NEW METHODOLOGIES AND TECHNOLOGIES IN MET

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Abstract

Within the context of the education of engine and deck officers, maritime education and training systems in the wake of IMO requirements are subject to crucial updates especially in regards to developments in computer technology.

The radical amendments to the STCW Convention agreed in 1995 only came into effect in 2002, and the provisions concerning the need for governments to submit quality standards reports to IMO, concerning their national training and certification systems, were only required to be met as recently as 2004. However, sufficient time has probably elapsed to assess the extent to which the amendments have been a success in fulfilling their underlying objective – restoring confidence in the validity of seafarers' certificates of competence regardless of the country of issue. On the other hand, since 1995, there has been rapid revolution in design of ships and the equipment used in the navigation and propulsion systems on board these ships and yet there has been no serious attempt to revise the STCW and/or the International model courses.

Each graduate of the maritime academy should be properly trained as an officer seafarer at the operational and management levels of responsibility aboard the ship, at the same time that he must be prepared to fulfil the engineer's role ashore. A proper MET programme must include theoretical and practical education and training in a well balanced curriculum and must ensure there are well-designed and internationally recognised programmes of education and training leading to higher qualifications and certifications for career progression as well as for job diversification. There is therefore a need for clear education and training pathways recognised internationally with clear progression routes onto degree and higher qualifications in the related subjects.

Many major accidents lead to new regulations and conventions. These new regulations and the ISPS code, together with commercial demands, have increased the workload on-board. Certain sectors of the industry have experienced very severe shortages, and the continuing growth of the world fleet, combined with work pressures on board ships and at ports indicate that demand for qualified seafarers will continue to increase over the next decade.

Under the above considerations, this paper intends to discuss respective issues in order to define the most suitable MET Programme to meet the demanding requirements of the whole maritime sector:

Key Words: MET Programmes, STCW Code, short courses

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1. Introduction

Within the context of the education of engine and deck officers, maritime education and training systems in the wake of IMO requirements are subject to crucial updates especially in regards to developments in computer technology.

Amendments to the International Convention on Standards of Training, Certification and Watch keeping for Seafarers (STCW 78), adopted by the STCW 1995 Conference, have created new requirements for, and placed new demands on, administrations, ship-owners and maritime academies. At the same time, new concepts in maritime training have seen a shift from a knowledge-based to competency-based orientation in the development of ship personnel.

Innovative concepts of marine education, a shift from a knowledge-based to a competency-based training, and the need for constant professional updating and recertification have brought maritime training institutions out from under the shadows of the maritime administration and industry; now they must assume an equal partnership rather than simply reacting to the others' demands. Maritime institutions must implement their course syllabi effectively according to IMO Model Courses; they must improve standards of teaching staff, facilities and equipment. Simulators used for training or assessing competence are required to comply with provisions contained in Section A-I/12 of the STCW Code, which is especially devoted to the use of simulators.

The radical amendments to the STCW Convention agreed in 1995 only came into effect in 2002, and the provisions concerning the need for governments to submit quality standards reports to IMO, concerning their national training and certification systems, were only required to be met as recently as 2004. However, sufficient time has probably elapsed to assess the extent to which the amendments have been a success in fulfilling their underlying objective – restoring confidence in the validity of seafarers' certificates of competence regardless of the country of issue. On the other hand, since 1995, there has been rapid revolution in design of ships and the equipment used in the navigation and propulsion systems on board these ships and yet there has been no serious attempt to revise the STCW and/or the International model courses.

Each graduate of the maritime academy should be properly trained as an officer seafarer at the operational and management levels of responsibility aboard the ship, at the same time that he must be prepared to fulfil the engineer's role ashore. A proper MET programme must include theoretical and practical education and training in a well balanced curriculum and must ensure there are well-designed and internationally recognised programmes of education and training leading to higher qualifications and certifications for career progression as well as for job diversification. There is therefore a need for clear education and training pathways recognised internationally with clear progression routes onto degree and higher qualifications in the related subjects.

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Under the above considerations, this paper intends to discuss the following issues in order to define the most suitable MET Programme to meet the demanding requirements of the whole maritime sector:

- Sufficiency of IMO Model Courses and STCW courses to meet the requirements of recent developments in technology, environmental awareness and legal regulations

- Advantage and disadvantages of dual cadet (deck & engine) pathway training
- Number of hours to be devoted to simulators, school ships and sea training
- Requirements for internationally recognized certification system and examination system to comply with these requirements
- Additional units and/or short courses for smooth transition to specific shore duties for career progression as well as for job diversification
- Continuous learning and e-learning to include on-line assessment and certification

2. Sufficiency of IMO Model Courses and STCW courses to meet the requirements of recent developments in technology, environmental awareness and legal regulations

Maritime industry is one of the oldest industries of the world and for a developed country; this industry plays an important role for the advancement of the country itself. Nowadays with the rapid emergence of the new technologies, the ships – main instruments of the maritime industry – are becoming more advance and sophisticated. These kinds of ships will be required to be manned by lesser number but better educated and trained crew.

Today seafarers are becoming the high-tech group of the industry compared to recent years. The advancement in maritime transportation from the age of sail to the internal combustion engine witnessed higher level of skill and experience are needed to man such a vessel. Seafaring evolved to a level of highly qualified profession where specific knowledge and skill are needed to operate the mode of transportation and, experience are needed to ensure safety and efficiency. It becomes a subject of science and not more an art only matters to sail the ship.

Analysing the effects of new technologies on the human element, the main ones seem to be caused by navigation and communication related technologies. The effects of technologies related to navigation support and communication & management support are very similar. The main difference is that the development in information systems on board a ship for navigation support may lead to more decision-making on board, while the development of external information systems may lead to less individual decision-making per ship.

The advancement of information and communication technology has reduced the gap between human located in the distance places and this also benefited the shipping industry. It is easier to maintain communication between ship and its owner; this indirectly resulted in more interference in term of ship management. The master of the ship is no longer seem to be in command of his ship, thus the impression of commercial requirement supersede the safety and security.

One very important development has been the introduction of automation in operating a ship. The modern ships particularly container and fuel carrying vessels are becoming increasingly automated. The automation has brought with it two problems, one concerning the inadequacy of existing seafarers' education and training viz., that if any aspects of automation fails the crew often are not trained to use alternative systems and hence respond to it effectively (IMO MSC 82, 2006; Ziarati, 2006). The second problem has arisen from the review of the arguments from recent IMO Maritime Safety Committee (reports MSC 82/15/2 and MSC 82/15/3, 2006) namely that the human operators rarely understand all the characteristics of automatic systems and these systems' weaknesses and limitations which have now been found to be the main causes of accidents.

Investigation of several serious and recent accidents at sea due to automation failure has revealed that there is a need to improve the content of all maritime training and that the knowledge, skills and understanding of automation should be included in the basic training of all Chapters of the STCW Code of practice and hence address this very serious issue at source. Furthermore, to address the second problem, it is considered feasible to gather the knowledge for inclusion in the existing seafarer's education and Training in a short course format that can be easily introduced for existing seafarers and hence enabling the seamen

currently working at sea and in ports to develop the competence to handle and respond to automation failures.

A paper (Ziarati, 2006) and report to IMO (MCA, 2006) clearly identify a major source of accidents particularly in the future to be the problems with application of automated systems and failures in any aspect of automation. There are two related issues/needs which need to be addressed. One can be highlighted, for example, by a recent report by the Maritime Accident Investigation Branch in the UK (MAIB) concerning the details of the heavy contact made by Savannah Express (2005) with a link span at Southampton docks, after the ship lost astern engine power. The report stated that the engineers on board were experienced and held appropriate STCW certificates but they were unable to correctly diagnose the reason for the engine failure. Lack of adequate training in how to operate and trouble-shoot the automated engine was a significant contributory factor in the accident. What was significant was that STCW training standards for Engineers have not been updated to account for working with such new engines. The second issue can be highlighted by an in MER (addressing automation, 2007) stating that it is not impossible to bring presently serving seagoing engineers to the standards needed if a course could be devised to include synchro- and cyclo- converters, harmonics, etc. as an add-on to the existing IMO syllabuses. Ziarati (2006) reports on the need to include instrumentation and control systems including hydraulics and pneumatics in the syllabuses of the programmes for the Engineer and Deck officers. Under STCW there is no specific training requirement for electrical engineering officers on board vessels, and therefore no internationally or European agreed standard by which shipping companies can effectively assess their knowledge.

TUDEV has been working on this issue for some time and developed a new short course program to address this problem. The project was also proposed to EU together with 8 EU countries as Leonardo Pilot Project.
The proposed course contains some 8 modules in various aspects of automation for:

1) Ratings and for Cadet Officers on automation components,
2) Deck Cadet Officer on automated navigation systems at support and operational levels,
3) Engineering Cadet Officers on automated propulsion systems at support and operational levels,
4) Chief Mates, on integrated navigation on operation and management levels,
5) Second Engineers on automated propulsion and power transmission systems,
6) Chief Engineers on fully integrated and computer controlled propulsion system,
7) Masters/Captains on fully integrated Bridge-propulsion-power transmission system and
8) On team operation, Deck-Engineers interaction and combined scenarios.

Automation has been reported to have qualitative consequences and does not simply replace human work with machine work. It changes the task it is designed to support and creates new errors and error pathways and often shifts the error occurrence into some time in the future and may hide the error and make it more difficult for it to be identified and hence rectified (Comett, 1990).

In addition there are non-technical skills which are equally important. In many incident and accidents, the complexity of the automation is the error enforcing condition. To prevent such errors it has been found that it is important to consider resource management, skills such as situational awareness, decision making, work-load management (EUREKA, 1996 – Factory of the Future report). Combined Master-Chief Engineer emergency team operations (SOS, 2005) could also lead to a more effective response to a given failure. All these are included in the proposed course consisting of 8 modules of training, one for each class of seafarer and one for team building. Each module has several exercises, these will be developed to cater for known situations and possible scenarios and each partner will bring one specific expertise to ensure a whole range of skills are available.

In addition to technological developments, Legal and Environmental issues are also subject to crucial changes. Maritime transport of goods and passengers involves different types of risk. As a consequence of a maritime accident, loss of life or injury may occur to crew and passengers, damage to the property of ship-owners and the cargo, as well as potential risk to life, health and property of third parties and the natural environment. Over the last decades, the risk of accidents has increased. Contributing factors are the

larger volume of maritime transport, including dangerous or polluting cargos, a higher exposure to third party interests and, finally, the increased recognition of the value of the natural environment. Therefore efforts have been made to reduce the risk through better technology, rules and supervision as well as mechanisms of compensation. As a consequence of a number of high profile accidents, the international community has developed a series of legal instruments to manage liability and compensation. Current environmental training is both limited and inconsistent across Europe . Existing training tends to focus on meeting minimum standards and compliance with legislation. Little attempt is made to explain why environmental regulations are in place and how individual actions can make a difference.Therefore a proper MET program must aim to include all these changes and updates to develop a certified training programme in environmental awareness for mariners, with the aim of establishing an internationally recognized standard for environmental training. To address this issue TUDEV has been working on another pilot project to update the knowledge, skills and understanding of those working in the water transportation sector. The proposal responds to the needs of the sector for training of employees and employers, paying particular attention to the training and re-training needs of smaller companies and self-employed. The project is divided into three parts.

In part one, a classification system will be developed grouping various short course programmes under specific headings, viz., safety, security, specialised, legal, management, environmental and so forth. Through cross-referencing techniques, developed as part of an earlier European Union (EU) funded project (Eurotecnet and Force), a matrix table will be produced identifying where these courses are delivered within the partner countries and later the courses offered in the surrounding countries would be added to the database, including information such as fees, frequency of delivery, location and other relevant details. Through a harmonisation plan, the titles and content of these courses will be examined and a comprehensive set of training programmes will be developed. Learning materials will be gathered together and additional materials developed. Other resources (equipment, simulators, software, charts, manuals, etc) will be incorporated and shared among the partner countries and will be made available to other European Union member states as part of the intended valorisation.

The second part of the project concerns sharing of resources and value added activities manifested in jointly planned and/or joint delivery of these courses, providing a golden opportunity for training the trainers, in an efficient and effective manner.

The third part relates to the development of specific training and re-training courses on newly emerging requirements, particularly relating to national and international conventions and security requirements, specifically those introduced after 9/11, for instance, requirements of USA coastguards or specific ports relating to security. **The project provides an opportunity for partners to recognize each others' certificates.** This is an important objective of the project.

To ensure these developments are successful, it is proposed **to establish a network of partners** including the relevant authorities to ensure these programmes received the support needed. The work will commence with the review of an existing needs analysis report and identification of urgent short courses which will incorporate the latest requirements of bodies such as the International Maritime Organisation (IMO). There will be a training programme with support from partners for the trainers and their certification in line with European vocational qualifications for trainers/assessors and those who will be involved with internal and external examinations. It is agreed that a serious attention will be paid to provision of pathways, through 'integrated short course programme', to technician qualifications and also through existing routes to higher qualifications. The reason for this is the anticipated shortages of qualified seafarers in the near future (Ziarati, 2005).

3. Advantage and disadvantages of dual cadet (deck & engine) pathway training

Recently most of the ships are becoming fully automated with very sophisticated engine control systems. The nature of these systems is also changing the role of traditional engineering officers from technical perspective to managerial levels. Expected raise in the training of the engine ratings such as technical high

school/higher school graduates may also alleviate maintenance and operational responsibilities of the engineering officers while allowing them to perform deck officer of the watch duties. The workload of the engineer officers could also be reduced by allowing graduates with engineering knowledge such as mechanical engineers to be utilized onboard as support staff. Of course they should be given certain maritime safety and operational knowledge before they are allowed to serve onboard ship.

On the other hand deck officers are also required to have better knowledge on the engine systems especially weaknesses and limitations of these systems such as emergency procedures to be applied in the case of emergencies. With better trained engine ratings, well planned onboard spares of self trouble shooting systems and centrally available technical advice mechanism under the developing communications systems, it is believed that any officer graduate of a well balanced 4 - 5 year MET programme can handle both deck and engineering officers roles simultaneously. Sea training period of such a programme may also be divided into two parts for deck and engine and appointments from deck to engine or vice versa can be achieved by short adaptation courses which are becoming essential with the introduction of highly sophisticated and expensive systems. For further and higher training (master and PhD), these uniform (line) officers may choose either technical or management level studies for employment ashore.

The load of the Master and other management levels officers may also be reduced by the creation of additional position in the form of administrative support so that the workload for paperwork could be monitored by an administrative officer where the person holding this position need no special maritime skill and duration of the training is short.

Such a pattern may also provide more reliable pilots in the future. We don't expect pilots to be experts on core subjects such as celestial and great circle navigation, cargo handling but more familiar with different shipboard systems and their limitations mainly engine and rudder systems.

However, such a radical shift from traditional MET system, if approved by IMO, will eventually require very carefully planned and well balanced curriculum, adaptation of several short courses, change of duration at sea at each rank for promotion to higher ranks and change of sea farers examination system and certification procedures.

4. Number of hours to be devoted to simulators, school ships and sea training

One of the most important factors determining the educational process in maritime academies is the influence of the IMO legislative activity. Its revised STCW Convention represents a very significant step forward, necessitating an improvement in curricula and encouraging the introduction of new didactic tools, among others, simulators. The introduction of simulators into the education of officers has had a number of significant positive consequences:

- The necessary time to complete an officer's education has been decreased.
- The costs of education have been decreased.
- New spheres of education have become possible, in particular, advanced training.
- The standard and quality of education have been increased.

The education of an officer is an extremely expensive process due to the extensive range of theoretical and practical knowledge that must be acquired in order to practice the profession. A number of diverse reasons, including a sought after reduction in the associated costs of education, have seen both the introduction of various kinds of simulators into the training cycle of officers, and changes to the basic curriculum at Maritime Academies. Such significant changes are justified by more than cost reduction alone; other factors which have demanded an evolution in the educational process include the particularly rapid ongoing development in technical innovations which are immediately implemented on ships, combined with limits to the duration of a student's education, as well as the need to comply with the requirements of STCW'95.

From the moment of acceptance into a course, and throughout a student's entire education in the Maritime Academy, schools must use all possible means at its disposal to ensure the development of an officer with the ability to operate present machines and ship devices, and the capacity to understand and adapt to future innovations . Observations so far indicate that training on the simulators produces graduates who are more quickly and better able to operate particular mechanisms, at the same time that they acquire a full appreciation of the processes involved. And of course the consequences of mistakes are negligible.

Modification of the curriculum to satisfy the requirements of IMO-STCW 78/95 may also allow reducing the total number of course hours without in fact decreasing the quality of knowledge imparted to students. The introduction of training on the simulators reduces the amount of time necessary for training in laboratories with particular mechanisms, including the main engine and diesel generator, with an advantage to the Academy in the reduction of maintenance costs - in terms of use and repair - of these machines. It has been estimated that training costs may have been reduced by 10%.

On the engine room simulator, for example, participants experience the workings of the main engine under different emergency situations, as well as how the crews behave under stress. Such simulated situations range from minor defects to serious breakdown of the main engine or its particular mechanisms. Future engineers, through these simulated experiences, are able to learn appropriate responses and necessary routines to master these situations and to resolve the stressed behavior of the crew. The diagnostic simulator of a ship's main engine allows training in the strategy for repairs to an operating engine, based upon routine measured parameters of engine motion. The chief engineer makes decisions concerning the terms of repairs or surveys of particular machines and devices, including the main engine, during the normal operation of an engine. The diagnostic simulator aims to instruct the officer to arrange the order and schedule of repairs and surveys to the best advantage of the technical state of the whole engine room. The simulator of the cargo operations of a LNG ship allows training in all typical cargo operations of a gas tanker - cooling tanks, unloading gas from a ship, loading a ship etc. With the increasing quantity of cargo carried on gas tankers of LNG and LPG types, and the unusual conditions of loading/unloading and carriage (chiefly low temperatures), it is necessary for crew of these tankers to undertake special training.

In the STCW95 Convention, details regarding the simulators requirements and training objectives were detailed only for radar simulators, these provisions could be considered as the kick-off of the world scale training based on simulation in the maritime education and training (MET). From the beginning of the 90ties, simulator manufacturers used computer technology on a large scale in order to create virtual navigation equipment and ship handling controls.

The main reason for this policy was the reduction of the price for the simulator systems and an easier way to reproduce all the parameters of the ships equipment using full dedicated software. A combination of real equipment and virtual equipment remained an option for the buyer, but the actual trend is a limitation of the real equipment to the steering console and auxiliary panels. This trend is also justified by the new generation of real ships with integrated bridge systems (IBS), where PCs, trackballs, keyboards and monitors replaced many of the traditional knob and push button panels.

As we all know, STCW 95 introduced a compulsory 12-month seagoing service for every candidate for certification as deck watch officer (operational level). At least six months of this period the cadet must perform bridge watch keeping duties under the supervision of a qualified bridge watch keeping officer (IMO, 1995). The cadet's achievements during onboard training programs must be documented in an approved training record book.

There were two areas where maritime administrations rushed to implement the new STCW requirements: seagoing service periods and IMO compulsory courses. From the national Maritime Authorities' point of view these were the easiest task to accomplished, because they do not require manpower or logistic efforts from the Authority. This one-year sea service period for cadets raised a lot of logistic problems for maritime universities. The first one was a substantial reorganization of curricula, in order to allocate time for on board training. The

second main logistic problem lies in finding owners and ships for almost 200-300 cadets each year. This problem is amplified by the lack of national flag ships and in many cases by the non-implication of the national Authority for providing help and support for solving this problem.

More than that, the students lose the contact with the university for several months, and they have major difficulties to re-enter in the teaching programme. There are only very few large ship-owners having a coherent onboard training programme with a serious involvement of the cadets in training activities.

School ships, especially tall ships are the pride of the MET institutes who own one of them. They may provide excellent training opportunity especially on the development of basic seamanship skills. Therefore school ships can be very beneficial for the first part of the sea training phase on deck seamanship as well as supporting ongoing lectures on the respective subjects. If they may fully replace the seamanship part of the sea training and used as a laboratory for practical training, it will be quite worthwhile to maintain a school ship. However, the second part of the sea training-Officer of the Watch practices- will certainly require real ships to smell the nature of the art of seamanship under the realistic conditions as an on the job training. This duration may be considerably reduced with the increased amount of hours to be dedicated for simulator training. This will also help to solve the problem of limited number of training berths under the increasing number of cadets.

New MET programmes must define the number of simulator hours and subjects that may replace sea training in certain terms and redefine sea training periods accordingly.

5. Requirements for internationally recognized certification system and examination system to comply with these requirements

TUDEV has developed a new EU proposal which is designed to improve vocational education and training standards and hence the qualifications of cadets, who are attending Officer of the Watch (OOW) vocational maritime education and training programmes (MET) at TUDEV. The aim of this project is to ensure cadets at TUDEV attain EU standards and their qualifications are recognized by all EU Countries. The project is intended to meet the increasing demand for qualified deck watch officers (OOW) which has come about due to growth of maritime sector in the EU in line with the rapid increase in the maritime trade both in EU and in Turkey. Although vocational Maritime Education and Training must be in compliance with IMO (International Maritime Organization) regulations/model courses in all countries, due to application differences, Turkish OOW licences are not recognized by EU countries. On the other hand, investigation of the maritime accidents which caused significant loss of lives and properties has shown that the main reason/causes of the maritime accidents is due to human errors, which in turn is due to lack of well-developed and well-assessed vocational MET. This problem has restricted the free movement of the maritime manpower due to stated standard differences. Turkish ships, as result, have been disadvantaged and are experiencing difficulties entering ports worldwide. Education, training and certification of such an international profession should be at least to EU standards and recognized worldwide. TUDEV, in collaboration with her permanent partners, Centre for Factories of the Future (CFF, England) and Glasgow College of Nautical Studies (GCNS, Scotland) has identified the differences through the former Leonardo Mobility project TRAIN4Cs and through the Leonardo Pilot Project Safety On Sea (SOS). The latter project developed MET programmes which are fully compatible with those in the EU countries. This new proposal (TRAIN 4Cs II) is a follow-up of the former project and is intended to apply the findings of the TRAIN 4Cs and also those from the SOS project by developing an integrated mobility proposal. The proposal will give TUDEV cadets the opportunity to acquire qualifications which will be recognised throughout the EU and worldwide. The current partnership with GCNS and CFF and new association with Plymouth University had led to this new proposal. The proposal will help to overcome the shortage of qualified officers in the maritime sector in Turkey and will provide the Turkish merchant navy cadet officers (OOW) with internationally recognised qualifications and through this recognition it will provide their free movement in the EU and in the world. In parallel to above expected results; it will be verified that MET system of TUDEV is at the EU standards. Some of the trainees from this project are expected to return to TUDEV and help to apply their newly founded knowledge and skills hence in the very near future

TUDEV MET programmes will be updated fully to EU standards enabling other EU countries particularly those joining or recently joined the EU to learn from TUDEV's experience through planned and expected dissemination arrangements as was the case in the past (Ziarati, 2006. SOS final conference proceeding 2007, and so forth)T

Similar practice may also become a worldwide application with the revision of the STCW which must encourage training of seafarers and especially of maritime officers in maritime education and training (MET) institutions, certified by the national maritime authorities and periodically assessed by international commissions for the world wide recognition. Revision of the STCW must specify a minimum number of training hours (courses and practical applications) for each main category of competences, at least at operational level which requires a lot of updates taking into account the evolution of technologies in maritime transport in the recent years. After a major revision and update of the content of the existing IMO courses, they could be declared as a minimum standard of training for maritime officers. Such documents will also help the national maritime authorities in their tasks to standardize the quality of national MET system and to establish the content of the certification exams for their seafarers.

In the context of the 21st century and of the abundance of electronic navigation equipment, IMO, using the STCW regulations, must give a clear signal regarding reduction of theoretical knowledge in certain subjects such as celestial navigation. Such a message will provide guidance for national maritime authorities in establishing assessment requirements for the certification exams. MET institutions could not take the first step in reducing the hours allotted to the courses, because the national maritime authorities are afraid to eliminate from the certification examination the subjects involving deep theoretical knowledge. Scientific pocket calculators and even PC software must be accepted as practical means to get the results of many nautical calculations.

6. Additional units and/or short courses for smooth transition to specific shore duties for career progression as well as for job diversification

TUDEV's SOS project was designed to improve safety at sea through improved education and training. TUDEV has been running programmes of education and training for Deck Officers and Engineer Officers based on the IMO (International Maritime Organisation) syllabuses for some ten years. To improve the standard of its programmes, in 2003, the partner using the syllabuses developed by northern European countries revised its programmes and at the same time, applying cross-referencing techniques (EUROTECNET 37), also satisfied the requirements of a major international awarding body (Edexcel) for the award of a higher national diploma (HND). Graduates from these programmes can continue their education and enrol on the final year of appropriate degree programmes. This is important because many seafarers after a period at sea would like to settle down and work on shore, and the diploma would help them find good and permanent jobs. The development of the HNDs by the Contracting partner led to identification of deficiencies and ambiguities which have proven to have led to many safety lapses at sea. The comparison of the HNDs in Turkey and those in England and SCOTLAND has clearly indicated several differences in content and method of applications. Through discussions and using cross-referencing methods an attempt has been made to bring the two sets of the HND programmes together. In doing so, with no disrespect to organisations involved with validation and accreditation of these programmes, it has been realised that there are serious differences in standards being applied, and even in the pathways chosen to satisfy the same awarding or even the same licensing body. Many examples of these differences and in some cases deficiencies have been highlighted in the body of this proposal.

With reference to the OECD report (OECD, Jan 2003), those seafarer intending to come ashore to work finds that they need additional skill to adopt to the shore working environment and competency for the job requirement. The training received by seafarers in most country is still limited to the need of the marine environment and in most country training is on the seafarer own initiatives and expensive. Thus resulted they only acquired certain type of trainings that only related to the job concerned but no other soft skill such as business savvy, accounting and financial, communication and interpersonal skill and many skill

that were not incorporated during their earlier involvement in the maritime sector. Most of those who came ashore have to learn on the job and risk losing out or some may just give-up and return to sea. This effect would later on discourage those who are intent to choose the sea as their career to shy away as there is not career alternative later in live. The maritime sector is facing a lack of well trained maritime business managers. There exists significant new and rising demand for education and qualifications which enhance the innovation capacity within the sector so as to benefit from the predicted growth rates in the maritime transport sector. In future, maritime business managers need to be better prepared by possessing multidisciplinary knowledge and skills set to cope with growing maritime traffic, port development, and rising environmental challenges, all within an intermodal environment.

7. Continuous learning and e-learning to include on-line assessment and certification

The concept of continuous learning has become quite prominent over the past five years. As mentioned above core issues in maritime environment, especially on legal and environmental issues are changing rapidly. Therefore, it's difficult to find any approach to doing anything in organizations that doesn't soon become outdated. The concept of continuous learning has become important because it places priority on noticing, adapting and learning from change. On the other hand, rapidly increasing communication capabilities are alleviating use of internet almost from any point on the earth providing transfer of web based flexible learning material together with a certifiable test. This may allow cadets and officers to take some courses even when they are at sea. TUDEV's two EU Projects were mainly focused on this issue with the aim of on-line assessment and certification.

As defined in the project document, the first project-E-GMDSS was basically focused on provision of vocational education and continuing vocational training for Short Range Certificate (SRC) which is mandatory for seafarers operating vessels of up to 300 GRT within 30 NM from coast. The target group were all mariners (there are more than 2 million of them in EU alone) that are either starting their nautical training or have to refresh their knowledge and skills at least once a year (so seafarers ranging from amateurs to professionals). The knowledge required for the SRC can be obtained through either self-training, nautical education institutions or internal training conducted at larger marine companies. To obtain the SRC award a candidate must be able to competently operate four different GMDSS communication devices (VHF DSC, Navtex, EPIRB and SART). These devices are only used for emergencies at sea which occur rarely. Therefore, the knowledge of operation of these devices tends to fade over time and should be regularly refreshed to ensure safety of crew, passengers and freight (even though this is not a legal requirement).

Project was developed in cooperation with 8 institutions from different EU countries ; Slovenia (Spinaker si), England (CFF-Centre for Factories of the Future), Spain (Facultad de ciencias nauticas), Spain (Cetemar), Italy (C.S.S., SE.MA2), Netherlands (Maritime Institute Willem Barentsz), Poland (Maritime University of Szczecin), Finland (Institute of Maritime Studies).

As a result of almost two years of dedication and hard work , several working meetings and mutual visits, initially a web site (www.egmdss.com) in English has been developed for the aimed online SRC Course. With this course, which includes also DSC VHF radio simulator, NAVTEX receiver simulator and quizzes that is available online for FREE, one can practice to get a Short Range Certificate (SRC) License or simply practice before going to sea. When sailing as a professional or as an amateur on leisure crafts such as speedboats, yachts or sailing boats and in a distress or an emergency situation such as your boat capsizing or sinking, SRC course will provide you with the basic knowledge to use the different equipment on board the boat to enable you to communicate with others in emergency situations.

GMDSS SRC courses include Simrad's GMDSS VHF RD68 simulator and McMurdo's NAVTEX receiver NAV 6 Plus simulator. The aim of simulators is to put learners into an active mode. The simulators are available in seperate web browser window so that the learners can attend the SRC in one window, and practice in the simulator in another web browser window. Thus, learners can practice and verify their knowledge on simulators withouth SRC course interruption.

The web site (www.egmdss.com) has been chosen as one of 9 best from 443 e-learning resources in the "My favorite e-learning resources" contest (16.6.2006 - an European Commission initiative elearningeuropa.info).

Future works aims to enlarge course content to the upper certificate levels such as ROC, GOC and REO and to become certified teaching and examination centre on behalf of national authorities. Since web site is available worldwide in other European Languages besides English, it will provide universal standards for maritime communications as well which is essential for the safety of all seafarers.

The other ongoing project-MarTELL- is focused on to develop a series of Maritime English language standards incorporating also the IMO's SMCP, at three different standards: i) Foundation – Elementary, Intermediate and Advanced, ii) Officer – Deck and Engineering, and iii) Senior Officers – Deck and Engineering, also senior officers at port and pilots. The success of the project would lead to vocational qualifications in Maritime English and usage which is expected to be recognised Europe-wide. The standards and their associated study units will provide an opportunity for many companies' particularly smaller ones to become involved particularly taking advantage of learning materials and the intended e-learning and e-assessment and facilities for self-learning and self-assessment. Impact is expected to be substantial as the project responds to a European and international acknowledgment of the problem which this project intends to address at source and through industrial lifelong learning.

8. Conclusion

The International standards for merchant navy education and training (MET) currently in place were introduced in 1995 (IMO STCW-95). Since 1995, there has been rapid revolution in design of ships and the equipment used in the navigation and propulsion systems on board these ships and yet there has been no serious attempt to revise the STCW and/or the International model courses such as IMO 7.03, 7.04, 7.01 and 7.02. One very important development has been the introduction of automation in operating a ship. The modern ships particularly container and fuel carrying vessels are becoming increasingly automated. The automation has brought with it two problems, one concerning the inadequacy of existing seafarers' education and training viz., that if any aspects of automation fails the crew often are not trained to use alternative systems and hence respond to it effectively (IMO MSC 82, 2006; Ziarati, 2006). The second problem has arisen from the review of the arguments from recent IMO Maritime Safety Committee (reports MSC 82/15/2 and MSC 82/15/3, 2006) namely that the human operators rarely understand all the characteristics of automatic systems and these systems' weaknesses and limitations which have now been found to be the main causes of accidents. These reports concluded that there is a need to improve the content of all maritime training and that the knowledge, skills and understanding of automation should be included in the basic training of all Chapters of the STCW Code of practice and hence address this very serious issue at source. Furthermore, to address the second problem, it is considered feasible to gather the knowledge for inclusion in the existing seafarer's education and Training in a short course format that can be easily introduced for existing seafarers and hence enabling the seamen currently working at sea and in ports to develop the competence to handle and respond to automation failures. To overcome these problems TUDEV has instigated an EU project with several partners from EU.

The main aim of the project is to transfer the innovation already developed in the design, delivery and assessment of short courses in order to fill the gap created as the result of emergence and application of the automated systems in the education and training of seafarers by the provision of a training course enabling them to have a full understanding of automated systems and these systems' weaknesses and limitations and receive International/European-wide recognition for it.

The partnership is composed of partners who have the necessary knowledge either on related aspects of automation or those who have developed software and/or hardware which are needed for the proposed short training programme in automation. The partnership is composed two small progressive high technology SMEs and several major merchant navy education and training (MET) institutions supported by their awarding, accrediting and/or certificating authorities. Some of the partners have recently been involved in

harmonising and complementing the existing MET programmes in the EU (Safety On Sea, SOS 2005-07) and some have developed an innovative e-learning and assessment platform as part of current Leonardo Pilot project (E-GDMSS, 2006-2008). The platform has been successfully tested and evaluated using two groups of trainees composed of different people from different sector of maritime education and industrial sectors. The proposal instigator was the representative of IMarEST at recent IMO MSC (2006) and at the same time a member of a national delegation at the event. The contracting organisation is also involved with a Leonardo pilot project started in November 2007 named MarTEL concerning the transfer of innovation by reviewing the accidents and incidents and identifying causes of these accidents albeit primarily due to language competency. Several other countries would like to become involved with this proposed project. The partners have collectively almost a complete range of bridge and engine simulators including fully integrated bridge-propulsion-power transmission, two with full mission capability incorporating high level of physical fidelity and different levels of severity. One of the partners is involved in the development of the next generation of simulators for marine diesel engines. Two major simulator system manufacturers (one largest in Europe) have agreed to support the project.

The main tangible outcome is a new course in automation with 8 modules, each concerning a particular level of depth in knowledge, skills and understating, for a given level of seniority and concerning a given job function. The second outcome is expected to be the intended adaptation of an e-learning platform with assessment facilities currently under development in E-GMDSS (2006) or use of an earlier platform developed in a previous EU funded project by one of the partners (Ziarati, 2002). The team building module may replace the existing non-standard, but on high demand courses such as Bridge Resource Management and Ship Handling. Since the intention is to adapt e-learning and e-assessment both in the training and learning methods, viz., self-learning and self-assessment tools, the project products, as stated earlier, will target a wider audience including active seafarers working on board automated vessels.

The main intangible outcome is that the course would provide an opportunity for many rating and officers with no or little knowledge of automation to acquire the necessary expertise and seek employment on board vessels with automated systems. The knowledge needed for example by Engineers and Deck officer on board a vessel has to match the complexity of the automated system and other related equipment they operate. To ensure this will be the case the course is designed to be a bolt-on programme and capable of being up-dated. There has been a shift from component based training to system-based training and the focus is on team operation viz., bringing the bridge team to work effectively as a team and in turn making sure that the Engine personnel and Deck crew work in harmony particularly in emergency situations. The latter consideration is as important today and it has been in the past. The e-learning and e-assessment tools and internet software interfaces already available will be adapted for application in delivery of the intended course/modules would be able to be applied in the delivery of other units of training and as self-learning/assessment tool.

Impact will be substantial as this project responds to an internationally acknowledged problem which the partnership is confident of resolving and since the social partners including employers and ship owners are involved in the proposed project the impact is expected to include widespread use of the course in partner (expected use of internet portals and e-learning and assessment - a transfer of knowledge from an existing Leonardo project EGMDSS, 2006 - 2008) and other EU countries and obtain recognition (a transfer from a recent successful Leonardo project Safety On Sea – SOS, 2005 – 2007) for it.

The project is expected to fill the gap created as the result of emergence and application of the automated systems in the education and training and further training of seafarers by provision of a training course enabling them to have a full understanding of automated systems, and these systems' weaknesses and limitations. Accidents could cause loss of life and substantial material damage, therefore seafarers not only have to learn how to operate automation systems but should regularly be refreshed to ensure the safety of the crew, passengers (if any) and what the carry. Seafarers will need to remember also how to react to dangerous and emergency resulting from automation failures and able to react and handle the situation.
The course will be also available to industry to ensure companies in the sector**,** particularly ship operators and ship builders are aware of the support these systems require and operational features as well as their management. It will enhance the governance and attractiveness of VET systems through increased cooperation with social partners and all relevant stakeholders by facilitating the participation of companies

and SMEs. It is in this respect that the proposal also addresses to improve the quality and to increase the volume of co-operation between institutions, enterprises, social partners and other relevant bodies. This aim is expected to make the companies more competitive and reduce loss of life and personal injuries as well as substantially reduce the cost of accidents and incidents due to automation systems and their failures. The course can also be used by ship crews who are working on board these vessels and pilots at ports, as an up-dating programme of personnel or self development. Furthermore, many employees and individuals will be able to enhance their skills and competence and hence become more employable and participate in the European labour market. The skills and competence again could help individuals to become more mobile and seek better paid jobs or work in other flag states.

The project also aims is to adapt e-learning and e-assessment systems and use Internet as a means of communication within the target groups as well as for training material delivery and its assessment. There will be two types of assessment. One as part of the learning strategy so that self-assessment and trainee-centre-learning and inquiry methods could be used to enhance learning; and the second is assessment which is designed to measure performance evaluation and for progression purposes.

Since the developed courses will be given in English as well as partners own language, it will also contribute to Vocationally oriented language learning (VOLL) and Content integrated language learning (CLIL) priorities that apply across all Leonardo Projects.

TUDEV has achieved a great deal in receiving recognition for its Merchant Navy Education and Training programmes for both deck and marine engineering officers through the Leonardo Safety on Sea (SOS) Project. The SOS project also helped TUDEV to become involved with other National and European projects. There are now over 30 major centres working with TUDEV supporting various European Projects.

The vision of TUDEV is not only to support the maritime industry in Europe but also look into the future and make an attempt to identify the trends and prepare the industry. TUDEV's training and education philosophy is primarily based on skills and competence preparing the young people not for the past but for the future through self studies, student centred activities, group and individual assignments and a series of other skills essential for a well rounded and confident person.

With the emergence of the Piri Reis Maritime University, TUDEV intents to become involved in Graduate and Post Graduate programmes preparing young people for life as well as work, focusing on young well educated and trained graduates with a clear sense of direction, judgement and wisdom. The outcomes of the above mentioned projects will be applied and developed by the Piri Reis University and will be presented to IMO as the new methodologies and technologies in MET for the revision of the existing model courses to meet the requirements of the today's maritime industry.

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