practices. The second objective is an appraisal of the scholarship produced on this topic by the International Association of Maritime Universities in that the published proceedings of ten years of Annual General Assemblies now at our disposal should give rise to the occasion for some critical reflection. The third objective, fundamentally conjoined to the first two, is a review and reassessment of the mission and objectives of IAMU itself, most specifically with the goal deliberately stated in the charter "to develop a comprehensive Maritime Education System for following generations [and to] develop standardized Undergraduate Curricula and an International Certification System for Competency" [1]. Such a macroscopic project, of course, runs the risk of oversimplification when compacted into a single essay, and thus my remarks will tend toward to the general rather than the specific. Nonetheless, it is hoped that the nature of this analysis – a review of past and current pedagogical methods with an eye to future changes -- may serve as a platform for further analysis and discussion.

2. National and Intranational Educational Systems and the Outcomes-based Model

In the United States, in Europe, Australia and elsewhere, there is a movement which, while certainly not new, has been gaining traction and has swelled to the point where it can now be said to constitute a paradigm shift in educational assessment practices. This movement is characterized by a transition from "input-based" factors of the educational system such as duration of a program, location of instruction, and the pedagogical content underpinning a specific educational qualification toward "outcomes-based" assessment: the measurement of what a student knows and is able to actually do at the end of a learning process. From this perspective, the "principal question asked of the student or the graduate will therefore no longer be 'what did you do to obtain your degree?' but rather 'what can you do now that you have obtained your degree?'" [2].

Traditionally, academic programs were constructed from the "ground up" via course design and instructor input: what is going to taught, how long it will be taught, what tools will be used to teach it, and what instruments will be used to determine how well students absorbed the material. As we all know, this "teacher-centered" approach has shifted to a student-centered approach which transforms the emphasis dramatically – it's not what you teach, it's what your student learn. Instead of examining the efficacy of the educational program through models which specified the number of units, number of contact hours, types of exams or selection of textbooks, this orientation focuses on learning outcomes.

While the genesis of this outcomes-based approach may be traced back to the behavioral objectives movement in the United States in the 1970s, or even to the educational reform of vocational centers in the 1920s, evolving terminology over the past years has served to confuse the field with an array of competing programs and acronyms. Outcomes-based education (OBE) can be said to encompass or be aligned with "performance-based education" (PBE), "competency-based education" (CBE), "competency-based training" (CBT), and so on. "Competencies" are clearly important in any discussion of a curriculum that incorporates STCW standards, yet the term itself is a loaded one, and is often invoked in differing and even contradictory ways. According to Kennedy, Highland, and Ryan,

> It is difficult to find a precise definition for this term. Adam (2004) comments that "some take a narrow view and associate competence just with skills acquired by training". The EC Tuning project7 which was initiated in 2000 used the term "competence" to represent a combination of attributes in terms of knowledge and its application, skills, responsibilities and attitudes and an attempt was made to describe the extent to which a person is capable of performing them. The lack of clarity or agreement in terms of defining the term competence is apparent in the ECTS Users' Guide (2005), which describes competences as *"a dynamic combination of attributes, abilities and attitudes"*. The Guide goes on to state that "*Fostering these competences is the object of educational programmes. Competences are formed in various course units and assessed at different stages. They may be divided into subject-area*

> *related competences (specific to a field of study) and generic competences (common to any degree course)"*. Since there does not appear to be a common understanding of the term competence in the literature, learning outcomes have become more commonly used than competences when describing what students are expected to know, understand and/or be able to demonstrate at the end of a module or programme" [3].

If we can agree that this definition is meaningful and useful, then regardless of the country of origin or international educational system or acronymic set used, the common denominator in all these programs is a commitment to the significance of "Student Learning Outcomes," and a cursory glance through the literature reveals a shared understanding of this term. To cite just a few examples: "Learning outcomes are statements of what is expected that the student will be able to do as a result of learning the activity." (USA); "Learning outcomes are statements of what a learner is expected to know, understand and/or be able to demonstrate after completion of a process of learning" (UK); "Learning outcomes are statements that specify what learners will know or be able to do as a result of a learning activity. Outcomes are usually expressed as knowledge, skills or attitudes" (USA); "Learning outcomes are explicit statements of what we want our students to know, understand or be able to do as a result of completing our courses (Australia); and "Learning outcomes are an explicit description of what a learner should know, understand and be able to do as a result of learning" (UK)" [4].

The focus on student learning outcomes thus has gained traction at the highest levels by national and international educational administrators and scholars. In the United States, the movement is acknowledged in terms of the kind of evidence requested by accrediting institution such as WASC (which accredits The California Maritime Academy), MSCHE (which accredits New York Maritime Academy) and NEASC (which accredits Massachusetts and Maine Maritime Academies), and by a growing body of external education specialists. In Europe, according to Stephen Adam, it is the Bologna Accords which have expedited the process and thus: "A new unified European higher education infrastructure, underpinned methodologically and practically by learning outcomes, is emerging fast. It is designed to make European higher education systems more efficient, competitive, compatible and comparable, whilst respecting academic autonomy and the requirement for institutional and national diversity" [5]. Other, program-based and discipline specific accrediting bodies have also embraced this model. Engineering departments, for example, have for years focused on outcomes assessment for quality assurance and evaluation of educational programs and the Accreditation Board for Engineering and Technology (ABET) has been a leader in moving to outcomes assessment as the primary mechanism for accreditation of these programs.

3. MET, STCW, and the Outcomes-based Debate

The push for outcomes-based reform in higher education becomes intriguing when contextualized within Maritime Education and Training. On the one hand if we were to look solely at STCW95 and its basis in specific competencies as the foundation of MET, then we might declare our programs to be in the vanguard of this reform movement, having embraced such outcomes nearly fifteen years ago. From the IMO website itself, it is stated that

> The 1995 STCW Convention is one of several key initiatives that underpin this new philosophy at IMO. It seeks to establish a baseline standard for the training and education of seafarers throughout the world and, by placing an

> emphasis on quality control and competence-based training, it establishes a structure that can ensure not only that the required standard is met, but that it is seen to be met. One of the key differences between STCW 95 and the previous Convention is the emphasis on competence rather than knowledge. STCW 95 stipulates in detail the required competences associated with different tasks, the knowledge and understanding required to perform them, methods for demonstrating competence and criteria for evaluating it. The Convention embodies provision for "hands-on" training and the development of basic skills through use of simulators, laboratory training equipment and other practical training aids. Although experience at sea will remain an important part of a seafarers overall career development, it will no longer be enough simply to "serve your time [6].

Much has been written of this in IAMU forums. Barrie Lewarn, before advancing to a sharper critical assessment of STCW, acknowledges that "STCW 78 focused on what seafarers needed to know to be deemed competent. Courses tended to be academic in nature, classroom based, teacher centred, with assessment based around formal written exams. Post STCW 95 the emphasis of training is supposed to be on what seafarers need to be able to do. Courses should be practical in nature, activity based, student centred, with assessment based around the demonstration of acquired skills [7]. Similarly, Cynthia Smith Robson notes of this pedagogical change a corresponding switch in testing practices: with "the advent of STCW95, mariner qualification was transferred from knowledge based to proficiency based examination. The Convention provides for several methods of testing, both written and practical.[…] For each competence listed in the STCW Tables, methods for demonstrating competence and criteria for evaluating the same are listed in exhaustive detail" [8]. And therefore, according to Vladimir Loginovsky, "As a result, MET institutions are no longer in a position to keep utilizing any MET techniques and pedagogy that do not address the demands for competency and knowledge assessments in the newer definitions of a competent and knowledgeable mariner, afloat or ashore" [9].

Yet, there are also criticisms of STCW95 and its competency-based approach as revealed in IAMU literature: for some, STCW95 is not nearly as "outcomes-based" as it purports to be, often because the very concept of outcomes-based learning is challenged by the rigid adoption of the IMO model courses. "IMO model courses are, conceptually, a good idea provided they are viewed as guides upon which teachers can build to develop appropriate teaching and learning experiences. In a number of countries marine administrations have taken the view that the courses they approve must follow exactly an IMO model course. The highly prescriptive nature of model courses eg number of hours required to achieve competence, is at odds with the CBT approach espoused by STCW 95" [10]. For Robson, writing in the proceedings of the 8th Annual General Assembly, the problem is not with adopting a competency-based model, but rather that "specific methodologies [for implementation] are not provided. These are left to the discretion of the assessor, to be developed according to the parameters outlined" [11]. And finally, to return to Lewarn, the process of change itself is fraught with problems: "Empirical evidence points to a level of dissatisfaction by educators as they seek to move towards a more output driven model of education. This dissatisfaction is partly caused by the overly restrictive and prescriptive approaches taken by marine administrations and the relative inflexibility of the input driven model of education still most commonly found in use today [which in turn] does reduce the potential effectiveness of teaching and learning in a CBT environment. The system impediments identified […] are worthy of more rigorous research if the philosophy espoused by STCW 95 is to be achieved" [12].

For these critics, the competency-based model current utilized in MET has simply not yet evolved enough and/or must be modified to some degree; for others, though, there are serious and perhaps fatal flaws in the system. Detractors of competency-based practices find it to be "excessively reductionist, narrow, rigid, atomized, and theoretically, empirically, pedagogically unsound and therefore 'largely unsuitable for the teaching and learning which goes on in higher education institutions, whether this occurs in general/academic or professional/vocational contexts" [13]. In their study, 'Contradictions in the Practices of Training for and Assessment of Competency: a Case Study from the Maritime Domain" Gholamreza Emad and Wolff Michael Roth found that "fundamentally the assessment system has changed the objectives of the education and training practices from learning skills and knowledge required on-board ships to passing competency exams" [14].

Finally, it should be noted that even if STCW competencies can be taught to the satisfaction of most maritime educators, MET, obviously, is not solely a delivery mechanism for STCW competencies. Not only does STCW simply prescribe baseline, minimum requirements for seafarers, but many maritime universities and academies embrace other learning outcomes to ensure breadth and depth of study and have also created entire non-licensing programs that contribute to maritime industry needs in the realm of public policy, international law, logistics, business administration, port maintenance, etc. To further complicate the matter of simply agreeing to a standard set of competencies and assessment tools for maritime programs, maritime academies often have multiple and different regulatory bodies. For example The California Maritime Academy is a campus of the California State University and thus enjoined with that public system's educational aims, objectives, and mandates; it is also a federally-sponsored maritime academy under the auspices of the U.S. Maritime Administration and therefore bound by specific regulations and requirements which are overseen by the U.S. Coast Guard for the certification of merchant marine officers under U.S. law. More autonomously, CMA values and maintains a system of beliefs and principles including the significance of experiential learning, the development of personal and professional ethics, and the importance of student-centered inquiry to confront the personal, moral, and social problems that are an inevitable part of human life. To cite another example wherein national and international regulatory bodies complicate maritime education and training methods and objectives, in Europe "the EU policy distinguishes between higher education (The Bologna Process) and vocational educational education and training (The Copenhagen Declaration, as amended) and sets different standards for the two. National MET systems in Europe differ mainly in that they may make part of the former or the latter, and quite frequently the two systems are combined" [15]. The question becomes: how then, to develop an outcomes-based educational system that can accommodate and answer to all of these internal and external obligations and responsibilities? The fact that many maritime academies straddle these divides places strain on a system that tries to be all things to all people.

4. IAMU and the Call for Uniformity and Commonality

Into this debate over the outcomes-based model of maritime education and training we can now insert the question of commonality. The Bologna process, with its desire for a high degree of harmonization across European university systems, may serve as a correlative. To re-assert the claim made by UK Bologna expert Stephen Adam, the drive for a unified European higher education infrastructure is motivated by a desire to make these "systems more efficient, competitive, compatible and comparable, whilst respecting academic autonomy and the requirement for institutional and national diversity" [16]. Rhetoric such as this, with its desire to find a balance between efficiency and uniformity on one hand and respect for institutional autonomy on the other, could easily be mapped onto certain issues faced by the IAMU. For the IAMU, too, has sought to address the challenge of developing uniform maritime curricula among its international member institutions, with such ambition often thwarted by a variety of national educational infrastructure matters.

As noted in the introduction, two of the founding and central objectives of the IAMU are "to develop a comprehensive Maritime Education System for following generations [and to] develop standardized Undergraduate Curricula and an International Certification System for Competency." In an oft-cited speech to the IAMU General Assembly in Dalian in 2006, Nippon Foundation Chair Yohei Sasakawa appears to re-assert this objective: "There is an urgent need to ensure not only a high level of education, but also a uniform curriculum for all students […] We need to develop a new systematic, integrated curriculum" [17]. Prior to and since this call to action, many IAMU scholars have risen to the occasion. In 2005-2006, Boris Butman's IAMU Project, "Standardizing Marine Engineering Curriculum," compiled data on marine engineering programs around the world and sorted by sea-going time, credit hours for each course and laboratory, unit distributions for principal program components, and curriculum structures per semester and year [18]. Mohye El Din El Ashmawy's AGA 2008 paper advocates for IAMU to work toward the unification of MET universities to the point wherein the IAMU itself would have regulatory and accrediting authority over aspects of maritime education and training [19]. Cynthia Robson's 2007 AGA article on simulator training objectives calls for an "international rubric" in order to advance the "standardization of the methodologies of mariner competency assessment" [20]. In fact, Robson concludes her essay with an answer to the question posed by Peter Muirhead of the World Maritime University in 2006: "'is it realistic to expect marine simulators across the globe to be used uniformly by different assessors, against an agreed set of performance criteria, to measure seafarer competence?' The answer to his question is a resounding yes" [21].

Notwithstanding the narrower context of maritime simulator competency being addressed, the answer to the question in general of internationalization and standardization to my mind may not be a resounding affirmative. Because of multiple and overlapping systems of accreditation that drive many maritime universities, as well as the complex economic, cultural and organizational differences of these institutions, the objective of a truly universal and global standardized undergraduate curriculum may not be attainable. If the IAMU's goal of a "uniform curriculum for all students" moves beyond IMO model courses and baseline STCW competencies toward universal rubrics and the further standardization of unit loads and curriculum mapping, then creativity and innovation in curriculum design for each campus may be stifled. This, perhaps, is the problem of "being common:" the forces of globalization and the collective will of the organization push towards "common seas, common shores, and common solutions to common problems," but at the critical juncture of praxis, the pitfall to avoid is a capitulation to the lowest common denominator.

Perhaps a way out of this imbroglio – a way to circumnavigate the thorny, and perhaps fruitless attempts to construct a universal set of maritime curricula that can be all things to all people – is to re-orient the debate away from baseline STCW competencies for license-granting programs, summative analyses of laboratory hours in respective national maritime institutions, and the search for universal assessment rubrics. These are all worthy and necessary projects, but in the pursuit of universality, we may be missing the forest for the trees. To return to a few lines of Sasakawa's speech which have not claimed as much attention, he writes: "contemporary maritime education seems to place excessive emphasis on cramming students with inadequate knowledge and skills required to operate ships. What this does is to produce seafarers who lack pride in their work, and do not possess a true seaman's spirit. In this respect, I wonder whether the IAMU needs to review the balance of its study themes. I also think that the IAMU needs to make more effort to ensure that the knowledge and skills of seafarers are utilized more effectively by the maritime community at large" [22]. The intangible qualities of "spirit" and "pride" may be difficult to measure, but they may also provide the broad philosophical backdrop upon which to drape the narrower concerns of specific skill sets. The objective, then, is to find the unifying seams across MET and our heterogeneous institutions. For licensing programs, the unity is STCW baseline competencies, but where else might we find unity that can transcend the complications of the differences enumerated above? After all, for STCW, the original desire for standardization was to elevate the long tail of underachievement rather than raising the bar at the more sophisticated and innovative end of the spectrum. The answer may lie in the creation and development of universal student learning outcomes on a multi-level scale that can be managed in an outcomes-based pedagogical model without restricting the intellectual freedom of any single maritime institution. The implementation and alignment of broad learning outcomes recently developed at Cal Maritime may provide some useful direction.

5. The CMA Model

In order to better understand and measure the comprehensive educational mission of the institution, last year Cal Maritime embarked on a project to craft Institution-Wide Student Learning Outcomes (IW-SLOs). The challenge was to develop a set of outcomes that would best reflect the unique nature of the Academy and simultaneously encompass a set of more generalized competencies because, as noted previously, Cal Maritime is bound by different oversight bodies whose interests and concerns do not necessarily overlap in concentric circles. Also, this set of outcomes needed to encompass *all* academic programs, regardless of the kind of licensure associated with individual programs. A committee of faculty and administrators first identified the constitutive features in Cal Maritime's academic and co-curricular programs and measured these features against cohort educational institutions across the country. The first draft of the IW-SLOs was deeply informed by the American Association of Colleges and Universities' 2005 national initiative "Liberal Education and America's Promise" (LEAP) as well as those learning-centered, outcome-oriented aspects of The California State University's newly-revised Strategic Plan. After successive revisions and in consultation with experts in the development of learning outcomes, a set of IW-SLOs (organized under four themes which correspond to the school's mission) was approved and an assessment council was formed and tasked with developing and sustaining an assessment plan (See Appendix 1).

Of course, the development and publication of specific Institution-Wide Student Learning Outcomes must be properly tethered to the individual academic programs, each of which have developed their own learning objectives (P-SLOs) and which are further refined and made more specific on the course level (C-SLOs) Every program, furthermore, has an assessment plan which situates and aligns its P-SLOs vertically between the course-level outcomes and with the IW-SLOs, and this alignment is crucial for efficacy in quality control management. For example, the set of learning outcomes for the Marine Transportation Program (see Appendix 2) corresponds to those outcomes on the institution-wide level but also drill down to the level of competencies required for STCW. Furthermore, the Program-level outcomes articulate the criteria used to measure each outcome, and, when these outcomes are attached to specific courses, desired performance levels (beginning, intermediate, advanced) are also attached.

6. Conclusion

Student Learning Outcomes are present in some form or another in nearly all institutions of Maritime Education and Training. One of the ever present challenges facing MET, and one which has concerned IAMU for the past decade, is that of curriculum standardization for better communication between institutions as well as improving the efficiency and safety of the maritime and shipping industries as a whole. In this way, the challenge mirrors those facing other organizations such the European Union on Education and the US Department of Education in their respective desires for easier mobility between institutions in an era of rapid globalization. The turn to outcomes-based models, instead of complicating and exacerbating the issue, may actually prove to be a useful means by which to work towards standardization. Might it not be possible to develop a set of universal outcomes? Might a collection of Institution-Wide (or University-Wide or Academy-Wide) outcomes be adopted on the level, of, say, the IAMU member organizations? This may work to satisfy one of the central objectives of the organization while the actual implementation and measurement of these outcomes on the curricular level could be designed by individual institutions in line with principles of academic freedom and with available resources. Of course the work of developing best practices on these levels could and should continue as different member institutions share rubrics, methodologies, and pedagogical innovations. We have common seas and common shores and common objectives, but we strive to foster uncommon schools, unique faculty, and exceptional programs. A way to navigate through across this divide may be found in the work of Leicester, Bloomer and Steward, who posit that the issues that arise in the dilemma between control and standards on the one hand (which they label “rock values”), and freedom of choice and diversity of innovation (using the metaphor of “the whirlpool”) on the other hand. “The ‘rock values are the good things that quality control delivers: consistency, transparency, reliability, protection against the system falling below a minimum standard, possibilities for consistent comparison of performance across time and between countries, the possibilities of continuous improvement. The whirlpool values serves diversity, dynamism, range of possibilities, spontaneity, autonomy, intelligent consumption, personal validity as a measure of usefulness, and a faith in humanity to make right choices for themselves” [23]. The challenge here is to keep improving the structures and processes of Maritime Education and Training, even as we prepare for and embrace changes that arise from ambiguous national and international policies and fluctuations in market forces. An attention to the innovations in other programs of higher education – both the successes and failures of an outcomes-based structure – may help inform the direction of MET in the future.

Appendix 1

The California Maritime Academy:
Institution-wide Student Learning Outcomes (IW-SLO)

Consistent with the mission of the California Maritime Academy to provide a college education combining intellectual learning, applied technology, leadership development, and global awareness, students will develop the following competencies. Through participation in curricular and co-curricular learning opportunities, our graduates will be able to:

A.	Coherently and persuasively share information	Communication	**Intellectual Learning**
B.	Comprehend, analyze and objectively evaluate new information and ideas; and to explain things in new and different ways, often through synthesizing or applying information	Critical and Creative Thinking	
C.	Exercise intellectual inquiry via the use of sound reasoning to identify and analyze problems, formulate solutions, predict outcomes, and make conclusions and inferences from numerical information	Problem Solving	
D.	Demonstrate an understanding of fundamental concepts in human development and the natural world	Human Development in the Natural World	
E.	Employ self-knowledge of the social and cognitive factors influencing the learning process; to engage in ongoing reflection and exploration of the purpose of personal development; and to synthesize and apply knowledge and experiences to new personal and professional applications	Lifelong Learning	**Applied Technology**
F.	Demonstrate competency in discipline-specific, maritime-related fields	Mastery of discipline-specific skills	
G.	Define a specific need for information; then locate, access, evaluate and effectively apply the needed information to the problem at hand; and effectively use simulators, computers and computing applications in order to create, access, store, process, analyze and communicate information	Information Fluency and Computing Technology	
H.	Work with others in achieving common goals, and when necessary, envision new goals; motivate and empower others to achieve them; interact constructively with a diverse group of people; and foster collegiality, goodwill and community among them	Leadership, Teamwork, and Personal Development	**Leadership Development**
I.	Behave and perform in a manner that is accepted in one's profession, as well as move oneself continuously toward a goal or set of goals	Professional Conduct	
J.	Apply standards of proper conduct and responsibility towards society in one's professional or personal life	Ethical Awareness	**Global Awareness**
K.	Demonstrate an awareness of diversity in the global culture and environment, as well as the responsibilities associated with promoting the welfare of state, country, whole of humanity and planet	Global Stewardship	

Appendix

Marine Transportation Program Learning Outcomes and Alignment to IW-SLOs			
	Program Learning Outcome	Performance Criteria	Aligned to IW-SLO:
1	Mastery of knowledge, techniques, skills and modern tools required to safely operate all sizes of marine vessels from large tankers to tugs	Demonstrated ability to operate bridge equipment including Radar/ARPA, GMDSS and ECDIS equipment, sextants, radar transfer plotting sheets, etc.)	F
		Demonstrated ability to use non-electronic navigational tools (plotting equipment, sextants, radar transfer plotting sheets, etc.)	
		Demonstrated ability to use shipboard equipment in the proper handling of cargo	
		Demonstrated ability to properly utilize shipboard safety equipment.	
2	Ability to apply knowledge of current nautical theories to allow adaptation to emerging technologies in marine equipment, systems and structures	Demonstrated ability to apply the fundamentals of stability and use computer programs to calculate stability in the handling of cargo	F
		Demonstrated ability to understand emerging technologies as applied to marine and shipboard operations	
		Demonstrated ability to use computer tools to assess the impact of loading on the ship's structure	
3	Ability to function effectively on teams	Demonstrated understanding of issues involved in working on a team	H
		Demonstrated ability to function as a member of a small team including providing individual contributions to the team	
		Demonstrated ability to lead a team	
4	Ability to function as a manager in a maritime related business	Demonstrated ability to function as a manager in a maritime related business	I
5	Ability to communicate effectively in a technical environment	Demonstrated understanding of effective writing skills	A
		Demonstrated ability to write an effective technical report	
		Demonstrated understanding of the principals of effective speaking	
		Demonstrated ability to conduct a professional presentation	
6	Recognition of the need for and an ability to engage in lifelong learning	Demonstrated understanding of the importance of lifelong learning	E
		Demonstrated ability to research new concepts and discover emerging technologies	
		Demonstrated ability to learn new concepts on one's own	
7	Ability to understand and apply professional, ethical and social responsibilities	Demonstrated understanding of ethical issues of the maritime industry	J
		Demonstrated ability to analyze a potential ethical situation and present a clear and compelling written discussion of same	
		Demonstrated understanding of social responsibilities	
8	Knowledge of contemporary professional, societal and global issues	Demonstrated understanding of issues of maritime law	D,K
		Demonstrated understanding of the issues of the environmental effects of the maritime industry	
		Demonstrated understanding of the regulations that impact the operations of ships	
9	Commitment to quality, safety, timeliness and continuous improvement.	Demonstrated understanding of the measures of quality and timeliness and how these measures are applied	J
		Demonstrated understanding of current management tools for continuous improvement such as ISO 9000, and TQM (Total Quality Management)	
		Demonstrated understanding of safety as it relates both to vessels and maritime facilities	
10	Ability to receive a Coast Guard License	Successful passing of all sections of the USCG third mate's license exam	F
		Successful completion of all STCW requirements for Officer in Charge of the Navigational Watch	
		Successful completion of all STCW requirements for Ratings forming the Navigational Watch	
		For students in QMED minor, successful completion of the QMED exam	
11	The ability to perform industrial operations planning including managing technical projects involving scheduling	Demonstrated ability to understand and develop job plans	J
		Demonstrated understanding of management tools including scheduling and cost	

2

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Improving International Cooperation for Maritime Education and Training in Developing Countries with Vietnam as a Case

Nguyen Thanh Thuy, D.Sc
Vietnam Maritime University, nguyenthuy@vimaru.edu.vn

Abstract International cooperation for maritime education and training is a very important issue in order to improve the quality of maritime education programs in developing countries. As maritime education and training institutions gradually recognize the profound impact the forces of globalization has made on maritime industries, they have taken measures to improve their education programs by collaborating with higher quality maritime education and training institutions in the developed countries. This is the way to not only further and develop cross-cultural understanding and economic interdependence, but also to provide a better education program for students primarily in the developing countries but indeed also to students in the developed countries. The obstacles to these programs are finance limitations, inadequate English skills of students, lecturers and administrators alike. However, perhaps the most difficult obstacle is the conservative mindset of some educators as well as the lack of support from the government in the developing countries. This paper discusses a number of issues to improve the international cooperation for maritime education which is applicable in Vietnam as an example for other developing countries in Asia and the partners in the developed countries.

Keyword: *Maritime Education, international cooperation for MET, education program*

1. Introduction

In this era of globalization, international cooperation for maritime education and training (MET) institutions is a definite trend and an absolute must. As the economic globalization advances, international cooperation in MET brings many challenges but also advantages to collaborating MET institutions. Similar to globalization, international cooperation in MET will improve the quality of education and enhance the transference of professional skills between nations, as the IAMU Presidents'/Rectors' Forum issued "The Dalian Statement" (2006) which asserted, in part, that "globalization has been progressing rapidly in the international shipping arena" and therefore "passing on maritime skills and knowledge to the following generations needs to be achieved on a global scale." Presently, maritime universities have been attuned to the social, cultural, and political forces of globalization, and organizations such as IAMU work to disseminate ideas within a global arena [4].

In developing countries, as maritime education and training institutions gradually recognize the profound impact the forces of globalization has made on maritime industries, they have taken measures to improve their education programs by collaborating with maritime education and training institutions in the developed countries where quality is allegedly higher. This is the way to not only further and develop cross-cultural understanding and economic interdependence, but also to provide a better education program for students primarily in the developing countries but indeed also to students in the developed countries. The two main obstacles to these programs are finance limitations and inadequate English skills of students, lecturers and administrators alike. However, perhaps the two most difficult obstacles to overcome are the conservative mindset of some educators and administrators as well as the lack of support from the government in the developing countries.

This paper discusses a number of issues to improve international cooperation in maritime education with Vietnam as an example of a developing country in Asia with partners in developed countries.

2. Advantages of international cooperation for MET institutions

Globalization is a fact, and a forceful fact at that. Internationalization of an institution and a curriculum does not come by itself. It is the result of deliberate decisions made at institutional and government levels in both developed and developing countries. Indeed difficult decisions but necessary decisions for the institutions that want to stay ahead in the tough and very competitive market that maritime education and training has become.

However, there are many ways to establish an international cooperation for maritime education and training between two MET institutions in two nations in which one of them belongs to a developing country. It might be simply implementing a student/researcher/lecturer/administrator exchange program, or sending students/lecturers/researchers and administrators to MET institutions in developed countries to job-shadow or study on a scholarship program, or collaborate in an education and training sandwich program, or the MET institution in the developing country may invite lecturers/researchers from their partner in the developed country to their institution to give lectures for domestic students or lecturers, etc. Which kind of cooperation would bring more benefit to both institutions depends on each individual institution. Naturally, both institutions will gain advantages or benefit themselves. For example, the exchange student program helps students in both institutions to have the opportunity of studying abroad at different institutions which improve their knowledge of the world which is so important in an ever more global community. Experiencing face-to-face cross-cultural communication will bring them experience to work with other cultures since the maritime field is indeed a global field of work. If they can manage that as students, their future positions - as professionals in the maritime industry - will be vastly improved.

The international collaboration in research allows for systematic scientific knowledge sharing at regional and international levels and constitutes a key instrument for institutional capacity development. Partnerships of long standing can engender a cooperative mindset that is based on the partners' strengths and is beneficial for both sides from a cultural and scientific standpoint. Such partnerships are also an efficient instrument for the promotion of brain circulation. Another key factor in this regard is fostering cooperation between stakeholders in the scientific and business communities, particularly when it comes to public-private partnerships and supporting the establishment of technology and business centres for innovation and technological and/or economic development.

The collaboration in under-graduate programs may also lead to collaboration in research or higher education programs. This pursues not only development policy goals, but also serves to further the interests of the donor country. A comparison of various international evaluations has shown that the foreign policy establishments of donor countries tend to regard programs for higher education and research as a means to further national interests and promote good international relations. Moreover, donor ministries of education and research mainly tend to view such programs as a way to promote the internationalization of domestic institutions. Universities and research institutions profit from the internationalization of their activities. And above all, development cooperation aims to ensure that the aid granted to partner countries is spent efficiently to strengthen human resource and institutional capacities in these countries. The difficulty of striking a healthy balance between the various interests involved often translates into programs whose design is insufficiently results-oriented [1]. The cooperating programs also bring chances to researchers in two institutions to exchange their knowledge and collaborate in research work, which is helpful for both institutions.

2.1 Perspectives from MET institutions in developing countries

First of all, by collaborating with other higher quality MET institution in developed countries, MET institutions in developing countries can provide students a higher quality education at a cheaper price than studying abroad. Most collaboration programs are conducted in English, which means that students must master the English language very well which will be very helpful for them in order to get a good job after their graduation. The collaborating MET institutions, therefore, become more attractive and desirable in the students' eyes. Participating in a collaboration program also brings more chances for students who wish to enroll in higher education programs in developed countries after graduation.

Secondly, through the collaboration, MET institutions in developing countries can help their lecturers enhance their motivation, improve their knowledge and educating and teaching skills. The process of transferring knowledge will be happen between two institutions more or less as the programs evolve over time.

Lastly, MET institutions in developing countries may learn from the administration model of their partners in developed countries in order to plan, perform, monitor and audit a school year more effectively.

2.2 Perspectives from MET institutions in developed countries

Beside exchanging knowledge or collaborating research work, researchers or lecturers in developed countries may enjoy visiting their partner institutions in order to collect data and materials for their research, or simply to expand their maritime research network and get a good experience working in a developing country. Lecturers, researchers and administrators also gain a good insight into the needs of the developing countries and opens up for ways in which the expensive MET institutions in the developed world can profit through cooperating with MET institutions in low cost developing countries where the bulk of seafarers are trained and educated today.

3. Challenges in international cooperation for MET institutions in developing countries with Vietnam as a case

3.1 Cost

One of the most difficult issues in the cooperation is the finance limitation of MET institutions in developing countries. With very low budgets from the government and through tuition as well as low incomes on the part of students and lecturers alike, it is hard for them to send students and lecturers to a developed country to study or teach even in a short term exchange program. Usually students and lecturers should obtain scholarships from a supporting organization or from their partner institutions. Vice-versa, when lecturers/students from developed countries visit their partners in developing countries in order to give lectures, they usually complain about poorly maintained facilities, shortages of instructional materials and low living standards. In Vietnam, with a collaboration program of bachelor degree in which professors and lecturers from MET institutions in developed countries in Europe or the US coming to Vietnam to give lectures, students usually find it hard to bear the tuition fee, except when the partner has a priority program for exchange students like a supporting finance program or a scholarship program. Table 1 shows the example of the difference in fee between a domestic bachelor/master program and that of a similar collaboration program carried out in Vietnam.

Professionals	Degree	Domestic Institution	Partner Institution	Domestic program		Collaboration program	
				Duration	Fee	Duration	Fee
Business Management	Bachelor	Hochiminh City University of Transport, Vietnam	University of Sunderland, UK	4 years	US$1200/ course	4 years (3 years in Vietnam, 1 year in UK)	US$30,000/ course
Logistics and Finance	Master	Vietnam Maritime University	University of Nantes	2 years	US$1200/ course	2.5 years (in Vietnam)	EUR 14,000/ course

Source: Author collected data from different collaboration programs in Vietnam

Table 1. Difference in fee between a domestic bachelor/master degree program and that of a similar degree of collaboration program carried out in Vietnam

3.2 Academic calendar

Different academic calendars in two collaborating MET institutions may create problems in curriculum schedule and enrollment management for the exchange students or exchange lecturers' program. For example, most U.S. maritime universities run on a two-semester academic calendar – and sometimes they run by quarters - from September to December and January to April; The Australia Maritime College's semesters run from February to June and July to November; but in Vietnam the semesters run from August to December and from January to June. If there is an exchange student who studies abroad for one semester, he/she may get conflicting schedules between the two institutions. Missing days or weeks of coursework (especially if it falls at the end of a term) has wave-like detrimental repercussions: missing course work and/or exams can lead to lack of course credit or certification, which in turn may delay graduation. Foreign students wishing to register for courses late or withdraw early at their host institution also place burdens on individual faculty who may not be able to accommodate such flexibility in their curriculum plans. And obviously, many courses are designed for incremental skill-set acquisition with final exams used as assessment tools: to miss the beginning or end – especially if the foreign student must also grapple with a new language and new culture – makes mastery of a given subject nearly impossible [3].

3.3 English skills of students, lecturers and administration staff
Poor English skills is one of the most frequent challenges in the collaboration program seen in the developing country, like when the students have enough financial ability but their English skills are not good enough in order to study in the program. The cooperation between lecturers and administration staff may also run into troubles because of poor English skills, so it may take a long time to discuss every tiny issue for the collaboration. Eventually also the support staff need to improve their English skills if the university is to receive foreign students, lecturers and researchers for more than just a short visit.

Faculties	Navigation and Ship Engine	Maritime Transport Economics	Ship Electricity – Maritime Infrastructure	Ship Building - Information technology
Total students	831	682	629	695
Maximum TOEIC Score	500/990	800/990	805/990	805/990
Average TOEIC score	250-300	300-350	280-320	250-300

Source: Khiem, N.K (2009) "Evaluating and Establishing a English Evaluating system for students in Vietnam Maritime University", Journal of Maritime Science-Technology (in Vietnamese)[4]

Table 2. Average English level of fresh year students in Vietnam Maritime University (VIMARU) based on TOEIC test taken in September 2009

3.4 Governmental procedures in application for educating collaboration
When setting up an international collaboration agreement between two MET institutions in two countries, even if it is a rather simple program such as an exchange program for students or lecturers, the two institutions can make decisions about that and design and implement the program themselves. However, it is not easy to go through all procedures like Visa application for students in developing countries. For example, in case of Vietnam, it may take about 6 months or more to process the Visa application and go through all other procedures in order to go to the US for an exchange student or an exchange researcher.

If two institutions collaborate in a Bachelor program or Master program, the procedure is even more complicated. In Vietnam, the MET institution should submit the application to the Ministry to which they belong and the Ministry of Education and Training. It takes minimum one year for the Ministries to go through the content of the program and give the decision to allow the course to be opened or not. The MET institution should prove not only that the program has a good and adaptable content, but also the good finance program for students and good plan for running the schedule as well as a good program in order to internationalize the domestic institution.

3.5 Others challenges

1/. Two quality levels of curricula in collaborating MET institutions

In MET institutions in developing countries, the problems incurred would be those of the lack of equipment, outdated teaching methods, unmotivated students, and so on. Students might find that the academic success is not an important issue in order to contribute meaningfully to their country's social and economic advancement. However, in case the collaboration program has been conducted here, the curricula might not be oriented toward local situations and there might be little connection only between the academic environment and the working world.

2/. Program evaluation

Even though many collaboration programs have been successful in many approaches, it is still hard to evaluate the academic result of each program by both MET institutions. Some collaboration programs did not fit to domestic market orientation after all.

3/. Conservative mindset of some domestic educators

This is one of the most difficult obstacles for many collaboration programs. Some domestic educators assume that it is not necessary to set up any collaboration agreements because the foreign educating programs may – in their eyes - not be all that much better and indeed they have no way to meet the domestic market orientation. They believe that only domestic education programs may train and provide the suitable human resource for the local labor market. This conservative mindset of some educators may exist in any MET institution or even in governmental system and will no doubt create a huge dilemma for any collaboration program, not only in the maritime education and training field. Indeed the same mindset can be found in MET institutions in developed countries where some lecturers and administrators may believe that their programs are the best and that there is nothing to be learned by cooperating internationally.

4. Issues to improve international cooperation for MET in developing countries

4.1 Institutional issues

The first issue, that both MET institutions should pay attention to, is setting up the right program for the collaboration. In the education field, this program can be in any field of the maritime sector such as training seafarers or educating for off-shore jobs. However, the collaboration program should satisfy some of the issues below:

1/. Demand orientation and ownership: The programs should be clearly linked to the needs of the target partner, means government or institutions, and cooperation should be based on clearly and jointly defined partnership principles.

2/. Enable partner country organizations to define their needs according to their strategies and capacities, as well as local situations: Ownership can be strengthened by transferring to the partner country or institution the responsibility of identifying and explaining their demand, and of planning, defining and implementing their programs and projects on their own. Program structures and regulatory frameworks should be designed along these lines.

3/. Curriculum development: Syllabuses should focus on skills development, based on local needs, and designed accordingly and integrate innovative content and methods;

4/. Harmonization and complementarities: The programs should be coordinated at the national and international levels according to the requirements of the donor organizations. In order to ensure that the MET institutions in the developed countries can play an active role in the collaboration, domestic strategies and programs should encourage and promote their participation. This in turn necessitates reciprocal harmonization of the policies of the relevant ministries in the partner countries.

The second issue is in relation to the need for the collaboration program to implement and maintain high quality standards with regard to teaching and learning methods, as well as research. Therefore relevant personnel in both MET institutions should receive training like the integrated training as well as English language skills for all staff (academic, technical and administrative) to improve institutional capacity development.

As for the exchange student/researcher/administrator programs, it should be mandatory to put in place a system for quality assurance and quality enhancement including English skills enhancement. The following measures will eventually improve educational quality in partner countries like support via consulting, information sharing, training, reforming, planning and conceptualization of education, science and research systems, or promoting quality management and governance.

As for the scholarship programs scholarship programs alone cannot improve the quality and efficiency of educational and research institutions but they allow academic personnel to be trained in a higher MET institution in order to participate more efficiently in the collaboration. The benefits and relevance of scholarship programs for development policy overall and their institutional impact in particular can be enhanced if the following criteria are met:

1/. Training needs are set out in the strategic development plans of the institutions concerned;
2/. The benefits of a training course have a visible impact beyond the individuals concerned;
3/. Educational and training measures are realized as sandwich or joint degree programs;
4/. Educational and training measures produce a substantial and convincing multiplier effect;
5/. Subject-specific follow-up activities are offered on the basis of scheduled tracer studies.

The last issue is in relation to an evaluating system, which both MET institutions should set up in order to evaluate the measures and targets of the collaborated program. If the program does not meet the requirements, both MET institutions should discuss necessary methods either to improve the quality of the program or to terminate the program.

4.2 Governmental issues

The support from government is always a dominant factor for any international collaboration to succeed. If the government has a strategy to improve the maritime sector nationally and internationally, the demand for high quality human resources will become apparent in any cooperation with the aim of improving the education quality. This will then eventually create favorable circumstances for the collaboration in maritime education and training too.

In any collaboration, the finance issue is always the most important one for both MET institutions to consider before entering a collaboration agreement in maritime education and training. Different from many other fields, the maritime field requires a huge investment in facilities for education and training. Normally the MET institutions in developing countries depend on the government budget or aided funding projects from developed countries in order to invest in training facilities. Therefore the support of the government is a major impact to the quality of maritime education and training program.

Another governmental issue concerns to the administrative procedures when setting up an education collaboration program for undergraduate or graduate/post graduate students in a developing country. The longer time and the more complicated the procedures are, the less chances the program has of getting off the ground. Consequently, if the program meets the requirements of quality, self-finance issues and domestics market orientation, the government should permit it to be applied into the domestic MET institution as soon as possible.

The last issue involves to the human resource. The ministry in charge of the MET institutions in developing countries may apply a ‘release- system’ which has measures and instruments to move ‘backward’ educators and administrators (ie those with a conservative mindset) into other and more suitable positions in order to improve the education system institutionally, nationally and internationally by opening up the thus vacant positions to more qualified persons.

5. Conclusions

Improving international cooperation in maritime education and training is a very important issue in order to improve the quality of maritime education programs in developing countries. Facing obstacles like finance limitations, inadequate English skills of students, lecturers and administrators alike, lack of support from the government or a conservative mindset of some educators and administrators, international cooperation in maritime education and training is obviously an uphill –but necessary and inevitable - battle for any MET institution in developing and developed countries alike. This paper discusses all obstacles which a developing country may face with Vietnam as an example and introduces a number of institutional and governmental issues in order to proceed successfully with a collaborationprogram between two MET institutions in two countries bearing in mind that globalization will be there and evolving rapidly no matter what we do in MET. Internationalization of a MET institution on the other hand requires deliberate and determined – and difficult – decisions and actions.

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BSAMI – an innovation in MET and implementation towards the future

Avtandil Gegenava
Professor, Batumi State Maritime Academy a.gegenava@bsma.edu.ge
Abdul Kakhidze
Professor, Batumi State Maritime Academy a.kakhidze@bsma.edu.ge
Hisashi Yamamoto
Doctor, Istanbul Technical University, hisashi@attglobal.net

Abstract The article deals with the description of the Black Sea Association of Maritime Universities (BSAMI) foundation by six Black Sea region maritime universities - Nicola Y. Vaptsarov Naval Academy, Bulgaria, Batumi State Maritime Academy, Georgia, Constanta Maritime University, Romania, Admiral Ushakov Maritime State Academy, Russian Federation, Odessa National Maritime Academy, Ukraine and hosting Maritime Faculty of Istanbul Technical University, Turkey, Tuzla, on April 2, 2010. The article also presents an introductory information dealing with analysis of the Black Sea Region education activities at present, giving possibility to forecast its further development.

The foundation of BSAMI was caused by the result of the analysis of two leading factors of the modern maritime infrastructure: the world globalization processes and lack of the highly qualified maritime human resources. Accordingly, the main purpose of BSAMI is creation of maritime educative Black Sea global center providing the high standards of seafarers education and certification on the basis of STCW, Regulation I/10.

Keyword :

1. Introduction

The world maritime community, taking into consideration the shortage on the one hand and the increasing need in qualified seafarers on the other hand, actively promotes maritime education activities and modern trends.

The BSAMI countries encompass an area of approximately 18.9 million square kilometers with 295 million people.

BSAMI will serve as a forum for cooperation in a wide range of maritime education affairs with the main purpose of a global center creation to assure knowledge, innovation and implementation towards the future in Maritime Education and Training System (MET).

BSAMI potential development will be more effective with regard to the STCW amendments adopted at Diplomatic Conference, 21-25 June 2010 Manila, the Philippines.

The amendments, known as "The Manila amendments to the STCW Convention and Code" enter into force on January 1, 2012 under the tacit acceptance procedure and are aimed at bringing the Convention and Code up to date with developments since they were initially adopted in 1978 and further revised in 1995.

2. A Brief Description of the Black Sea Maritime Educative Space

The main objectives for BSAMI are the following:

- Education issues in maritime field;
- Extention of the collaboration in science & research;
- Common educative projects implementation;
- Development of a comprehensive MET System for following generations;
- Development of standardized Undergraduate Curricula and an International Certification System for Seafarers Competency.

2.1 Constanta Maritime University (CMU)

CMU was established in 1972. CMU has a growing dinamics of development: 1000 students in 1990 – 5800 students in 2010. CMU consists of 2 Faculties:
Navigation & Maritime Transport Faculty;
Electromechanics Faculty.
CMU is accredited at national level for: bachelor, master degree and doctoral studies. The international accrediation includes European and IMO levels.
CMU being a part of international network of different universities has a wide net of partnership with national and international crewing and shipping companies, maritime national authorities and local adminsistrative entities.
Having new laboratories, simulators, buildings and good financial conditions, CMU proposes the following scheme of the projects - research at the national and European levels, development of human resources, international collaboration, and projects for local community (environmental protection, etc).

2.2 Nicola Y. Vaptsarov Naval Academy (NYVNA)

The mission of the NYVNA is to be an educational institution that trains highly qualified leaders and specialists for the needs of the transforming Navy of the Republic of Bulgaria and the global and national maritime industry. Accordingly, the main objectives are the following:

- Higher military and civilian education for officers for the Navy;
- Higher education for maritime personnel at doctor's, master's and bachelor's degree for the merchant marine;
- Postgraduate training for senior maritime personnel;

Other objectives of NYVNA include vocational training and enhancing the qualification of professional sailors.
The main steps of NYVNA include a more than century long history presented by:
1881 - The establishment of the first technical school in Bulgaria;
1917 – The first officer class graduation;
1929 - Beginning of training of officers for the Bulgarian naval and commercial, sea and river fleets, port and naval aviation specialists;
1956 - Acquisition the status of Academy of Higher Engineering Maritime Training;
1960 - International recognition of the Academy's diploma;
1992 - Beginning of postgraduate training for officers;
1998 – The first full program accreditation of core specialties;
2000 - Approval of syllabi under the STCW 78/95 Convention;
2000 – The first ISO 9002.4 certificate of quality;
2000 - Cofounder of the International Association of Maritime Universities (IAMU).
2001 – The first institutional accreditation;
2003 - Acquisition ISO 9001:2000 certificate of quality;
2004 - Audit by the European Maritime Safety Agency.
Navigation Faculty includes the following specialties – navigation, inland waterway navigation, ship radioelectronics, technology and management of maritime transport and ports.
The Engineering Faculty proposes the following list of specialties - ship machinery, ship electrical systems and technology of ship repairing.

2.3 Odessa National Maritime Academy (ONMA)

The ONMA is the leading higher educational center in Ukraine, which trains officers in all maritime specialties for sea-going, river and fishing fleet. The ONMA is well-known for a long time in the world of marine shipping thanks to its 45 000 highly qualified specialists, its graduates. About 13,000 cadets study at ONMA. The Academy was accredited by the State Board of Ukraine with accreditation level IV (the highest). The terms of studies are the following: four years for Bachelor degree and additional one and a half year for Specialist and Master of Science degree. The system of ship's crew training is in compliance with the requirements of the International Convention STCW-78/95 and other international conventions which give graduates the right to work on all types of vessels of native and foreign companies. The ONMA Quality Management System is certified by Russian Register.

- ONMA comprises of the following faculties and branches:
- Navigation faculty;
- Navigation on Sea and Inner Waterways faculty;
- Marine Engineering faculty;
- Automation faculty;
- Electrical Engineering and Radio Electronics Faculty;
- Maritime Law faculty;
- Foreign Students' faculty;
- The Azov Maritime Institute of ONMA (Mariupol);
- Izmail Faculty (Izmail);
- Seafaring College of Technical Fleet of ONMA;
- Marinesco Seafaring College.

The Academy has signed the agreements on co-operation with the following foreign shipping companies:

- Priamos Maritime S.A. (Greece);
- Anthony Veder Rederijzaken B.V. (the Netherlands);
- B.K.W. Dredging and Contracting Limited (Boskalis) (the Netherlands);
- Wagenborg Crewmanagement B.V. (the Netherlands);
- MOL Ship Management Co., Ltd. (Japan);
- V. Ships Crew Ltd. (Monaco);
- Stolt-Nielsen Transportation Group B.V. (the Netherlands);
- Tsakos Shipping and Trading S.A. (Greece);
- BW Gas ASA (Norway);
- NYK Shipmanagement (Japan);
- Stamco Ship Management Co. Ltd. (Greece);
- MSC Shipmanagement Ltd. (Cyprus);
- A.P. Møller A/S (Maersk) (Denmark);
- Bernhard Schulte Shipmanagement (Cyprus) Limited;
- Crew Management Services S.A. (Vanuatu).

Teachers and scientists of the Academy actively participate in the following IMO meetings:

- Sub-Committee on Standards of Training and Watchkeeping;
- Sub-Committee on Radiocommunications and Search and Rescue;
- Maritime Safety Committee;
- Sub-Committee on Safety of Navigation;
- Legal Committee;
- Council.

2.4 Admiral Ushakov Maritime State Academy (AUSMA)

AUSMA represents 16 Specialties and 145 courses of professional training with an annually growing number of the cadets (5000 in 2010)

There are Navigation Faculty, Ship Engineering Faculty, Faculty of Economics and Management, Faculty of International Maritime Law and Regional Center of Additional Vocational Training (SRCAVT) as a department of AUMSA that is responsible for the special training of ship staff, personnel of port facilities and shipping companies. SRCAVT effects training in accordance with national requirements of Russian Federation and regulations of the International Conventions as STCW 78/95, SOLAS 74, MARPOL 73/78, ISPS Code and others. Certified instructors and tutors have specialized training and as usual a scientific degree as well as seagoing experience onboard merchant ships. Modern simulation equipment of world leading manufacturers, such as Transas Set (Russia), Ship Analytics (the USA), Nor Control (Norway), Kronberg (Norway) is properly engaged in the training process. About 15 thousand students are trained in different specialized courses annually, the total number of these courses in SRCAVT.

There are 3 branches of AUMSA in other cities.

AUSMA is ready for the co-operation with other countries in organization international seminars, conferences on handling dangerous cargoes in ports and at sea.

AUMSA has all facilities for carrying out Search and Rescue Training Courses in the Black Sea Region.

AUMSA Oil Spill Response Training Courses for the Black Sea Region are aimed at the improvement of ecological stability of Azov-Black Sea region. AUMSA has experience in carrying out Port State Control

Training Courses in the Black Sea Region in accordance with Black Sea Memorandum of Understanding. This course can be attended by candidates from various countries.

2.5 Maritime Faculty of Istanbul Technical University (ITUMF)

ITUMF was established in 1773 as a discipline in Naval Architecture and Marine Charts. Now it has 12 Faculties with 5 campuses including Tuzla. Academical Departments include the following: Maritime Transportation and Management Engineering Department, Marine Engineering Department, Maritime Transportation Management Department, Basic Sciences Department.

There also are Master and PhD programmes at ITUMF. ITUMF also delivers the education activities at:

- Maritime Transportation and Management Engineering Department Labs;
- Full-mission Shiphandling Simulator;
- Shiphandling Simulator;
- The VTS Simulator;
- The GMDSS Simulator;
- Maritime Communication Laboratory;
- Full Mission Liquid Cargo Handling Simulator;
- M/V “Akdeniz” Training Ship and Tug “Hopa”;
- Maritime Navigation Laboratory;
- Seamanship Laboratory;
- Computer Based Training Laboratory;
- Lifeboat Training Platform;
- Fire Training Center;
- Indoor Training Pool.

Marine safety training centre offers the following continuing studies for seafarers:
STCW 78 / 95 COURSES;
ITUMF at International/National MET platforms:
Establishment of the IAMU (founding chair);
Respectability at IMO (STW chairman of MET Issues of 162 Administrator parties to IMO between 2000-2002);
Bilateral International Academic Cooperation with Japan, Romania, Egypt, Poland, Korea, Russia, Ukraine, China, the USA, Bulgaria, Georgia;
ITUMF actively promoted BSAMI foundation process and played an important role in its creation.

2.6 Batumi State Maritime Academy (BSMA)

Maritime education has a century history in Georgia. The first maritime courses were founded in Poti in 1901. Maritime Industrial Technical Secondary School was functioning in Batumi since 1929. In 1944 Batumi Maritime Technical Secondary School was reorganized into Batumi Maritime College. Batumi Higher Maritime College was founded 1992. In 2006 Batumi State Maritime Academy received today’s status – Legal Entity of Public Law – Teaching University - Batumi State Maritime Academy (BSMA).
Maritime education in Georgia is regulated by three laws:
Law of Seafarer’s Training and Certification of Georgia (2000);
Law of Higher Education of Georgia (2005);
Law of Vocational Education of Georgia (2007).
The control of IMO requirements realization in the sphere of Maritime Education in Georgia is under the control of the Maritime Transport Department and National Legislative issues are in the competence of Georgian Education and Science Ministry.
Maritime Transport department, together with Georgian Governemnt for 20 years actively cooperates with IMO and other international organizations:
In June 1993 Georgia became the IMO member.
In 1994-1995 Georgia joined 25 international maritime IMO and UN Conventions.
In 1998 The Law of Georgia on Maritime Areas of Georgia was adopted.
In 1999 Vessels Registration Regulations, Maritime Incidents Investigation Regulations, Maritime Mortgage Registration Regulations, Harbour Master Regulations, Pilot Service Regulations were adopted.
In 2000 the following Laws were adopted: On Training and Certification of Seafarers, in accordance with STCW78/95, and On Maritime Search and Rescue Service.
In May, 2004 IMO MSC confirmed the position of Georgia in the IMO STCW "White List".
Higher education upgrade was recognized as the basic condition for success of Lisbon strategy which the European Union began in March, 2000 and which aspiring the modernization of economic and social systems within EU.

In 2003 Georgia began the transformation of higher education system according to the principles of Bologna process which is actively supported by the European Commission.
BSMA is the basic educational establishment of Georgia. Since 2000 the world-recognized International Quality Management System ISO 9001:2000 is incorporated at the Academy according to the requirements of International Convention STCW 78/95. In 2006 BSMA joined the International Association of Maritime Universities (IAMU).
At present two faculties function at BSMA:
Maritime.
Business and Management.
BSMA developed and presented two higher vocational educational programs:
Marine Navigation.
Marine Engineering.
Maritime Faculty has Bachelor programs:
Marine Navigation.
Marine Engineering.
Electrical Engineering.
Since 2006 the new Training and Certification Centre functions at the Academy.
Cadets of academy pass shipboard training by the training-cargo vessel "ACADEMY".
Training and Certification Centre have the following Transas Set simulators:
Integrated navigational simulator – Navi-Trainer Professional 4000, full navigational bridge.
GMDSS simulator TGS 4100.
Engine Room Simulator ERS 4000.

3. Conclusion: The Main Trends of BSAMI Activities

Practical and proactive innovations in the Black Sea Region are the important part of the whole Global Maritime Infrastructure. Taking into consideration the fact that six Black Sea Region countries provide about 20% of total worldwide existing seafaring officers, the flexible teamwork of Black Sea Association of Maritime institutions will become an effective element of the Global Maritime Community. The global market requires the best quality provision in all activities where the human element plays the most important role. The key elements of the highly qualified seafarers training include the development of creativity skills in all educative spheres. There are three main working directions to be organized within BSAMI frames:

- Research;
- STCW/MET and Legal;
- Information and Communication Technologies (ICT)/Networking.

Accordingly the special attention will be paid on the development of:

- High Technologies in Information and Communication;
- Digital Network of Association Members;
- Distance Learning;
- PC-based Assessment System;
- Digital Library and other data sharing systems;
- Digital Education and Training Courses;
- Digital Assessment etc.

Having considered that the globalization of international maritime community will further progress in the 21st century, and technological developments led by ICT in all areas of human activities will integrate into one whole bigger and complicated system, at the same time, knowledge and innovation will be the key elements of such system, the role of academic institutions in such environment significantly increases, the Black Sea Region countries will share their unique experience in maritime education activities.
Abstracts will undergo review by anonymous, impartial specialists in the appropriate field prior to final acceptance for IAMU AGA11. Based on short comments of the referees the editors will decide on acceptance or not.
Authors will be asked to sign a copyright transfer form prior to publishing of their paper. Reproduction of any part of the publication is not allowed elsewhere without permission from the

editors whose prior publication must be cited, only in the cases that the contents issued in the material are completely the same as others submitted in other publications. The understanding is that they have been neither previously published nor submitted concurrently to any other publisher with the same contents.
Submitted papers will be published through a rapid and concentrated reviewing process by Paper Committee of Local Executive Committee in Korea Maritime University.

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Maritime Academies as Community Services Agents: With Special Reference to the Arab Academy for Science, Technology & Maritime Transport

Mohye El Din El Ashmawy

Captain, M.Sc. in MET, WMU, Consultant to President

Arab Academy for Science, Technology and Maritime Transport
IAMU News and Journal Editorial Board Correspondence African Region
mohyldin_a@yahoo.com & mohyldin@aast.edu

Abstract Maritime academies are not merely established for education and training. Academies play a central and crucial role in identifying the maritime as well as social community needs of their societies, providing suggestions and solutions and contributing to the development of the environment protection. The strength of links between these academies and their societies, whether civil or marine, and the services provided comprise the solid foundation of the maritime culture of these communities. The Arab Academy for Science, Technology and Maritime Transport has had as a prime objective to qualify marine and marine engineering cadets and to serve the community in a sincere obligation towards society as well. The Academy is an affiliate of the Arab League of States; in this respect it is considered a nonprofit organization for the education and training of marine cadets.

The Academy, with all its sectors, educational, research and training, and all its different branches in Egypt and the Arab countries, enables all members of civil, marine society to achieve the maximum possible benefits of these services, using means and methods of modern technology. The colleges and academic centers of the Arab Academy in their different specialties are nationally and internationally accredited, fostering bonds with regional as well as international universities and institutions. Moreover, there is partnership and collaboration between the Academy and such international organizations as UN, UNDP, IMO, and World Bank. In this respect the Academy is considered a centre of radiation and a driving force to assessing the civil and maritime institutions, providing suggestions and solutions to all issues. The faculty members are regarded as scientific and intellectual bodies, representing high civil society groups, and are leaders and experts in all disciplines of all industry in general and maritime industry in particular. Seminars and conferences are continually held at the national and international levels on related marine issues of interest with a view to strike a balance between community services and the marine ecosystem. The important role the Academy adopts in the service of civil society and the sea inside and outside Egypt will be handled in full text in the paper presented to the congress.

Keyword: *community services, AASTMT, academia, collaboration, coordination, market, environment, youth*

1. Introduction

Developed communities consider higher education institutions and their research centers, whether universities or academies, as the driving force behind developing these communities via their innovative ideas, creations and cultures which allow further development and refinement of tools of production, and also as the powerful tool that preserves the cultures of these communities and enhances their performance.

These institutions, considering their higher education, is the locomotive of change in communities that want to progress involving plenty of unique international experiences in which education was one of the most important pillars of progress and transformation. Higher education is therefore, directly associated with the future of any society, not only because it is a cognitive process through which students receive required knowledge and technical skills, but also due to its growing role in the preparation of generations that are capable of actively and consciously participating and planning for the future, armed with the highest values, life skills and right directions that all lead to improving life quality.
Interest in education, higher education in particular, remains to be the key essence to moving any community forward since it is capable of changing the fabric of society in different dimensions and various visions towards the prosperity and advancement of any work system. There is no doubt that community renaissance has always been subject to the development in its education.
The role of universities and academies in community service is one of the vital issues that has an enormous social significance, not to mention that their role is not merely restricted to learning but it comprises a radiological, enlightening and educational side that is connected to, interactive and correlated with production and service institutions.

2. Higher Education: Goals, needs, and expected roles

Institutions of higher education trigger change processes in any community since their role in the society – in addition to the educational and training role – is to innovate and implement innovations, and to transfer knowledge by providing the means to gaining it in the first place and then to making use of it in both the present and the future; in addition to initiating and supporting research and providing assistance to all activities in the surrounding community.
Everywhere universities, as well as maritime academies, try to meet and carry out some objectives, namely welfare, social systems, intent, and truism. Thus, these objectives combined represent the reason behind the presence of these educational institutions. First, these institutions focus on the welfare of the community by preparing its students for constructive integration within the labor market through the acquisition of knowledge and skills which are the means to achieve progress and development, and through developing fields of research and innovation in these communities to enhance the economic force of a particular nation.
As for the social system, these educational institutions help the community to be a "harmonious society" in which different groups exchange references, and also make science, knowledge and technical skills relevant and appropriate. With regard to intent, these academic institutions study life assumptions as defined by the community, looking at it from the different world views, old and new, and reorganize data according to the new and different standards. Consequently, these institutions have the ability to indicate possible reforms in the society, which is considered the basis for any ushering carried out by nations through their universities and academies to serve their communities. In addressing truism, these institutions will explore the unknown as it is the ordinary system of which humanity is an indispensible part.

3. New Cultures and the absence role of scientific and educational institutions

Scientific and educational institutions take on the larger and more important role of helping communities rise, clarifying the culture of objects and the need for humans to recognize them so they would not fall prey to ideas and cultures changing their performance and development in a negative direction. Cultural differences between peoples have been and will remain the strong motive behind accomplishment as long as there are new ideas that do not throw communities into turmoil.

Universities and academia must also have the ability to clarify the impact and role of education, of globalization culture and of the challenges of new global system on communities. There is a wide array of lexical items that entered the language during the nineties and has quickly spread, thanks to modern means of communication and knowledge revolution, which facilitated the movement of people, capital, goods and services. These have become the driving force behind the rapid spread of globalization, which aims at increasing economic, commercial and investment ties among the parties of the world, bringing cultures closer and removing boundaries between states.

The openness of these institutions to public life and rejecting the idea of constraining their role to lecture theaters and laboratories, in spite of the fact that the results of such a role have proven well to the whole community, have argued that the role of these institutions, besides education and training, is an enlightening role that helps lead the transfer of society to what is better and more positive; thus we can establish a rule of thumb that science is in the service of society.

4. Basic premises about society and institutions of higher education

4.1 The first tenet: On educational institutions and society

Institutions of higher education should be able to declare its opinion on the ethical and social problems of the surrounding community as totally independent and fully responsible institutions, exercising a kind of intellectual power that can be needed by the community to assist reflection, understanding and taking action. Higher education institutions should also have the ability to adapt to modern trends in society and the ability to spread openness values and mutual understanding with others in the surrounding community.

4.2 The second tenet: The changing roles of educational institutions

There are new roles for educational institutions such as the rehabilitation of human cadres in several disciplines that serve the needs of the community; needs that have been imposed on the community by recent developments since the speed at which economic change is taking place constitutes a challenge even for developed countries, in addition to the growing role of science and technology in developing societies. The roles of higher education institutions in community service and environmental development includes a set of service roles, a set of productivity roles, a set of consultancy roles, a set of enlightening and culturing roles, and a set of educational roles.

4.3 University and community service: Levels, objectives, action pivots and implementation mechanisms

4.3.1 Levels for the role of higher education institutions in community service

There are three levels for the role of higher education institutions in community service. The *first* is the foundering role level that is achieved via the educational role, i.e. providing human cadres, and via the role of research, i.e. providing knowledge that is the basis for progress. The *second* is the evaluation role level where higher education is responsible for monitoring and assessing the movement, growth and development of society. The *third* is the executive or performance role level which is carried out via specific mechanisms, i.e. centers and units of special nature.

4.3.2 Objectives

In light of the changing careers and roles of groups in society, it became necessary to develop connections and coordinate exerted efforts of higher education institutions and the different sectors of society in addition to government agencies in order to achieve a set of objectives:

1 - Maximizing the national capacity through organizing participation and coordinating exerted efforts of institutions of thought, science, and knowledge, on one hand, and production and services institutions on the other hand.

2 - Cultural development.

3 - Economic development.
4 - Environmental development and reduction of environmental risks.

5. Expected roles of higher education institutions in community service

Our goal is to have a regional backer for every educational institution, i.e. a region with which the institution interacts and which thrives on providing environmental, social and public cultural services where the institution is the means to the development and promotion of life in this region or the back region.
The specific expected roles of these institutions in community service is summed up in their contribution in improving the quality of life and creating a well-being society through the continuous and comprehensive development of community in several areas. Some of these areas are strengthening the links between the educational system and the labor market, identifying local problems, strengthening public participation, developing different scientific and technical skills, preparing feasibility studies for economic projects, providing counseling services to certain sectors, e.g. workers and women, providing advanced employment training, being integrated with the production and service institutions, marketing innovations and research findings, following-up graduates in the labor market, preserving the environment and reducing risk, raising youth awareness of society problems, providing basic competence for all citizens to understand and use information and communication technology as means to learning, research, work and leisure, providing expertise in communication between different cultures, improving professional skills, teaching languages, and introducing foreign cultures.

6. Vision for activating the role of the Arab Academy for Science, Technology and Maritime Transport "AASTMT" in community service and environmental development

6.1 Introduction
No one can deny the role played by AAST-MT in serving, improving and developing the community. AASTMT is a monument of high scientific status. It is a pioneer in the training and education in the field of maritime transport in Egypt and Arab world as well as some African countries in addition to the various specializations of engineering, computer and information systems, management, and logistics. This confers upon its administration the burden of maintaining the status quo on one side and upgrading it on the other.
Developing AASTMT institutional performance is the first and topmost challenge that faces the Academy in light of the new environmental changes. No one can underestimate the impact of globalization and the advances in information technology and communications, among other variables on the educational process at the Academy in terms of form and content.
The only truth is that the real success of the Academy should be built on the foundations of strategic planning based on correct understanding and accurate analysis of the reality of AASTMT and its potentials. AASTMT is a pioneer in its vision, mission, and strategic objectives all of which it thrives to achieve and which reflect the ambition of its administration for a better future in the field of specialization mentioned above as well as in research and community service. It is no longer an acceptable strategic option whether to maintain the status quo of the Academy or not, rather accepting the strategic challenge to reach a better future has become a matter of fact. There is no doubt that the coordination of efforts among the colleges, institutes, service centers and the management of the Academy would be a complex process because of the need to assemble the scattered efforts in an integrated form.

6.2 AASTMT's strategic plan

AASTMT's strategic plan is based on the following assumptions:

- AASTMT has been and will remain a beacon for maritime education and training in Egypt, the Arab region and Africa through the substantial scientific, intellectual, and training contributions it made and offered to them.
- AASTMT is to keep its programs up-to-date with unprecedented academic scientific progress in the fields of science, technology, education, maritime training, research, and community service.
- AASTMT realizes that competition in the field of education, in general, and in maritime education and training, in particular, has become a reality and that the only way to deal with this competition is to develop its competitiveness.
- The demand to enroll in education programs that are part of community service programs at all levels and disciplines will remain on the rise.
- AASTMT will seek to create an educational environment that is characterized by dynamicity, challenge and the desire to excel.
- AASTMT's target progress must be achieved through the consolidation of relations with the outside community and all stakeholder parties.
- AASTMT will employ its potential human and material resources as one important element in the development of the competitiveness of the Academy and its different branches.
- AASTMT shall achieve its strategic objectives through the development of intellectual capital.

6.3 AASTMT's Colleges, Institutes and Centers

The Academy incorporates 6 main colleges: College of Maritime Transport and Technology, College of Engineering and Technology, College of Management and Technology, College of Computing and information Technology, College of International Transport & Logistics, and Graduate School of Business offering M.Sc and PhD in some specialties in addition to research and consultancy programs for executives and businessmen.

The Academy offers its educational, training, and research as well as community services through:

- The headquarters in Alexandria.
- The Academy's branches in Cairo, Upper Egypt "Asswan", Port Said, and Latakia "Syria".

Also through its sophisticated institutes and centers:

The Institutes: Productivity & Quality Institute, International Transport and Logistics Institute, Technical and Vocational Institute, Institute for Language Studies, Port Training Institute, Investment and Financial Institute, Arab Institute for Trade and Commodities Exchange, and Marine Safety Institute.

The Centers: Project Incubation Center, Industry Services Center, Marine Hotel Center, Information and Documentation Center, Multimedia Center, Computer Services Center, Computer Networks and Data Center, Research and Consultation Center, Regional Center for Disaster Risk Reduction (under construction), Arab Center for Transport Studies (under construction), and Arab Center for Media (under construction).

6.4 Technical Assistance to Developing Countries

Since its establishment in 1972, one of the main goals of the AASTMT has been to develop maritime education, training and supplementary industries on both Arab, African as well as Asian levels. One of the most important achievements in this field was the establishment of a regional centre for inland and maritime transport in Bangladesh. Additionally, participating in the development of maritime and engineering education in both Ghana and the state of Ivory Coast, providing technical assistance and human resources management to Kuwait, Saudi Arabia, Qatar, Sudan, Libya and Syria are other achievement along the same line.

Furthermore, the AASTMT offers, on an annual basis, academic scholarships to students from African Countries such as Djibouti, the Comoros, Ghana, Nigeria and others. The AASTMT also opened branches in some Arab Countries to enhance the integration of maritime and engineering training processes to comply with the international maritime requirements set by the IMO.

6.5 Specialized Institutes and Centers:

6.5.1 Institutes:

6.5.1.1 Productivity and Quality Institute (TQM)

In a sincere attempt to promote cooperation with the industry, the TQM institute has been founded introducing ISO and Total Quality concepts to the local market and demonstrating the implementation of T.Q. standards in educational institutions. The TQM now offers MSc. and PhD degrees, research and consultancy services both locally and to the whole Arab World.

As a specialized unite, it offers integrated services in productivity and quality improvement and conformance with international standards through 3 major activities: Training programs; Consultation services; and Graduate Studies.

The Institute conducts a large number of *training programs* in various fields including: Quality Management; Management & protection of environment; Productivity improvement; Managerial & financial skills; Health care & safety management; Statistical methods; Information technology; Personal & behavioral skills.

The Institute offers *consultation services* in various fields of quality improvement and total quality management, in addition to conformance with international standards.

The institute gives graduates of universities and high educational institutes of various specializations the opportunity to continue their higher educational in quality management through offering the following degree programs: Diploma, Master, and Doctorate in Quality Management.

6.5.1.2 Technical and Vocational Institute

The Academy developed its specialized center of technical studies formerly known as the Seaman Training Center. The development covered all aspects of the center including its name that changed to the Technical and Vocational Institute in order to reflect the Academy's objectives and plans. The institute provides opportunities for vocational training in various professions, in addition to technical training for Egyptian and Arab as well as African.

6.5.1.3 International Transport and Logistics Institute

The mission of the institute is to preparing management leaders to work efficiently in the field of commerce, law, transportation and logistics, providing consultation and scientific research related to commercial, industrial, and economic activities in the field of logistics and modern transportation in the frame of the sophisticated systems of Global Supply Chain, and reaching high levels of development in the art of logistics management, uni-modal and multi-modal shipping, business legal transactions, and logistics.

6.5.1.4 Port Training Institute

The mission of the Institute is to provide training and qualification opportunities for local and regional maritime transport and ports personnel.

6.5.1.5 The Institute for Language Studies (ILS)

The main objective of ILS is providing high-quality language related services to the Academy's students, staff, and Institutions as well as the Egyptian and Arab community at large. The Institute also aims at facilitating the communication with other regions in the world through providing training courses in a variety of fields like translation, editing and preparation to International Exams in: Arabic, English, French, German, Italian, and Spanish.

The Institute also provides the following academic services for Egyptian communities in Alexandria; Cairo; Upper Egypt and to Arab countries as well: Linguistic revision of correspondence, economic and feasibility studies, tenders, bids, etc., translation of correspondence and research papers in a variety of specializations such as engineering, tourism, business administration, etc, and translation and interpretation in conferences and symposiums.

6.5.2Centers:

6.5.2.1 Multimedia Center "MMC"

MMC is an integrated multimedia production house specialized in the development of educational and training multimedia courses on the internet, CD-ROM, and DVD-ROM. MMC in Alexandria is considered one of the largest specialized centers that produces interactive educational programs in the Middle East serving educational systems in the Academy and the school community in Egypt and Arab Countries.

E-Learning & E-Training Work Experience and Community services: The MMC executed a variety of training and educational projects for Kingdom of Saudi Arabia, United Arab Emirates, Kuwait, Lebanon, the UNCTAD (United Nations Conference on Trade and Development), and the UNESCO (United Nations Educational, Scientific and Cultural Organization).

One of the latest projects in the center was developing an on line (Internet) interactive school website **(www.madrastyonline.com)** for students of the Egyptian schools, covering the Egyptian subject curricula. Also developing the School Management System "Madrasty Online", which features a web-based "School Management System" that covers all aspects of student management and addresses the needs of the entire school educational enterprise.

6.5.2.2 Regional Informatics Center

To continue playing its pioneer role in informatics, which was confirmed by all services offered to Egyptian and Arab citizens, and being keen on spreading information technology in the Arab World and Africa, the Academy established the Regional Informatics Center in 2002. This Center is the first informatics center affiliated to the International Federation of Informatics in the Middle East and Africa.

6.5.2.3 Computer Services Center

AASTMT established this center to meet the needs of labor market in the fields of information technology and communications, through offering the services of training and accredited examinations to its community.

6.5.2.4 Research and Consultation Center (MRCC)

Implementing the terms of the Academy's agreement of establishment, the MRCC was established in 1984 to develop and enrich scientific research and to provide innovative consulting services, applied research studies and best practice solutions in different fields in order to promote and to support the development not only in maritime community but also to any other communities in Egypt, Arab World and Africa to reach and maintain an international level.

MRCC provides the following services in the fields of Maritime Transport and Logistics: Business development; Project planning and implementation; Economic and financial feasibility studies; Applied research and Consultation; Information Technology solution; Knowledge and technology transfer; and Engineering project management.

6.5.2.5 Regional Center for Disaster Risk Reduction (under construction)

The United Nations Secretary-General submitted his annual report to the General Assembly of the UN on the implementation of the International Strategy for Disaster Risk Reduction at its sixty-third session which was held on 10 September 2008. The report commented on the efforts and contributions of AASTMT in promoting Disaster Risk Reduction in West Asia and North African Region. UN and AASTMT signed a MOU in February 2008 which resulted in a strategic technical partnership with the Academy at regional level.

AASTMT is also partnering with World Bank in implementing regional projects on climate change adaption in North Africa. AASTMT has become a "Center of excellence" on climate change for the region.

6.5.2.6 The Integrated Simulators' Complex

The complex consists of the following Simulators, laboratories and Centers:

1- Simulators: Oil Spill Crises Management; Environment Crises Management; Ship Handling; Liquefied Natural gas "LNG" Cargo; Liquefied Petroleum Gas "LPG" Cargo; Very Large Crude Cargo Vessel "VLCC"; Oil Product Carrier Simulator "VLCC Terminal, LPG Jetty and Oil Chemical Tanker"; Global Maritime Distress and Safety System "GMDSS"; etc.

2- Laboratories: Oil analysis Lab; Environmental Lab; PC Lab; Multimedia & Audio/Video Production Lab.

3- Technical Services Centers: Development and Maintenance; Database Modeling; Geographic Information Systems; Multimedia.

4- The Complex plays an effective role in executing training and research missions to serve the Maritime Transport Sector, Petroleum sector, and State Ministry of Environmental Affairs in Egypt.

6.5.3 Programs

6.5.3.1 IGCSE/GCE Program

One of the educational activities AASTMT undertakes is offering secondary school certificate organized and supervised by Cambridge University through program that started in 1990.

6.5.3.2Community Services Programs and Continuous Education

Due to the AAST-MT's belief in the role of the educational institutions in serving the Community, it has been started offering various educational programs to service the community of Alexandria. The aim of these programs is to further develop and enhance the skills of those who did were denied the opportunity of being well qualified or distinguished in the fields of language, computing, secretarial work, aviation tickets reservation, marketing and management. These programs also grant them a chance for continuous education, and open new tracks for them to pursue other fields of specialization should they use it.
These programs start over every three months, and they are ongoing all year round. These courses attract a considerable number of those who aim at developing and enhancing their vocational skills, as well as gaining new ones. In addition, these courses are sometimes especially designed for groups of employees in a certain company or organizations. The estimated number of those benefiting from these programs, through the year, ranges from 15000 to 20000 Alexandrians. Furthermore, there are summer courses for the education of children which benefit around 5000 children. The center offers various activities and services to the customers in all fields:

6.5.3.2.1 Training

Training is provided through:

1. Long Term Programs which aim at educating and training leading to vocational certificates and diplomas.
2. Professional certificates which aim at acquiring specialized knowledge and address executives and technicians to cope with the fast development and sever competition in the field of labor market such as: various Computer Programs, executive secretary, modern and advanced accounting, marketing and sales, human resource management, computer skills, English language skills "20 levels".
3. Special programs: Due to the need for programs addressing special requirements, training was developed to take the form of special programs that help support competitive advantage through improving the performance of personnel. Those programs include:

    - Translation and Interpretation.
    - Computer and various software programs.
    - Professional banking course in insurance, financial evaluation, etc.
    - Ticketing and tourist services (Marketing and sales- Business Administration- Human Resource Management).

6.5.3.2.2Consultation

Utilizing the Community Service Center's expertise and responding to the demands of many business organizations, training, vocational, and technical consultation services came to existence, with a set of expert consultants in various fields, in addition to a selected group of qualified trainers and lecturers.

6.5.3.3 Arab International Women's Maritime Forum (AIWMF)

The mission of AIWMF is to promote female evolvement into the marine industry in MENA & Africa and empower women decision-making in full collaboration with IMO. The main objective of the forum is to function as a lobbying and advocacy body on women's concerns at the national, regional and international levels. Also, the Forum aims to build on and deepen the IMO gender mainstreaming approach, especially when addressing such challenges as the achievement of women's full participation in leadership and decision making in the maritime sector in most of Arab countries.

6.5.4 Others

6.5.4.1 International Arab forum for Maritime transport industry "A partnership between the Maritime Transport Industry & AASTMT"

The objective of this forum is to establish a unified maritime entity to serve the maritime transport industry which shall be entrusted with the task of utilizing maritime education and training to meet the needs of the regional and international market and cope with technological developments.

6.5.4.2 Supporting Job Opportunities Affairs

Supporting Job Opportunities Affairs was established in order to assist the graduates and postgraduates from different Colleges and Institutes of the Academy in finding jobs through contacting companies and foundations for vacant jobs opportunities, in addition to organizing job fair twice a year.

All these centers and sites exclusively serve the Alaexandrian, Cairen, Asswanian and Arab Countries societies both civil and maritime.

7. Proposed mechanisms for development

- The role of academia in community service must be reinforced by linking modern scientific research with the needs of the production sector and public services, and by emphasizing the need to utilize modern technology to achieve sustainable development. Thus, it is proposed to allocate places inside these academies for a number of productive and industrial companies and enterprises as their headquarters. This presence would allow cooperation between these entities with faculty members and teaching staff assistants to study the problems that face these institutions and impede their development, and then working on providing them with scientific and practical solutions.
- Joint strategic plans must be established between the organizations of society and academia to manage crises and disasters from a scientific perspective and in accordance with needed requirements and to recognize maritime academies - which is one of the systems of higher education - as expertise consultancy organizations in the field of environmental impact assessment. These academies can also be entrusted to some required studies to approve the establishment of new projects and facilities.
- Seminars should be held on the importance of water bodies and how to protect and manage them, as well as seminars on the role of women in community service.
- Academies should encourage young graduates and society youth to establish their own small and medium projects (incubators); pervade among them the concept of self-employment in all fields; and coordinate with society officials about graduates’ and youth’s training and consultancy needs

and demands in the various fields in order to attain remarkable achievements in the field of self-employment so they would become a model to follow.

- On the crisis of finding a job and the dream of employment that caress the imagination of all graduates, there should be extensive dialogues between the academies and the community about the employment of graduates. In this context, I propose that academies should pursue policies that target a rational relationship between education, training and employment in coordination and cooperation with the companies and institutions of different sectors to provide job opportunities on the basis of a direct correlation between the theoretical study and practical application.
- Intensive training courses must be prepared and held in each academy to improve the skills of its faculty members who wish to participate in the political and social arena and to prepare them well to join all election councils starting from community development associations ... etc.
- Different sources of funding should be found for these academies to support the provision of university and academic education as well as scientific research; and to ensure their quality so it would reflect positively on the services provided to the society and on the methods necessary for environment development. Therefore, coordination among businessmen, civil society organizations, companies and economic entities in the community must be established to promote the culture of social responsibility of capital and to enlighten them on how to fund academies and how to offer scientific scholarship grants that are spent in the correct paths of research and educational process in all disciplines.
- Full coordination between the community service sector, the Environment Development sector, Education and Student Affairs in maritime academies should maintained to prepare academy students to actively participate in community service and environment development.

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The Role and Impact of Piri Reis Maritime University of Turkey on MET of the Globe through the First International Mermaid Congress of MET Cadets/Academicians of the World as an İstanbul 2010 Cultural Capital of Europe Project

Osman Kamil Sağ
IAMU Honorary Fellow , Professor, Piri Reis Maritime University,
osmankamilsag@pirireis.edu.tr

Abstract Piri Reis Maritime University of İstanbul – Turkey and the National Maritime Association of Cadets of Turkey organised the very First International Mermaid Congress of Maritime Cadets at İstanbul, during May 21-25,2010. The occasion was an İstanbul 2010 – European Capital of Culture International Maritime Project uniting IMO – 2010 Year of the Seafarer and IMO Secretary General's Go To Sea Campaign Spirit with the IMO STW 41 work on the Comprehensive Review of the STCW Convention and the Code in Manila Diplomatic Conference of June 2010. The Congress had a record attendance of 586 Cadets of 42 Nationalities ,from 67 MET universities of 32 countries of the five continents of the Globe. A Joint International Statement of the 2010 International Mermaid Congress reflecting the MET Cadets' opinion on the Amendments and Resolutions of STW 41 is drafted to be declared at major MET platforms of the Globe throughout the year 2010.

Keyword *: IMO , STCW 2010 , MET Cadets, International Statement*

1. Introduction

The unique occasion of the very First International Mermaid Congress of the MET Cadets of the Globe is organised and hosted by the Piri Reis Maritime University of İstanbul-Turkey,named after the famous Ottoman Admiral and Cartographer of the XVth – XVIth Centuries, inaugurated by the Chamber of Shipping of Turkey through Turkish Maritime Education Foundation in 2008. The Co Organiser of the Congress is the National Maritime Association of Cadets of Turkey with approximately 4500 members from 18 Turkish Maritime Universities, Faculties, Colleges, Junior Colleges, and Vocational Maritime High Schools.

The First International Mermaid Congress is a İstanbul 2010- European Capital of Culture sponsored Project. The European Capital of Culture is a city designated by the European Union for a period of one calendar year during which it is given a chance to showcase its cultural life and cultural development. A number of European cities have used the City of Culture Year to transform their cultural base and, in doing so, the way in which they are viewed internationally. Conceding the view of European Parliament and approval by the Council of Cultural Ministers of the European Union on November 2006, İstanbul was announced to be the European Capital of Culture for 2010.

Maritime Projects to be accomplished within the scope of İstanbul 2010 European Capital of Culture Agency were targeted at;
Worldwide publicising of the nautical aspects of İstanbul, a city that is both United and divided by water;

Contributing to the preparation, development, and monitoring of national and international maritime projects, thereby
Transmitting Istanbul's maritime culture to the next generations.

While emphasis was made on the maritime culture of İstanbul, it was aimed that every Project and activity involved the participation of especially youth in order to create a new generation which is fond of the sea, maritime and water sports, and is sensitive on issues related to environmental and marine pollution.

The First International Mermaid Congress was elected as one of the most successful İstanbul 2010-Cultural Capital of Europe Projects among several hundred Project applications.

The philosophy and the mission of the Congress was to bring together Maritime Students and Academicians of the five continents of the Globe with different cultures and backgrounds to discuss and brainstorm the current MET issues of common interest of the Maritime Education World, and come out with solutions in the form of recommendations to be declared through a Joint International Statement in support of the Diplomatic STW Conference of Manila, Philippines in June 2010.

586 MET cadets and Academicians from five continents, 42 nationalities, and 67 MET Institutions participated at the First International Mermaid Congress which was a historical record. Overseas and Turkish participants all have been hosted at five star hotels throughout the Congress. Participants contributed to the three parallel sessions of MET, Naval Architecture, Maritime Administration/Management; took part in brainstorming, interactive workshops, and participated in the interactive Naval Architecture Boat Design Competition all during the five days of the Congress. Best presentations and life boat designs were awarded with Mermaid Congress Trophies.

All 586 participants of the Congress were taken for a boat tour of Bhosphorus, waterway separating Europe and Asia as well as sightseeing tours of touristic and historical parts of İstanbul. Overseas visitors participated in the International Maritime Cadets Festival, and attended to two Concerts/shows which were considered as the highlights of the Congress, and were enjoyed utmost by all participants.

The Congress received extremely positive feedbacks from almost all overseas participants upon their return back home. Thus, International Mermaid Congress started a Very First in the history of the World MET. Several MET Universities from all five continents volunteered to host and organise the Second International Mermaid Congress in 2011, an idea inaugurated and presented to the MET World by Piri Reis Maritime University, and National Association of Turkish Cadets. The Arab Academy for Science and Technology and Maritime Transport – one of the most developed MET Universities of the World representing the 23 members of the Arab League, situated in Alexandria/Egypy is the most likely hosts of the Congress next year in 2011.

The Joint International Statement of the Congress denoting the Brief Review of the World MET Cadets/Academicians perspective on STW 2010 Amendments and Resolutions is already presented by the Author [1] , [2] in Tokyo to the Japan Ministry of Land, Infrastructure, Transport, and Tourism Delegation to the Diplomatic Conference in Manila as well as at the STW 2010 Diplomatic Conference of IMO in Philippines in June 2010. Following the presentation of the Joint International Declaration of İstanbul 2010 at Busan Korea at the IAMU Conference, declaration of the Joint Statement of the International Mermaid Congress will be carried out at IMLA Conference[3] at Shanghai Maritime University of P.R. China in October 2010.

2. MET Issues of common interest raised and discussed at the Cadet Workshops

2.1 Seafarers Examination System for the Certificate of Competence (COC) – Oral / Written Examinations

More importance should be given in MET to oral examinations as they provide cadets with an opportunity to use their communicative skills. Standardized objective criteria of evaluating the cadets performance should be implemented. Furthermore, there should be one standardized international examination which is taken by everyone. cadets may not have the language skills to take a standardized test. Even some lecturers lack the level of English to successfully complete the examination.

2.2 Attracting New Entrants and Retaining Officers in the Sector

Salaries of officers should be increased and more social facilities should be provided for the officers as cadets believed that under the current economic conditions, an increasing number of seafaring officers are attracted primarily by the economic incentive versus any great attraction to the life at sea. The ILO MLC 2006 provisions regarding salaries should be extended to include officers.

2.3 E-Learning and Distance Learning Applications in MET

MET e-learning and distance learning applications are beneficial since they are time-saving. However, e-learning is not always practical because internet connections on board are rare and expensive.
E-learning can never replace books and in-class learning and the human touch entirely, but rather e-learning should be considered as an enhancement to distance learning.

2.4 Developing Web-based Networks of MET Institutions

It is necessary to develop web-based networks that give information about MET institutions and provide an opportunity to discuss problems that MET cadets have. Also an international foundation of maritime cadets should be established.

2.5 Shortage of Officers with Seafaring Background for Shore Duties

The salary of shore officers should be increased to ease the shortage of officers with seafaring background for shore duties. Collaboration with shipping companies will also improve this situation.

2.6 University Degree Essentials in MET

English and practical maritime-related skills are the essentials in MET. Training programmes are not enough. University degrees are essential for career progression.

2.7 Shortage of Seafaring Officers – Feasible Solutions

Seafarers need more opportunities to practice and gain experience. Ship owners must invest more funds in education. The mobility of seafarers internationally should be improved by relaxing government regulations on who can serve where.

2.8 Improving Human Performance Onboard

The basic problems are the shortage of qualified sea officers, financial issues, employers' indifference to crew's well-being, and the high cost of hiring people from Western Europe. Possible solutions include improving the life standards and facilities on ships through improved access to the internet, and psychological support.

2.9 Standardization of Onboard Training

When countries are compared, on the global scale, the systems are nearly the same with some differences in terms of facilities and education/training systems and their duration.

2.10 Mutual Use of Simulator Facilities and Training Vessels

Although there is rather limited availability, the simulators are very helpful. The cadets request more simulators and more frequent utilisation opportunity since theory must be accompanied by practice. For some countries, the training period should be longer, as they need more practice and experience in real life situations. Cadets must serve on some kind of real vessel to gain real practice. In-class and simulator experience doesn't replace real ship-board experience.

2.11 Applying Workshop Skills Training Ashore or On Board

The adequacy of workshops depends on the needs and expectations of people. There was no unanimous view on which kinds of workshops are most helpful.

2.12 Regimental System, Discipline, Uniform – The Cadet Perspective

Overall, this is a cultural topic – some cultures accept uniforms as standard, and essential, while others reject uniforms in educational academies altogether.
Most of the cadets shared the idea that a regimental system should be applied to build up discipline on board where cadets from various origins and backgrounds come together. It was also mentioned that it is essential to wear uniforms at school and on board to ensure discipline. On the contrary, one of the cadets didn't agree with the other cadets, saying that there is no need to have a regimental system as strict as the military regimental system.
Wearing a uniform helps in the classroom to create a feeling of being on a team, and a uniform commands respect, and encourages students to respect each other.
Regimental structures made a great difference in discipline in classrooms in Bulgaria. When the regimental system was removed from the merchant marine students, discipline suffered.

2.13 Expectation from Ship Owners – Accommodation Provisions for Trainees

Cadets agreed that they should have their own cabins. More recreational facilities should be provided for them. The cadets feel that onboard management should pay more attention to them and it should always be remembered that they are cadets, not officers or experienced seafarers. Ship owners should ensure their training/working conditions onboard and provide more opportunities for cadets to get a chance to go on board vessels as is their right.
Practical ways should be found to obligate ship owners to provide positions for cadets, such as involving ship owners in determining the number of cadets accepted into maritime education institutions, in exchange for their agreeing to provide them opportunities for experience at sea.

2.14 Internal and External Communications Onboard, Oral and Written

Nearly all of the cadets in this discussion group agreed that there should be a standardized examination for oral skills, and ship officers on board should communicate correctly as they are required to lead the cadets to use it correctly, too. An oral examination in Maritime English has to be mandatory in all countries. It is very important to have a global solution to internal and external communication problems.

3. Joint International Statement of the International Mermaid Congress of İstanbul 2010, European Capital of Culture

RECALLING the draft amendments to the International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (the STCW Convention) and its associated Code, and that such draft amendments have been approved by the Sub-Committee on Standards of Training and Watchkeeping (STW);
FURTHER RECOGNIZING that the proposed amendments are historically significant in that they are the very first major revisions of the two instruments since their adoption in 1995, this following on the original 1978 Agreement;
CONSIDERING that fraudulent certification of STCW training endangers lives, ships and cargo, and exemplifies the substandard level of professionalism from which the MET community wishes to distance itself;
RECOGNIZING that true compliance with the Convention and its Code can only be achieved by an effective standardized auditing process (internally or externally, performed by recognized monitoring agents affiliated with competent and authorized bodies);
CONSIDERING safety at sea and maritime productivity require mariners to be in good health, and that accidents, incidents and even fatalities have been attributed to seafarers suffering from poor health;
RECOGNIZING basic competencies among able seafarers are too often missing on deployment and relevant, enhanced skill sets are needed;
ACKNOWLEDGING that current MET requires an inordinate amount of time for celestial navigation lessons when it is believed that more attention should be paid to the more technologically relevant automatic radar plotting aids and radar use skills;
RECOGNIZING that while marine environmental training has increased significantly in some quarters of the industry, effective training in this area is not yet widespread enough;
SUPPORTING THE STANDPOINT that leadership and teamwork are crucial to promote for MET to improve shipboard management;
ACKNOWLEDGING inadequately controlled congested seaways pose significant risks to shipping and the environment;
SUPPORTING THE STANDPOINT THAT it is critical to protect the health and future of our marine environment;
RECOGNIZING the need for clear enforceable near-coastal requirements;
CONSIDERING modern ship technology places high demands on marine engineers, yet current MET does not address this adequately;
RECOGNIZING the changing role of radio operators;
UNDERSTANDING the need for specialized knowledge is a reality in increasingly specialized ship designs and functions;
RECOGNIZING shipboard manning reduction trends demand complete attention of seafarers to perform tasks at hand, and that not all training can take place shipboard;
CONSIDERING that seafarers face dangers not only from the industrial setting and weather risks inherent in their environment, but also from increasing risks associated with terrorism and piracy;
And TAKING INTO CONSIDERATION the majority of shipping accidents can be attributed to human error, including a substantial number caused by alcohol use, drug use, and insufficiently rested crew;

IN SUPPORTING the Sub-committee's proposed amendments to the STCW Convention;
THE 586 MARITIME EDUCATION AND TRAINING STUDENTS/CADETS AND ACADEMICIANS FROM 67 MARITIME INSTITUTIONS FROM 32 COUNTRIES ASSEMBLED FOR THE PROCEEDINGS OF THE INAUGURAL 2010 INTERNATIONAL MERMAID CONGRESS IN ISTANBUL, 2010 EUROPEAN CAPITAL OF CULTURE, HEREBY SUPPORT THE PROPOSALS:

RECALLING CHAPTER 1, - AS REGARDS GENERAL PROVISIONS, THAT

1. measures to prevent fraudulent practices associated with competency certificates be improved;
2. the evaluation process of the Convention compliance be strengthened; AND
3. seafarers' medical fitness standards be heightened and applied uniformly.

WE FURTHER RECOMMEND, RECALLING CHAPTER 2- AS REGARDS THE MASTER AND DECK DEPARTMENT, THAT

1. certification requirements for able seafarers be updated to be in line with current required skill sets;
2. MET navigation training requirements be changed to favour modern technology such as automatic radar plotting aids and radar application, over outdated methods such as celestial navigation;
3. greater focus be given to effective marine environment awareness training for pre-service and in-service mariners;
4. MET include standardized leadership and teamwork courses; AND
5. awareness of the importance of vessel traffic services be promoted.

WE FURTHER RECOMMEND, RECALLING CHAPTER 3 - AS REGARDS THE ENGINE DEPARTMENT, THAT

1. near-coastal requirement regulations be clarified;
2. greater focus be given to effective marine environment awareness training for pre-service and in-service mariners;
3. MET include standardized leadership and teamwork courses;
4. competencies for engineers be modified in line with contemporary professional requirements; AND
5. there be improved certification requirements for able (engine) seafarers.

WE FURTHER RECOMMEND, RECALLING CHAPTER 4 - AS REGARDS RADIO COMMUNICATIONS AND RADIO PERSONNEL, THAT

1. Radio Communications and Radio Personnel be renamed Radio Communications and Radio Operators; AND
2. such chapter be updated to reflect current regulations including reference to the International Aeronautical and Maritime Search and Rescue (IAMSR) Manual.

WE FURTHER RECOMMEND, RECALLING CHAPTER 5 - AS REGARDS STANDARDIZING SPECIAL TRAINING REQUIREMENTS FOR PERSONNEL ON CERTAIN KINDS OF SHIPS, THAT

1. specialized requirements be developed for seamen serving on board specific types of tankers, notably liquefied gas tankers; AND
2. regulations for personnel on "ro-ro passenger" and "passenger ships" be combined to cover all "passenger ships".

WE FURTHER RECOMMEND, RECALLING CHAPTER 6 - AS REGARDS EMERGENCY, OCCUPATIONAL SAFETY, SECURITY, MEDICAL CARE AND SURVIVAL FUCNTIONS, THAT

1. where training cannot be adequately conducted, new security training requirements be developed; AND
2. there be training specific to anti-piracy defence.

WE FURTHER RECOMMEND, RECALLING CHAPTER 7 - AS REGARDS ALTERNATIVE CERTIFICATION, THAT

1. changes to other chapters be reflected within this chapter

WE FURTHER RECOMMEND, RECALLING CHAPTER 8 - AS REGARDS WATCHKEEPING, THAT

1. requirements be updated and expanded regarding hours of work and rest; AND
2. there be new requirements for the prevention of alcohol and drug abuse.

DRAFT RESOLUTIONS
We, the assembled at the May 2010 International Mermaid Congress in Istanbul, do also hereby express our support for and acknowledgement of the Sub-Committee in its approving for submission to the Manila Conference 2010 thirteen draft resolutions relating to:

1. The contribution of the International Labour Organization (ILO);
2. The development of guidelines to implement international standards of medical fitness for seafarers;
3. Revision of model courses published by the International Maritime Organization;
4. Promotion of technical knowledge, skills and professionalism of seafarers;
5. Attracting new entrants and retaining seafarers for the maritime profession;
6. Promotion of technical cooperation;
7. Transitional provisions and early implementation of the revised STCW Convention and Code;
8. Promotion of the participation of women in the maritime industry;
9. Accommodation for trainees aboard ships;
10. Verifications of certificates of competency and endorsements;
11. Standards of training and certification and ship's manning levels;
12. Future amendments and review of the STCW Convention and the Code;
13. Recommendation of measures to ensure the competency of masters and officers on ships operating in polar waters.

BE IT RESOLVED ON THIS DATE THAT IN SO DECLARING THE ABOVE, we the assembled bring forth the mutual sense of the 586 MET students/cadets and participating academicians of 67 maritime universities/maritime education institutes from 5 continents, 32 countries, representing 41 nationalities in attendance at the inaugural 2010 International Mermaid Congress held in Istanbul in May. We, the undersigned, are of great diversity in origin but of one mind in resolution as to our support, a singular beacon of hope for smoother seas in our global human community.
Signed on behalf of the assemblage mentioned heretofore,

4. Participant Universities of the First International Mermaid Congress

Institution	Country
Admiral Makarov State Maritime Academy	Russia
Admiral Ushakov Maritime State Academy (AUMSA)	Russia
Antwerp Maritime Academy	Belgium
Arab Academy for Science & Technology and Maritime Transport (AAST -MT)	Egypt
Australian Maritime College	Australia
Bahçeşehir University, Maritime Junior College	Turkey
Batumi State Maritime Academy	Georgia
Constanta Maritime University	Romania

Danish Maritime University (DAMARU)	Denmark
Naval Academy	Turkey
Dokuz Eylül University, Maritime Faculty	Turkey
Ecole Nationale de la Marine Marchande (ENMM) de Nantes	France
Fisheries and Marine Institute of Memorial University of Newfoundland (FMIMUN)	Canada
Galatasaray University Maritime Junior College	Turkey
Gdynia Maritime University (GMU)	Poland
Girne American University	NRNC
Ho Chi Minh City University of Transport (HCMC-UT)	Vietnam
Hochschule Wismar University of Applied Sciences - Technology, Business and Design (HSW-UTBD)	Germany
Istanbul Technical University Faculty of Naval Architecture and Ocean Engineering	Turkey
Istanbul Technical University Junior College	Turkey
İstanbul University	Turkey
Italian Maritime High School	Italy
Jade University of Applied Sciences WOE	Germany
Karadeniz Technical University Faculty of Marine Sciences	Turkey
Kobe University	Japan
Kocaeli University Karamürsel Maritime Junior College	Turkey
Kocaeli University Yıldız Bilge Barbaros Maritime College	Turkey
Korea Maritime University	Korea
Latvian Maritime Academy	Latvia
Mapua-PTC College of Maritime Education and Training (CMET)	Philippines
Mersin University Maritime Junior College	Turkey
Massachusetts Maritime Academy	United States
Mokpo Maritime University	Korea
Netherlands Maritime University	Netherlands
Newcastle University	United Kingdom
Nicola Y. Vaptsavov Naval Academy (NYVNA)	Bulgaria

Odessa National Maritime Academy (ONMA)	Ukraine
Odessa National Maritime University (ONMU)	Ukraine
Ordu University, Fatsa Faculty of Marine Sciences	Turkey
Ortadoğu Technical University	Turkey
Ovidius University	Romania
Özel Eryetiş Reis Maritime Vocational High School	Turkey
Pendik Anadolu Maritime Vocational High School	Turkey
Piri Reis Maritime Vocational High School	Turkey
Piri Reis University	Turkey
Rize University Turgut Kıran Maritime College	Turkey
Satakunta University of Applied Sciences (SUAS)	Finland
Shanghai Maritime University	China
Szczecin Maritime University (SMU-P)	Poland
Technical University of Catalonia Barcelonatech	Spain
The Baltic Fishing Fleet State Academy	Russia
Tüdev Maritime Training Center	Turkey
Uludağ University Gemlik Asım Kocabıyık Maritime Junior College	Turkey
University of Athens	Greece
University of Cantabria - Escuela Tecnica Superior de Nautica (UC-ETSN)	Spain
University of Greenwich	United Kingdom
University of Ljubljana	Slovenia
University of Rijeka	Croatia
University of Rostock	Germany
University of Strathclyde, Glasgow	United Kingdom
Varna Technical University	Bulgaria
Yakın Doğu University Maritime Faculty	TRNC
Yalova Üniversitesi Yalova Maritime Junior College	Turkey
Yıldız Technical University Maritime and Naval Architecture Faculty	Turkey
Ziya Kalkavan Maritime Vocational High School	Turkey
Zonguldak Karaelmas University Maritime College	Turkey

5. Conclusion

International Mermaid Congress , an İstanbul 2010 Cultural Capital of Europe Project , organised and hosted by Piri Reis Maritime University of İstanbul – Turkey and National Association of Turkish Maritime Cadets, and sponsored by the Turkish Chamber of Shipping and several other members of the Turkish Maritime Sector achieved a very first in the history of World MET.

586 MET Cadets and Academicians from 5 continents, 42 Nationalities, and 67 MET Institutions participated in the Congress and took part in brainstorming, interactive workshops ,and declared a Joint Statement denoting the World MET cadets' opinion on the Amendments and Resolutions of STW 41 drafted to be declared at major MET platforms of the Globe throughout the year 2010 denoting their support to the outcome of the IMO Diplomatic Conference in Manila, Philippines.

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Transforming Maritime Education: Local Decisions in Global Perspective

Boyan Mednikarov
Capt. (BuN), DSc, Professor, "N. Y. Vaptsarov" Naval Academy, bobmednikarov@abv.bg
Kalin Kalinov
Cdr., PhD, Associated Professor, "G.S. Rakovski" Defence and Staff College – Naval Department, va_vms@yahoo.com
Nedko Dimitrov
Cdr., PhD, Assistant Professor, "N. Y. Vaptsarov" Naval Academy, dimine@abv.bg

Abstract Remaining dynamic and highly unpredictable, the modern maritime environment is getting more complex in the sense of being multidimensional. The traditional understanding of maritime environment as a specific area for transportation, fishing, and recently petroleum extraction, has changed significantly. The processes of globalization combined with the economic development give rise not only to new maritime activities, but also to the spreading out of the maritime domain deeply "on shore". As a result, a number of partly contradictory tendencies have emerged: narrow specialization and global management; multiagency involvement and standardized procedures; economic freedom and unified safety and security system. In line with the "good sea practice", maritime education is to be the integral component in the whole maritime domain. The real challenge of maritime education transformation is to provide common understanding, unified policy and standardized procedures in a multidimensional and multiagency environment. Presenting the conceptual framework for Bulgarian maritime education transformation, the paper stresses on cooperation among different national and international universities and agencies. The challenging role of the maritime academy in this "dispersed" educational system is to keep the integrity of the system and to provide commonality of the education. A special attention is paid to the problems of maritime safety and security education and training.

Keyword: *Maritime environment, Maritime education, Transformation, Maritime Safety and Security, Multidimensional and Multiagency environment.*

1. Introduction

Due to many reasons Bulgarian maritime domain recently is a subject of a process of radical transformation.

Some aspects of this process are spontaneous and driven predominantly by economic reasons. Traditionally these aspects are taken for granted and assumed to be environmental factors.

The second group of aspects is much "variegated" and is related to the objectives and policies of the maritime system's components. These aspects are considered to be relatively steerable and their management is regarded to be the very core of the transformational process.

Not going deeply in the tempting topic of "what in fact maritime transformation is", the paper addresses problems of the role of maritime education in preserving the integrity of the national maritime system[1].

[1] It is necessary to provide a definition for a national maritime system. For the purpose of the study the following one is applicable: the national maritime system is an aggregation of organizations which functioning is directly related to the maritime environment. The following considerations are to be added: (1) The maritime system is "naturally originated", that means that it is rather "a motive driven system" than "a goal driven system"; (2) The common motive of the system is an achievement and maintenance of a dynamic equilibrium among the components' goals; (3) The system's components are two types by origin – artificial (goal-driven) and natural (motive driven). The first group of components are established and

An investigation on the recent Bulgarian maritime situation development[2] reveals a set of partly contradictory tendencies:

1. Narrow specialization of maritime activities and global management of the branches.
2. Multiagency approach in processes management and necessity of standardized procedures.
3. High degree of economic freedom and establishment of a unified safety and security system.

These tendencies are typical not only for the area of maritime activities, neither they are brand new. Actually, evidences for the processes mentioned above can be traced back in the past. But the recent dimensions of the tendencies bring about new nuances of fragmentation of the maritime system, spontaneous interaction among components and lost of integrity of the maritime system (MS) as a unity.

In such circumstances the question about harmonization of the processes in the maritime domain is of vital importance.

Problems of the harmonization are directly related to the integrity of the system, which, in turn, is traditionally achieved by means of system centralization. This approach is traditional, partly valid, but predestinated to failure in a long term perspective[3].

Recent development of the organizational theory proposes an interesting concept for enhancement the integrity if the system, i.e. the concept of heterarchical[4] organizations. The idea for heterarchical organizations is a further elaboration of the idea of the so called multi-dimensional organizations, i.e. organization which structure is developed in result of multicriteria optimization, based on several (more than one) functions or goals.

Based on the aforementioned assumptions, the paper proposes some ideas for enhancing the system integrity in the environment of decentralized MS management.

2. Tendencies in the maritime domain

The global tendencies in the maritime domain are of particular interest for the study.

The **first global tendency** is one of the most tangible aspects of globalization: **the increasing role of the automation of the processes and subsequent tendency for professionalization of the activities**. Such a combination of automation and professionalization results in the following opportunities:

- formation of differentiated carrier fields;
- emergence of a managing personnel without a proper professional career development[5];
- the increasing part of maritime activities, especially logistics and management activities, are located “on shore”;
- increase of the number of specialists necessary for proper functioning of a maritime organization;
- necessity of a common understanding of the problematic maritime activities and necessity of unified procedures and technologies.

Taking into account that the professionalization of maritime activities is the foundation of the processes in the maritime domain, the **second global tendency** is in a way resultant from it: **the establishment of a multiagency environment for maritime activities**. Very often functions, interests and responsibilities among different organizations in this environment overlap and, as result form an environment not only for cooperation, but also for competition. Both activities (cooperation and competition) require regulation, establishment of common rules and common values.

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sustained for the purpose of particular function performance. Typical representatives are the Navy, the Border Police, the Maritime Administration, etc. The second group is originated predominantly because of the existence of an “economy niche” suitable for doing business; (4) The word “national” in the definition is added because of the restriction of the study to the Bulgarian maritime organizations, independently of their international relations.

[2] The investigation is performed by the group of experts from Bulgarian maritime institutions in 2009 and 2010. The results of the scientific research are presented at the Fourth National Scientific Conference “Bulgarian Maritime Education and Training” – BulMET 2010 held at “N. Y. Vaptsarov” Naval Academy, Bulgaria, Varna, 17.06.2010.

[3] The idea of limited capacity of the centralized management is provoked by Schwaninger M. A Theory for Optimal Organization [6].

[4] A good understanding for the term “*heterarchy*” is provided by Eberhard Von Goldammer, Joachim Paul and Joe Newbury. Heterarchy and Hierarchy -- Two Complementary Categories of Description. [2].

[5] A typical example is a financial manager in a maritime organization. Usually the financial manager “enters” the system without a sufficient professional career throughout the hierarchy of the maritime activities.

The **third global tendency** is classically related to **the enlargement of the maritime activities geographically**. This process has two aspects:
- integration of the maritime systems of different countries;
- mutual "penetration" of considered to be different and separate for a long period of time "pure maritime" activities with "pure terrestrial" ones.

It has to be underlined that this tendency results in the already mentioned consequences of the first global tendency and especially in "on shore" location of maritime activities and enlargement of the number of specialists necessary for proper functioning of a maritime organization. Taking into account that the tendency of the professionalization of maritime activities relatively precedes and provokes the tendency of geographical enlargement, the existence of such "a reinforcing loop" of increasing professionalization because of geographical expansion is a clear evidence, not only of an iterative nature of the processes in the maritime domain, but also of the progressive and irreversible development of the global tendencies.

Notwithstanding the importance of the progressive development of the global tendencies in the maritime domain, one possible aftermath of mutual "penetration" of considered for "pure maritime" activities and "pure terrestrial" ones is of particular interest for the study: the inevitable "clash" between, on the one side "well arranged terrestrial thinking", and on the other – the traditional "freedom of maritime thinking" and related "exterritoriality" of the activities.

Obviously there is one more challenge to the MS integrity resulting from the confrontation between clear distribution of the responsibilities and areas on shore and traditional "exterritoriality" at sea. It is expected that the most tangible aspect of this confrontation will be in the area of maritime safety and security (MSS).

In fact, **the fourth global tendency** can be defined in the area of maritime safety and security: **establishment of a common maritime safety and security system**. This tendency should not be fragmentary considered as an agreement of common MSS procedures and centralized management of MSS matters only. It should be transferred to the traditional maritime "exterritorial acceptance" of the safety and security problems, generally expressed by the understanding of necessity of a national engagement in hot spots, like the Gulf of Aden, regardless the distance.

In other words, the tendency for establishment of a common maritime safety and security system poses a significant challenge on solving the controversies between maritime "global thinking" and the existing political frameworks.

3. Challenges to the maritime educational system

Without going in details, the multidimensional challenges to the maritime system can be summarized in preserving the "good sea practice" in the dynamic environment of maritime activities.

The practical aspect of the problem is to preserve the integrity of the MS.

In the multiagency and multidimensional environment for maritime activities, the role of the maritime education is the core of the system where the "good sea practice" is generated on the basis of MS components' common motives.

In order to formulate practical recommendations for the transformation of the maritime educational system[6] (MES), we are to answer the question how the MES reflects the global maritime tendencies.

Before answering the question, let us provide short description of the MES.

MES is a complex of educational institutions, their programs, curricula and courses. Some authors add that the MES is a subsystem, on the one hand of the MS, and on the other - of the national educational system. The statement is generally correct but incomplete. The definition lacks systematical understanding. The paper comments on three aspects of systematical understanding of the MES.

Firstly, any system possesses a managing body. Unfortunately, MES suffers lack of clear understanding about the managing body. Something more, being a part of the managing body, some of the MES components do not understand their role and the scope of their responsibilities and accountabilities. The lack of clear understanding about the managing body is often accompanied with

[6] It should be noted that despite addressing maritime education, we consider education and training matters to be inseparable.

the false sense of being in charge of some of the existing components. As a result, MES faces significant problems with:
- establishment of a common goal;
- elaboration of a long-term strategy;
- maintenance of synchronized functioning of the components.

In addition, MES suffers permanent financial problems.

The next aspect of systematical understanding of the MES is the lack of understanding of the “dual membership” of the components. Actually, the fact that some of the components belong to more than one supra-system is partly accepted, but only in the sense of being subject to more than one law, different financial systems etc. Additional attention is to be paid to the inevitable status of “multiple citizenship” of some of the MES components. This “multiple citizenship” is typical to the peripheral components and to networks and its misunderstanding very often leads to misbalanced system decisions, especially from a financial point of view.

The last aspect of systematical understanding of the MES is the narrow comprehension of the MES purpose. Traditionally the purpose is defined as follows: maritime education is a specialized education of the maritime personnel. It is possibly to add some trends as “wide spectrum of activities”, “professional qualification” etc. The problem is that the proposed definition suffers narrow specialization.

The “systematic” role of the MES is to provide prerequisites for self-reproduction and self-maintenance[7] of the MS. In the very core of this purpose is the idea of providing prerequisites for adaptation of the MS to the dynamics not only in the maritime environment, but also in the processes within the system. The difference is that the second definitions reveals the necessity of a wide variety of feedbacks and stresses the necessity of “dispersion” of the educational functions among all MS components.

The second trend has a powerful theoretical and practical charge. In fact the necessity of “dispersion” of the educational functions among all MS components means that the MS and the MES are not different systems. They are different views on one and the same system.

Even though theoretical in nature, the problems of understanding of the systematic nature of the MES pose a significant difficulty for MES practical transformation. In fact, the Bulgarian MES has not been changed in the last two decades, it has only been amended to answer the requirements of the IMO or the EU[8].

Let us summarize and formulate the **“systematic” problems to the MES**:

1. There is not a clear understanding of the management of the system and the distribution of management responsibilities and accountabilities in the MES.
2. There is a lack of balanced system decisions that takes into account the membership of the MES educational components to different supra-systems. The consequent problems are most tangible in the financial sphere.
3. There is a lack of understanding that the purpose of the MES is to provide prerequisites for self-reproduction and self-maintenance of the MS. Practical dimensions of the problem are related to the necessity of:
- wide variety of feedbacks;
- “dispersion” of the educational functions among all MS components.

In general, there is a basic theoretical challenge: how to elaborate and apply a “systematic” decision in “non-systematic” environment.

Before proposing a solution, let us consider the way MES reflects the global maritime tendencies.

The reflection of the global processes is presented as two priority directions for transforming the MES.

The **first group of priorities** is related to **updating the maritime education**. The specific activities are:
- balancing the necessity of a wide spectrum education with practical and focused professional specialization;

[7] For more information see Mednikarov B. and K. Kalinov, “An alternative of the system approach to functional aspects analysis of the Maritime Crisis Management System” [5].

[8] The real problem is not the lack of changes. The problem is that being different views of one system, MS and the MES behave differently in the last two decades. In contrast to the radical change of the Bulgarian MS, the MES underwent a sporadic and politically driven reform.

- adaptation of the education of "non-maritime" specialists to the specifics of the maritime education;
- updating and adaptation of the rather basic technical maritime education to the requirements of the different management levels in maritime affairs.

Accomplishment of these activities is to be closely related to the peculiarities of the national educational system and to the traditions of maritime education.

In fact the problem of preserving the traditions is of vital importance for the **second group of priorities**, aimed **at preserving the integrity of the system**:

- generation of a common understanding of the aspects of maritime activities;
- establishment of a potential of knowledge for elaboration of common maritime policy;
- formulation of common standards for unified management processes and (when possible and necessary) management and technical procedures.

Obviously the idea of the MES transformation requires a profound development. For that reason the paper presents only a conceptual framework of the MES, focusing on the following aims:

1. Provision of a continuous education of the maritime specialists.
2. Establishment of a multicomponent MES.

Additional requirements to the system are:

1. Possibility for integrating the education of the maritime and "non-maritime" specialists for the purposes of maritime affairs.
2. Integration of MS components' efforts considering their interests and potential.

Issues, related to generation of a common understanding of the aspects of maritime activities and establishment of a potential of knowledge for elaboration of common maritime policy are considered to be secondary. It does not mean that they are of a lower priority. The aim is to achieve them by providing structural prerequisites in the MES organization for establishment of the desired system properties.

Finally, the issue of formulating common standards for unified management processes and (when possible and necessary) management and technical procedures is considered to be a priority of educational programs.

4. Possibilities to establish an adaptive maritime educational system

The most difficult objective of system engineering is the process of transforming theoretical principles into practical recommendations in the context of a given environmental status for the purpose of achieving a desired system functioning.

Taking into account that the formulated tendencies and the suggested priority activities are predominantly a mixture of the environmental status and the desired system functioning, let us introduce briefly the theoretical foundations of the proposed structure of the Bulgarian MES.

Not going into details, three ideas deserve to be presented:

1. The idea for the heterarchical organization of the MES.
2. The concept of adaptiveness.
3. The notion of fractal dimension of management functions and the related structures.

The idea for the **heterarchical organization** of the MES is based on the assumptions that

- on the one hand, comprehension that the MS and MES are different views on one system, and
- on the other hand, there is a need for "dispersion" of the educational functions among all MS components.

The practical dimension of the idea for heterarchical organization of the MES can lead to the establishment of a network-based MES able to transform the common motives of system's components into a common educational policy based on common educational goals.

The **concept of adaptiveness** is based on the assumption that the educational process serves the function of system adaptation [4, pp. 25-30].

On the other hand, despite being a process of setting and maintaining desired behavior, the management process is based on reactions [3].

Notwithstanding that two concepts overlap, they pose some distinguishable requirements and some additional explanations are necessary.

Assuming that education is a process of adaptation, we have to take under consideration that "adaptation takes place on at least three different levels" [1, pp. 292-294]. Based on this, we have defined three levels of system adaptiveness: short-term adaptiveness, long-term adaptiveness, and evolutionary adaptiveness.

Short-term adaptiveness is a process of adaptation to the current situation. It is therefore a process of direct and situationally-oriented adaptation. It is performed predominantly by the way of functional adjustment. The process of functional adjustment is very often related to selection of a functional model (scheme) that is relevant to the situation.

Long term adaptiveness is a process of adaptation to relatively predictable future conditions of the environment. In addition to the functional adjustment, it is performed by elaboration of structural prerequisites for functional adjustment to possible future situations. The practical execution of this process usually includes: making prognoses; analysis of possible situations; and elaboration of adequate reactions.

The evolutionary adaptiveness is observed in unpredictable situations. It is therefore performed by elaboration of structural prerequisites for the necessary system's properties for adaptation in cases of unpredictability or, in other words - emergency.

It is a good idea to make a parallel between, on the one hand, the three levels of adaptation, and on the other – the three levels of management (tactical, operational and strategic). Going one step further, we can state to a great extent of certainty that the maritime educational process has to provide prerequisites for the three types of adaptiveness[9].

As already mentioned, there are three typical levels of management: tactical, operational and strategic. They can be briefly described as follows:

1. Strategic management is responsible for formulating a long-term organizational policy. Generally it is related to the mission and desired end state formulation.
2. Operational management is a process of preparation, performance, and control of the processes that transform different types of resources into a desired product through applying a particular strategy. Typically operational management is an elaboration of a given set of objectives that define the strategy.
3. Tactical management is a process of estimating the peculiarities of the situation and achieving a specific strategic objective. Inseparable part of the tactical management is the process of selection of the proper procedures for successful accomplishment of a certain activity in the specific circumstances.

Given high level of specialization and repeatable technological processes we can add one more management level: technological (or operating). Technological management in fact "materializes" the tactical management. It can be defined as a process of direct management of typical activities and standards.

It should be noted that very often technological management is not considered to be management, but manufacturing procedures. We do not make e clear distinction between management and manufacturing activities because of the following reasons:

- maritime system tends to be network organized and heterarchical which means that not only the management, but also the manufacturing activities are "dispersed" among the components;
- the high rate of automation of manufacturing activities turns them into a management of technological systems.

Having in mind the above, we can present **the notion of fractal dimension of management functions and the related structures**. Without going into details, we can state that the proper functioning of an organization requires a "self-similarity" between any two neighboring in the hierarchy management levels. The self-similarity property directly affects system's functioning which, in turn, results in fractality (self-similarity) of the structures. The idea of fractality is to provide a fluent transition from the higher hierarchical level's decisions to a lower hierarchical levels' performance.

General model of the desired system for maritime education and training (E&T) is presented on Fig. 1.

[9] For more details concerning the idea of making a parallel between, on the one hand, the three levels of adaptation, and on the other – the three classical levels of management see *Boyan Mednikarov, Nikola Stoyanov and Kalin Kalinov Challenges to Education and Training in the Field of Harbour Protection Security. Maritime Transport & Navigation Journal, Vol. 1 (2009), No. 1.*

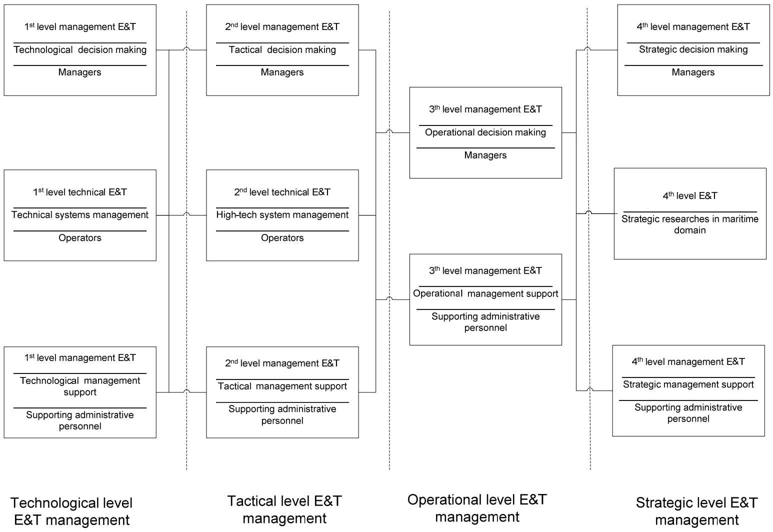

Fig. 1 Levels of education and training of the maritime personnel

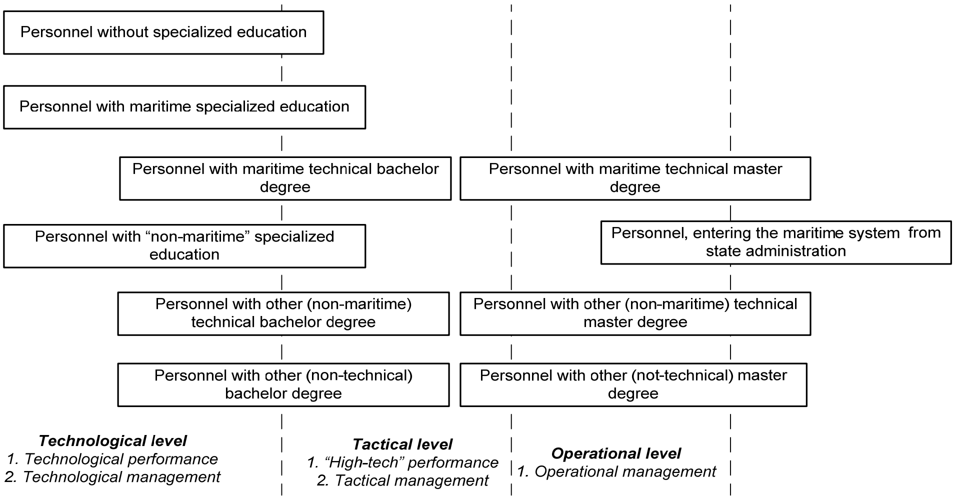

Fig. 2 Allocation of the personnel on different MS hierarchical levels according the education obtained (Current status)

Taking into account that the reactions to a situation are a composition of acquired experience and theoretical preparedness, the E&T main points of the proposed model at different E&T levels are:

1. Technological E&T level is to provide behavioral models for performance of standard functions. The educational process is closely affected by the existing technological basis.
2. Tactical E&T level is to provide behavioral models for adequate reaction to a standard situation. It is more management oriented than the Technological E&T level. An exception is the technical orientation of the education for high-tech systems operators.

3. Operational E&T level is to provide a wider range of behavioral models for recognition of the peculiarities of a given situation and includes the ability to set objectivities for achieving a goal in a dynamic context.
4. Strategic E&T level is to provide general behavioral models applicable for wide range of situations and includes the ability to formulate missions and supporting goals for long-term management.

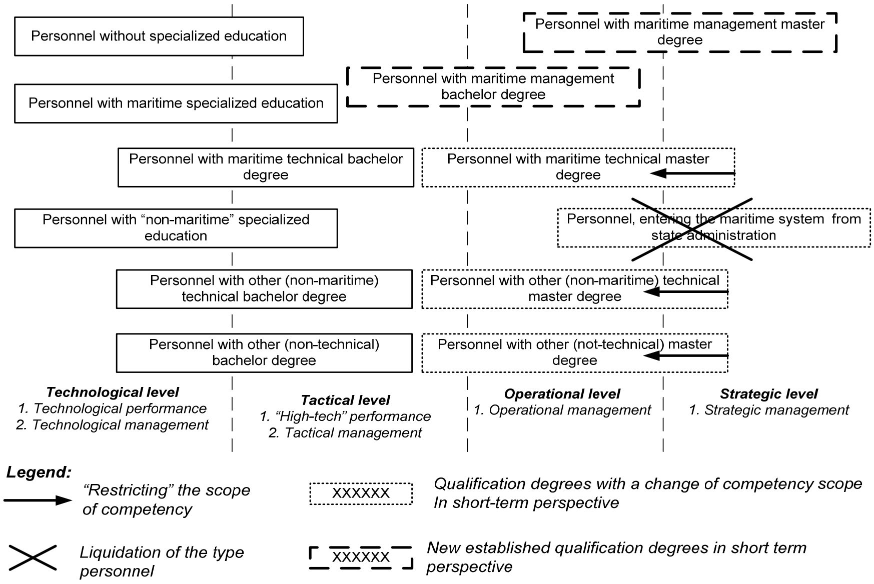

Fig. 3 Allocation of the personnel on different MS hierarchical levels according to the education obtained (Guidelines for short-term changes)

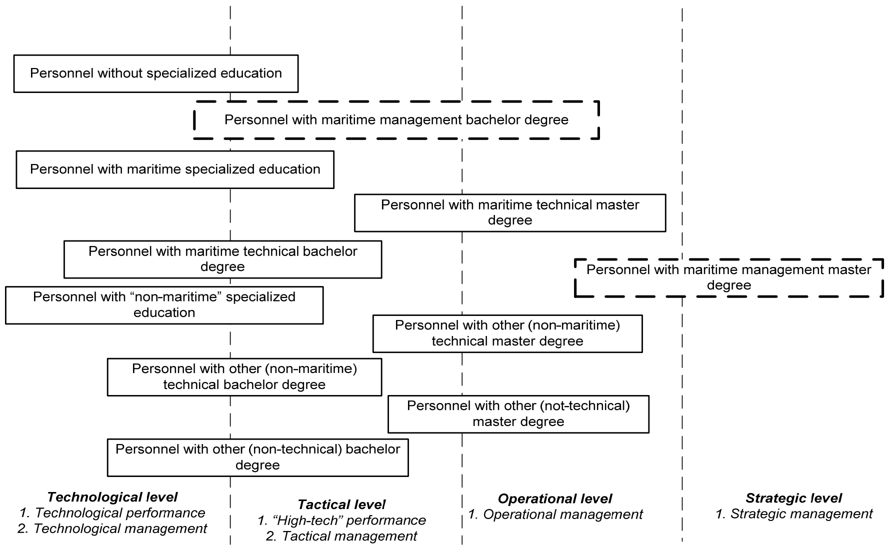

Fig. 4 Distribution of the personnel on different MS hierarchical levels according to the education obtained (Desired status)

The idea of MES transformation is interrelated to a different view on the MES which describes the allocation of the personnel on different MS hierarchical levels according to the education obtained. The current status is given on Fig. 2.

We should stress the high dependence of the maritime organization on personnel that is not a "product" of the MES. In such cases the possible after-effects could be:

1. Difficulties in establishment of common understanding of the maritime aspects.
2. Increasing inner conflicts.
3. Lost of "maritime identity".

The proposed suggestions for solving these problems are schematically presented on Fig. 3.

After transforming the MES the expected short term change in the distribution of the personnel on different MS hierarchical levels according to their educational level is presented on Figure 4.

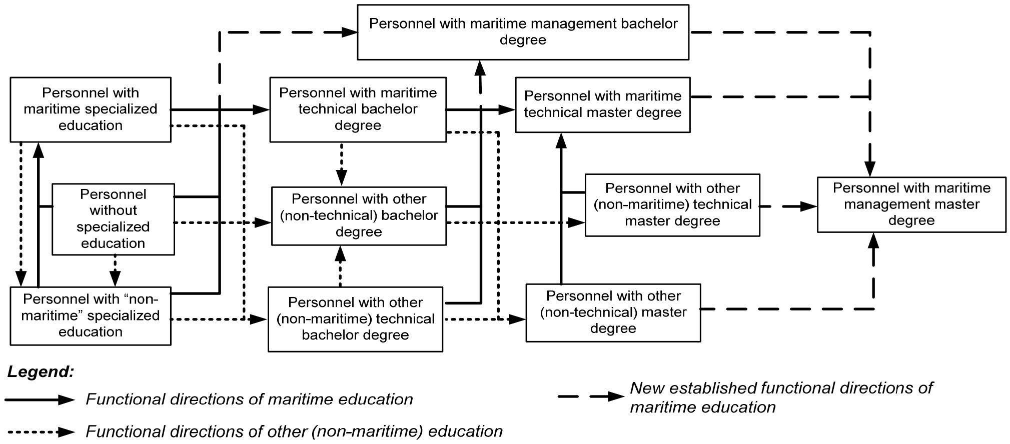

Fig. 5 Enhancement of the professional qualification of the personnel of a maritime organization (a short-term option)

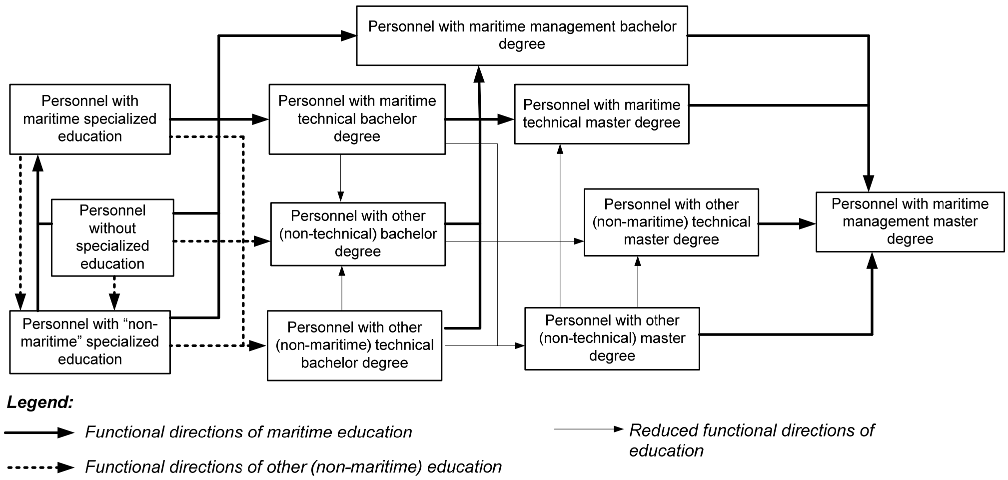

Fig. 6 Enhancement of the professional qualification of the personnel of a maritime organization (a long-term change)

Such a change will result in an enhancement of the professional qualification of the personnel of a maritime organization in short-term as presented on Figure 5.

The long-term expected change of the system for enhancement of the professional qualification of the personnel of a maritime organization is of particular interest. The expected change of the MES is presented on Figure 6.

The long-term changes are generally related to reducing the possibility for educational enhancement of the tactical and operational level maritime personnel in "non-maritime" educational institutions. This will definitely contribute to the establishment of common understanding of the maritime management and will result in enhanced national maritime system integrity.

5. Conclusion

Since the Bulgarian MES model for transformation is in a process of development and elaboration, we would like to underline the possible challenges for its successful implementation.
The first group of challenges is due to the fact that MES changes require cooperation between the MS elements. After transforming the MES the expected short term change in the distribution of the personnel on different MS hierarchical levels according to their educational level is presented on Figure 4. On the one hand the components of the maritime system, and on the other – the components of state supra-systems, i.e. educational system, security system, etc.
Solutions to the possible problems are rooted in the following **initiatives**:
- development of a national maritime strategy that considers maritime prosperity as based on the dynamic balance of national security, economic freedom and personal safety;
- active involvement of the maritime industry in the management of the maritime educational system, including direct participation in the processes of setting up educational priorities with subsequent implementation in the educational programs.

The second group of challenges is related to the already established relations in the national educational system. Some problems are expected because of insufficient capacity of the existing maritime institutions to provide adequate educational support to the transformation of the MES.
The possible general solution to the aforementioned problems is provided by the idea for **unified** educational programs involving the capabilities of different maritime educational institutions. Such cooperation is in full compliance with the idea of dispersed responsibilities in the maritime education.
Such a solution for MES transformation is a type of Local Decision in Global Perspective.

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Enhancing Maritime Officers Opportunities for Managerial Level Positions

Eugen BARSAN
Professor, Constantza Maritime University, ebirsan@internav.com
Codrut MUNTEAN
Assistant, Constantza Maritime Universit,y codrut.muntean@gmail.com

Abstract In the past few years, we have all witnessed and felt the effects of the global financial crisis. Consequently, maritime universities must continuously update their curricula so as to offer their graduates the advantage of a successful career in this most competitive domain.

Under the provisions of the Bologna Treaty, the period of technical higher education studies for bachelor's level were reduced from 5 to 4 years. With great efforts we manage to adapt the new curricula in order to maintain the license in waterborne transport engineering. The Romanian Naval Authority considered that in 4 years of study and maintaining the engineering specific courses the were no enough time left for all the compulsory maritime courses at operational and managerial level. The consequence was that part of the compulsory maritime courses with subjects for the managerial level had to be shifted to a new professional Master course. As most of the students envision a career at sea for no more than 10 years these Master's courses have proved to be very important for their career both at sea and on shore.

Keyword:

1. Introduction

The maritime transport industry has always been and will be a profitable endeavour, marked by fierce competition at every level. From this continuous and merciless competition, perhaps unsurprisingly, there are survivors who raise on top all the others. To be more specific the companies that have been in the business the longest, have managed narrow situations, and have seen through crisis times, world wars and many other difficult periods. A survivor in this line of business is an entity that aside from gaining a considerable wealth has something which is priceless, and that is a name with tradition and prestige, along with the respect of the entire maritime business community.

This being the general rule, it also extends to all industries related to maritime transport, and incidentally to the educational institutions that provide the necessary trained man-power for ship, cargo and port operations. All new maritime education and training centres are initially viewed with suspicion, and it generally takes tens of years before they are accepted [6]. During this period, it is not the quality of the teachers nor is it the quality of the school's equipment that is primarily evaluated [1], though these factors are regarded as important and they are certainly taken into account. Instead, everyone is analyzing and evaluating the performances of the university's graduated students, while at the same time quantifying how many of hem managed to reach managerial positions both on board ships and onshore. Moreover, it has been observed that students coming from prestigious universities have little to no problem in attaining some of the highest positions within a company relatively quickly [11]. It is somewhat expected of them, and when they do, it reassures everyone's belief in the educational level of that particular institution.

Constanta Maritime University (CMU) has nonetheless attracted quite a considerable amount of international attention. We have managed to do this because during our entire period of activity we have managed to deliver good, reliable and conscientious man and women to all branches of the maritime industry. In addition to this, we would also like believe that we are known through educational programs with international participation such as RoNoMAR, where we have Norwegian partners. Furthermore, it is believed that another interest factor is our rather high number of students. Some 600 future deck cadets join with us each year, and we have numbers for future maritime engineer and electrician officers also. However this high number of students may be, it also raises a problem in the way of what we, as a institution can do, to help them insure a future in this highly competitive industry. This paper deals with several ways our institution has envisioned to give them this most necessary help, and to aid them transform their hopes and visions of their future into concrete bright careers.

2. Enhancing cooperation with the maritime industry

Although the world financial crisis is not something new, it is of the utmost importance in every decision and long-term plan. In addition, before we could analyse how to improve the career progression of our students, we first started to concentrate on how to help them at the beginning of their careers. Before the crisis was felt, there was a staggering deficit of qualified maritime officers particularly at the managerial level [7]. That encouraged us to analyse our facilities for the purpose of extending and increasing the number of students that could study at our university. In the end we decided that the risk was acceptable and the student’s response was excellent and the maritime community, especially the crewing agencies, happily saluted our initiative.

As we increased the number of students, we also took into consideration that there was going to be a ever increasing difference between the number of students entering the final years of their studies and wanting to undergo their on board training and the existing absorption rate of the industry. Without much effort, one can realise that in order for a student to reach an operational position on board a ship, he or she must gain some on board experience, working as a cadet. In addition, we have observed that the 12 month on board training experience is crucial for the cadets and their development as officers. More importantly, it confronts with the realities actually of working on board a ship. For many of them being the first time they actually step on board a merchant vessel, it creates an impression that will last their entire life, and thus does much to influence their career progression [16]. We had some unpleasant situations, with cadets returning home very disappointed after a rather dissatisfactory seagoing experience.

In an effort to correct the situation before it further developed, we have signed cooperation contracts with the more important crewing agencies, as well as with some shipping companies [13]. These initial efforts eventually developed into collaboration programs between CMU and them. The purpose of these early programs was straightforward: to identify the specific needs and problems of both our cadets and of the shipping companies. One example was the PRACNAV program, which focused on the cadet training programs [7]. It prioritized training steps and periods, while also requiring the companies to implement a fleet wide cadet program. Another program requirement was the creation of positions such as Company Training Officer (CTO) and Ship Training Officers (STO`s). These persons, apart from supervising the cadet program, were also responsible for securing feedback information to CMU, about each cadet performance, and about any irregularities or recommendations that they might had. Later on we added more programs that would involve special training for these officers so that they would have a better understanding of their role as trainers.

After the crisis, hit most of the maritime transport companies cancelled their cadet training programs, and we anticipated that there was going to be a significant drop in the number of student’s applications, as well as an increase in the number of cancellation of studies. However, the impact was not as severe as anticipated. We believe that there are at least two plausible explanations.

One is that since our institution was founded we have managed to build a good image in our country as a tough maritime university that opens good opportunities for the future, along with a solid international reputation as a reliable source of good officers. The other explanation is that by attracting international attention we have ensured that our students have a competitive edge in their search for both employment and rapid career progression.

The international attention that we have spoken so much about was materialized in programs international participation and scholarships. The programs referred to at the beginning of the paragraph are, at least at the moment, aimed at improving the training of the trainers, and are also focused on experience exchange both for teachers and students. The scholarships are, private programs organised through CMU by witch international shipping companies sponsor a selected group of students throughout the duration of their studies. At their graduation, the students have a contracted obligation to work within these companies for a determined period of time.

These collaboration programs paved the way for an open dialog between CMU and the maritime industry, in such away that we were able to identify some specific needs that required modifications of our curricula. These requirements were especially focused on more detailed study of the ships electronical equipment, especially the navigation equipment [12]. In our interpretation of the instructions, this included a much more intense simulation-training programme in the 3rd year of the curricula. During these simulator-training sessions, the future officers are encouraged to make the most of the different electronical equipment, in order to have a better knowledge of what they will find on board a real ship [2].

This proved to be an invaluable piece of information, because due to the Bologna Treaty, the period of technical higher education studies for bachelor's level were reduced from 5 to 4 years. As a direct result we had to change and adapt the curricula, and seek the best way to educate our students, and to give them the edge they require when searching for a job.

3. MET for the Managerial Level

CMU has always taken pride in the fact that graduating students apart from becoming maritime officer are also licensed as engineers in Waterborne Transport Engineering. Over the years we have noticed that due to this double qualification, after having acquired some experience on board ships, our graduates are more easily employed within a company in a management position on shore [10]. With great efforts, we have managed to adapt the new curricula in order to maintain the license in waterborne transport engineers, which has been no mean feat.

The main problem was that the Romanian Naval Authority considered that in 4 years of study and maintaining the engineering specific courses the was not enough time left for all the compulsory maritime courses at operational and managerial level. The consequence was that part of the compulsory maritime courses with subjects for the managerial level had to be shifted to a new professional Master course. This was emphasized by a decision of the Romanian Naval Authority, that all new graduates in order to become Chief Engineers, Chief Mates or Masters must graduate a Master's course [4].

There was still the problem of identifying the most appropriate Master courses. Again, the dialog between the maritime community and CMU proved to be of great importance. Of course, the former students themselves are also a reliable source of information about what master courses we should develop [5].

In the majority of cases the former students, now maritime deck officers, choose the Maritime Transport Master Studies, which is designed primarily for future Chief Mates and Masters. The aim is to further the student's knowledge of how to safely load and navigate different type of ships, planning a voyage while taking into consideration all kind of safety measures. This is why students undergo a serious and rigorous simulation training exercises both in the Cargo Operations Simulator and in the Navigation Simulator. Furthermore, the curriculum contains management and international maritime law courses. After completing this course students should be better prepared for the on board necessities and should have all the knowledge required for them for the position of Chief Mates. Detailed curricula of this master course in shown in Table 1.

	No. of hours / week			
COURSES	Course	Seminar	Lab	Project
1st YEAR – 1st Semester				
Maritime Insurance	1		1	
Voyage planning	1		3	
Tanker operation	2		1	
Advanced Naval Architecture	2		3	2
Maritime Transport Routes	1	1		
1st YEAR – 2nd Semester				
Research Methodology	1		1	
Economics of Maritime Transport	2	1		
Integrated Management Systems	2			
Risk Management in Maritime Transport	1	1		
Safety and Security Management in Maritime Transport	2	1		
Multimodal Transport	1	1		
Project Management	2	1		
2nd YEAR – 1st Semester				
Information Management in Navigation	1		1	2
Bulk Carriers Operation	1		1	
Ship management and Administration	2	2		
Ship Handling in Special Conditions	2		2	
Leadership	2	1		

Table 1. Curricula for the Professional Master Course

As we can sea from the above curricula this professional Master Course has a lot of disciplines related with various aspects of management in the maritime field. It is also obvious that this Master Course exceeds the requirements mentioned in STCW regarding training for maritime managerial level [3].

Another significant proportion of the former deck students, along with an increasing number of lawyers, choose the International Maritime Law Master Studies. Although it was not specifically required by anyone, CMU felt the need for this Master because during the last 8 years we were constantly asked to organize refresher courses on topics that ranged form lay time calculations to maritime insurances and global limitation of liability. Initially the target group for this project were the officers that already had a managerial position both on board ships and on shore. However, it soon began to be evident that these studies were attractive to persons working in other branches of the maritime industry or related to it. To begin with, in Romania at least, there is a no so great tradition in maritime jurisprudence to speak of. Quite the contrary, the legal system during the last few years underwent a complete overhaul in an effort to comply with the relevant international conventions signed by our state. As a result, there were great deal of lawyers and quite a number of magistrates and judges that showed and interest in this Master degree.

The Management and Engineering in the Maritime and Port Operations Master Studies, was the CMU response to a very specific set of needs (table 2). One such need was from the administrative department of the Romanian Naval Authority to elaborate courses that will satisfy European requirements for their personnel, which would certify their qualification for this highly specialized field of operations. Another group of persons that required this Master Program are the maritime officers, either from deck or from the engineering department, with a desire to work on shore in maritime related businesses [9]. To cope with this wide range of requirements, this master has to offer a broad range of information. This includes resource, personnel and business management courses, along with administrative and maritime law. Other courses refer to economics, business implementation, logistics, and port equipment and operations, and multi-modal transport.

At the completion of this Masters, all graduates have a much better understanding of the economics that govern the maritime industry as well as a more comprehensive view of how this industry connects with other transport methods, and influences the business environment both locally, within the immediate geographical distance from the ports, and world wide [14]. This is why they have a much better chances of successfully getting a job on shore, or have a greater chance of being successful in their own maritime related private enterprise.

COURSES	No. of hours / week			
	Course	Seminar	Lab	Project
1st YEAR – 1st Semester				
E-Shipping	2		1	
Operation of port Systems	2		1	
Financial management in Maritime transport	2	1		1
Optimization of maritime Transport	2	2		
Geopolitics and Geostrategic	1	1		
1st YEAR – 2nd Semester				
Research Methodology	1		1	
Economics of Maritime Transport		2	1	
Risk Management in Maritime Transport			1	1
Safety and Security Management in Maritime Transport			1	1
Maritime Management	2	1		
Multimodal Transport	1	1		
Project Management	2	1		
2nd YEAR – 1st Semester				
Legal Aspect in Maritime Transport	2	2		
Port Marketing	2	2		1
Flag State Control and Port Authorities	1		1	
Port Information Management	2		1	
Integrated Logistics Systems	2	1		

Table 2. Curricula for the Maritime Management & Engineering Master Course

4. Conclusion

From the moment our university was founded it had undergone an uninterrupted process of change. However we would like to consider these changes as a matter of adaptation to the necessities and day to day hardships that not only we as an educational institution face, but anyone working in the maritime transport has to deal with.

Over the years CMU has confronted many problematic periods such as loosing its main training vessel the Neptune. She was a beautiful cargo vessel, but she had reached the technical limit of her service period. At that time we were confronted with two choices: one was to invest a considerable sum of money in her modernization or to do something else. In the and we had to let her go, although in doing so we lost our primary tool for training our cadets, and securing their onboard training period.

However, we managed to turn this loss, which many considered to be a capital disaster for our university, into outstanding and highly successful training programs. Through the foresight of the university's council, CMU adopted a new strategy that we still maintain to this day: a continuous and open dialog between the local crewing agencies and maritime related business companies in order to identify the most appropriate course for our future and current development.

These dialogs made quite clear from the very beginning that the maritime industry, at that time not worried by the crisis, was in dire need of well trained officers. As a result we purchased simulators, and proceeded at improving and modernizing our training methods. A direct consequence of all these actions was that CMU had a much better international public image. Indirectly our students were also beneficiaries: apart from being better trained, they had improved chances of both being recruited by local or foreign company and reaching the highest position possible for them within the shortest time possible.

Now that the entire world still suffers from the effects of the crisis, the cooperation between us and the industry is ever more important. Most if not all companies are desperately looking to cut expenses wherever they can, and as such recruitment of new personnel and promotions are almost nonexistent [15]. However dire this reality may be, we are proud to see that all our efforts have not been in vain and that the programs started not so long ago are still functioning, while talks to begin new programs are underway. This is why, at CMU, we believe that communication and cooperation between any maritime university must be the key of the educational process, in order to ensure both the bright and smooth career progression of the students, and the survivability of the institution that trains them.

Most of the maritime transport companies cancelled or reduced their cadet training programs, and we anticipated that there was going to be a significant drop in the number of student's applications, as well as an increase in the number of cancellation of studies.

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